

IFB NO. Y15-7012-PH

ISSUED: July 31, 2015

INVITATION FOR BIDS

FOR

**PUMP STATIONS 3391 NORTH ORLANDO INDUSTRIAL 3676 COUNTRY RUN 3265
OLD MEADOW PUMP STATION IMPROVEMENTS**

**PART H
TECHNICAL SPECIFICATIONS**

PART H

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Orange County Utilities

**PUMP STATION R/R PACKAGE No. 8
PUMP STATION IMPROVEMENTS**

**PS #3391 – NORTH ORLANDO INDUSTRIAL PARK
PS # 3676 – COUNTRY RUN
PS #3265 – OAK MEADOWS**

TABLE OF CONTENTS

DIVISION 1 - GENERAL REQUIREMENTS

01001	General Work Requirements <i>rev February 2015</i>
01010	Summary of Work <i>rev December, 2014</i>
01021	Soils Report and Other Information
01025	Measurement and Payment <i>rev November 2014</i>
01027	Applications for Payment <i>rev March, 2015</i>
01050	Surveying and Field Engineering <i>rev March, 2015</i>
01065	Permits and Fees <i>rev November 2012</i>
01070	Abbreviations and Symbols
01091	Reference Specifications
01200	Project Meetings <i>rev December 2014</i>
01300	Submittals
01310	Progress Schedules <i>rev May 2013</i>
01370	Schedule of Values <i>rev December 2014</i>
01380	Audio-Visual Documentation
01400	Quality Control
01410	Testing and Testing Laboratory Services <i>rev December 2014</i>
01516	Collection System Bypass <i>rev November 2012</i>
01560	Erosion and Sedimentation Control <i>rev November 2012</i>
01570	Maintenance of Traffic <i>rev March, 2015</i>
01580	Project Identification and Signs
01590	Construction Field Office <i>rev June 2013</i>
01610	Delivery, Storage, and Handling
01650	Pump Station Start-up and Testing <i>rev November, 2012</i>
01700	Project Closeout
01720	Project Record Documents <i>rev February, 2015</i>
01730	Pump Station Operation and Maintenance Manual
01740	Warranties and Bonds

DIVISION 2 - SITE WORK

02050	Demolition of Existing Structures
02080	Abandonment, Removal and Salvage or Disposal of Existing Pipe
02100	Temporary Erosion and Sedimentation Control
02140	Dewatering
02215	Finish Grading
02220	Excavating, Backfilling and Compacting
02571	Limerock Base
02572	Soil Cement Base
02573	Asphalt Pavement Removal and Replacement
02576	Concrete Sidewalks and Driveways
02578	Solid Sodding
02660	Potable Water System
02661	Wastewater Force Mains
02761	Cleaning Sanitary Sewer Systems <i>rev May 2013</i>
02771	Cure-In-Place Pipe for Sanitary Sewer Renewal <i>rev February, 2015</i>
02775	Wastewater Manhole Rehabilitation <i>rev February, 2015</i>
02784	Chain Link Fences and Gates

DIVISION 4 – MASONRY – NOT USED

DIVISION 3 - CONCRETE

03100	Concrete Formwork
03200	Concrete Reinforcement
03300	Cast-in-Place Concrete
03410	Precast Concrete Structures
03600	Grouting

DIVISION 5 - METALS

05500	Miscellaneous Metals
-------	--------------------------------------

DIVISION 6 - WOOD, PLASTICS, AND COMPOSITES - NOT USED

DIVISION 7 - THERMAL AND MOISTURE PROTECTION - NOT USED

DIVISION 8 - OPENINGS

08350	Access Hatch Doors
-------	------------------------------------

DIVISION 9 - FINISHES

09865	Surface Preparation and Shop Prime Painting
09901	Coatings and Linings
09905	Pump Station Valve Identification System
09910	Prefabricated Fiberglass Liners
09960	High Performance Ferrous Metal Coatings <i>rev March, 2013</i>

DIVISION 10 - SPECIALTIES - NOT USED

DIVISION 11 – EQUIPMENT

- 11305 [Submersible Pumps and Appurtenances](#) *rev May 2014*
- 11305-A [Submersible Pump Schedule](#)

DIVISION 12 - FURNISHINGS - NOT USED

DIVISION 13 - SPECIAL CONSTRUCTION

- 13423 [Level Measurement](#)
- 13430 [Pump Station Control Panels](#) *rev September, 2013*

DIVISION 14 - CONVEYING EQUIPMENT - NOT USED

DIVISION 15 - MECHANICAL

- 15062 [Ductile Iron Pipe and Fittings](#)
- 15064 [Polyvinyl Chloride \(PVC\) Pipe and Fittings](#) *rev August 2014*
- 15065 [Stainless Steel Pipe and Fittings](#)
- 15100 [Ancillary Equipment](#)
- 15105 [Check Valves](#)
- 15110 [Plug Valves](#)
- 15111 [Gate Valves](#)

DIVISION 16 – ELECTRICAL

- 16010 [Electrical General Provisions](#)
- 16110 [Raceways](#)
- 16120 [Wires and Cables](#)
- 16135 [Electrical Boxes and Fittings](#)
- 16142 [Electrical Connections for Equipment](#)
- 16143 [Wiring Devices](#)
- 16170 [Circuit and Motor Disconnects](#)
- 16180 [Over Current Protective Devices](#)
- 16190 [Supporting Devices](#)
- 16195 [Electrical Identification](#)
- 16420 [Service Entrance](#)
- 16450 [Grounding](#)

APPENDIX

APPENDIX A [GEOTECHNICAL ENGINEERING REPORT \(title sheet\)](#)

APPENDIX B [FORMS \(title sheet\)](#)

- Appendix B [Digital Data Submission](#)
- Appendix B [Pressure Main Sample Collection Submittal Form](#) *rev May,2014*
- Appendix B [Pressure Test](#)
- Appendix B [Pump Station Start-Up Report](#)
- Appendix B [Right of Entry Form for work on private property](#)
- Appendix B [Risk Management June 02](#)
- Appendix B [Water Main Disinfection Certification](#)

APPENDIX C [PERMITS OBTAINED BY COUNTY \(title sheet\)](#)

APPENDIX D [LIST OF APPROVED PRODUCTS \(title sheet\)](#)

Appendix D [Orange County Utilities - List of Approved Products \(February 11, 2011\)](#)

APPENDIX E [BOUNDARY SURVEYS \(title sheet\)](#)

PS 3265 Boundary Survey

PS 3391 Boundary Survey

PS 3676 Boundary Survey

APPENDIX F [STRUCTURAL ENGINEERING REPORT \(title sheet\)](#)

APPENDIX G [DEWATERING DISCHARGE OFF-SITE \(title sheet\)](#)

Appendix G [FDEP Notice of New Method for Mercury Testing](#)

Appendix G [FDEP Generic Permit for the Discharge of Produced Groundwater](#)

Appendix G [Memo – EPA –Analytical Methods for Mercury in NPDES Permits](#)

Appendix G [Orange County EPD Work Instruction](#)

SECTION 01001
GENERAL WORK REQUIREMENTS

1
2
3
4
5
6 **PART 1 - GENERAL 2**

7 1.01 NOTICE AND SERVICE 2

8 1.02 WORK TO BE DONE 2

9 1.03 DRAWINGS AND PROJECT MANUAL..... 2

10 1.04 PROTECTION AND RESTORATION..... 3

11 1.05 PUBLIC NUISANCE..... 4

12 1.06 CONTRACTOR’S PAYMENTS TO COUNTY FOR OVERTIME WORK 4

13 1.07 MAINTENANCE OF SERVICE 5

14 1.08 TRANSFER OF SERVICE 5

15 1.09 LABOR..... 5

16 1.10 MATERIALS AND EQUIPMENT 6

17 1.11 MANUFACTURER'S SERVICE 6

18 1.12 INSPECTION AND TESTING..... 7

19 1.13 PROJECT SITE AND ACCESS 9

20 1.14 UTILITIES 10

21 1.15 RELATED CONSTRUCTION REQUIREMENTS 13

22 1.16 CONSTRUCTION NOT PERMITTED..... 16

23 **PART 2 - PRODUCTS (NOT USED) 16**

24 **PART 3 - EXECUTION (NOT USED) 16**

25
26

1 **SECTION 01001**

2 **GENERAL WORK REQUIREMENTS**

3 **PART 1 - GENERAL**

4 1.01 NOTICES

- 5 A. All notices or other papers required to be delivered by the Contractor to the County shall
6 be delivered to the office of the Engineering Division, Orange County Utilities
7 Department, 9150 Curry Ford Road, Orlando, FL 32825.

8 1.02 WORK TO BE DONE

- 9 A. The Contractor shall furnish all labor, materials, equipment, tools, services, and
10 incidentals to complete all work required by these specifications and as shown on the
11 Drawings, at a rate of progress which will ensure completion of the Work within the
12 Contract Time stipulated.

- 13 B. The Contractor shall perform the Work complete, in place, and ready for continuous
14 service, and shall include repairs, testing, permits, clean up, replacements, and restoration
15 required as a result of damages caused during this construction.

- 16 C. The Contractor shall comply with all City, County, State, Federal, and other codes, which
17 are applicable to the proposed Work.

- 18 D. All newly constructed Work shall be carefully protected from injury in any way. No
19 wheeling, walking, or placing of heavy loads on it shall be allowed and all portions
20 damaged shall be reconstructed by the Contractor at his own expense.

- 21 E. Scope of Work: See Section 01010 "Summary of Work" and the Bid Schedule for details.

22 1.03 DRAWINGS AND PROJECT MANUAL

- 23 A. The Work shall be performed in accordance with the Drawings and Specifications
24 prepared by the County/Professional. All work and materials shall conform to the
25 Orange County Utilities Standards and Construction Specifications Manual, latest edition
26 or as indicated in these Specifications or Drawings.

- 27 B. The Contractor shall verify all dimensions, quantities and details shown on the Drawings,
28 Supplementary Drawings, Schedules, Specifications or other data received from the
29 County/Professional, and shall notify same, in writing, of all errors, omissions, conflicts
30 and discrepancies found therein. Failure to discover or correct errors, conflicts or
31 discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory
32 Work, faulty construction or improper operation resulting there from, nor from rectifying
33 such conditions at his own expense.

1 C. All schedules are given for the convenience of the County and the Contractor and are not
2 guaranteed to be complete. The Contractor shall assume all responsibility for the making
3 of estimates of the size, kind, and quantity of materials and equipment included in the
4 Work to be done under this Contract.

5 D. Intent:

- 6 1. All Work called for in the Specifications applicable to this Contract, but not shown on
7 the Drawings in their present form, or vice versa, shall be of like effect as if shown or
8 mentioned in both. Work not specified either in the Drawings or in the
9 Specifications, but involved in carrying out their intent or in the complete and proper
10 execution of the Work, is required and shall be performed by the Contractor as
11 though it were specifically delineated or described.
- 12 2. Items of material, equipment, machinery, and the like may be specified on the
13 Drawings and not in the Specifications. Such items shall be provided by the
14 Contractor in accordance with the specification on the Drawings.
- 15 3. The apparent silence of the Specifications as to any detail, or the apparent omission
16 from them of a detailed description concerning any Work to be done and materials to
17 be furnished, shall be regarded as meaning that only the best general practice is to
18 prevail and that only material and workmanship of the best quality is to be used, and
19 interpretation of these Specifications shall be made upon that basis.

20 E. Refer to the Contract for the order of precedence of items and documents.

21 1.04 PROTECTION AND RESTORATION

22 A. The Contractor shall be responsible for the preservation of all public and private property,
23 and shall use every means of protection necessary to prevent damage thereto. If any
24 direct or indirect damage is done to public or private property by or on account of any
25 act, omission, neglect, or misconduct in the execution of the Work on the part of the
26 Contractor, such property shall be restored by the Contractor, at his expense, to a
27 condition similar or equal to that existing before the damage was done, or the Contractor
28 shall make good the damage in other manner acceptable to the County/Professional.

29 B. Protection of Trees and Shrubs

- 30 1. Protect with boxes or other barricades.
31 2. Do not place excavated material so as to injure trees or shrubs.
32 3. Install pipelines in short tunnels between and under root systems.
33 4. Support trees to prevent root disturbance during nearby excavation.

34 C. Tree and Limb Removal

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

- 1 D. Trees or shrubs destroyed by negligence of the Contractor or his employees shall be
2 replaced by the Contractor with new stock of similar size and age, at the proper season
3 and at the sole expense of the Contractor.
- 4 E. Lawn Areas: All lawn areas disturbed by construction shall be replaced with like kind to
5 a condition similar or equal to that existing before construction. Where sod is to be
6 removed, it shall be carefully removed, and the same re-sodded, or the area where sod has
7 been removed shall be restored with new sod in the manner described in the applicable
8 section.
- 9 F. Where fencing, walls, shrubbery, grass strips or area must be removed or damaged
10 incident to the construction operation, the Contractor shall, after completion of the work,
11 replace or restore to the original condition.
- 12 G. The cost of all labor, materials, equipment, and work for restoration shall be deemed
13 included in the appropriate Contract Item or items, or if no specific item is provided
14 therefore, as part of the overhead cost of the Work, and no additional payment will be
15 made therefore.

16 1.05 PUBLIC NUISANCE

- 17 A. The Contractor shall not create a public nuisance including, but not limited to,
18 encroachment on adjacent lands, flooding of adjacent lands, or excessive noise.
- 19 B. Sound levels measured by the County/Professional shall not exceed 45 dBA from 8 p.m. to 8
20 a.m. or 55 dBA 8 a.m. to 8 p.m. This sound level shall be measured at the exterior of the
21 nearest exterior wall of the nearest residence. Levels at the equipment shall not exceed 85
22 dBA at any time. Sound levels in excess of these values are sufficient cause to have the
23 Work halted until equipment can be quieted to these levels. Work stoppage by the
24 County/Professional for excessive noise shall not relieve the Contractor of the other portions
25 of this specification including, but not limited to, completion dates and bid amounts.
- 26 C. No extra charge may be made for time lost due to work stoppage resulting from the
27 creation of a public nuisance.

28 1.06 CONTRACTOR'S PAYMENTS TO COUNTY FOR OVERTIME WORK

- 29 A. **County Inspector Work Hours: Normal work hours for the County's inspector(s)**
30 **are defined as any 8-hour period between the hours of 7:00 a.m. and 7:00 p.m. on**
31 **the weekdays of Monday through Friday. Any County Inspector(s) work beyond**
32 **the aforementioned normal work hours shall be requested in writing 48-hours in**
33 **advance. All overtime, any County holidays or weekend work compensation for the**
34 **County's Inspector(s) to work beyond the normal working hours are considered**
35 **overtime compensation and shall be paid for by the Contractor. The overtime pay**
36 **rate will be \$51.00 per hour or the most current rate as listed in the County Fee**
37 **Directory prepared by the Office of Management and Budget, in section "Orange**
38 **County Utilities Engineering & Construction", under the heading of "Inspection Fee**

1 **other than Normal Working Hours". The Contractor agrees that the County shall**
2 **deduct charges for work outside normal work hours and for overtime pay from**
3 **payments due the Contractor.**

4 1.07 MAINTENANCE OF SERVICE

5 A. Unless noted otherwise on the plans, the operation of the existing water, reclaimed
6 water or wastewater facility on each of the respective locations shall remain in
7 service until the transfer of service has been completed. The Contractor shall, prior
8 to interrupting any utility service (water, sewer, etc.) for the purpose of making cut-
9 ins to the existing lines or for any other purposes, contact the County and make
10 arrangements for the interruption which will be satisfactory to the County.

11 B. Utility lines that are damaged during construction shall be repaired by the
12 Contractor and service restored within 4-hours of the breakage. The County retains
13 the option of repairing any damage to utility pipes in order to expedite service to the
14 customers. The Contractor will remain responsible for all costs associated with the
15 repair.

16 1.08 TRANSFER OF SERVICE

17 A. When the County has accepted a proposed facility and placed it into operation, the
18 transfer of service is complete. The Contractor may begin the work of removing the
19 existing or temporary facilities.

20 1.09 LABOR

21 A. Supervision: The Contractor shall supervise and direct the Work efficiently and with
22 his best skills and attention. The Contractor shall have a competent, English
23 speaking superintendent or representative, who shall be on the site of the Project at
24 all working hours, and who shall have full authority by the Contractor to direct the
25 performance of the Work and make arrangements for all necessary materials,
26 equipment, and labor without delay.

27 B. Jurisdictional Disputes: It shall be the responsibility of the Contractor to pay all
28 costs that may be required to perform any of the Work shown on the Drawings or
29 specified herein to avoid any work stoppages due to jurisdictional disputes. The
30 basis for subletting work in question, if any, shall conform to precedent agreements
31 and decisions on record with the Building and Construction Trades Department,
32 AFL-CIO, dated June, 1973, including any amendments thereto.

33 C. Apprenticeship: The Contractor shall comply with all of the requirements of Section
34 446, Florida Statutes, for all contracts in excess of \$25,000 excluding roadway,
35 highway or bridge contracts and the Contractor agrees to insert in any subcontract
36 under this Contract the requirements of this Article.

1 1.10 MATERIALS AND EQUIPMENT

2 A. MANUFACTURER

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

32 1.11 MANUFACTURER'S SERVICE

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

1 1.12 INSPECTION AND TESTING

2 A. General

- 3 1. All materials and equipment furnished by the Contractor shall be subject to the
4 inspection, review and acceptance of the County and meet the requirements as
5 outlined in the Orange County Utilities Standards and Construction Specifications
6 Manual. If in the testing of any material or equipment it is ascertained by the
7 County/Professional that the material or equipment does not comply with the
8 Contract, the Contractor shall be notified thereof, and the Contractor will be directed
9 to refrain from delivering said material or equipment, or to remove it promptly from
10 the Site or from the Work and not accepted by the County shall be replaced with
11 acceptable material, without cost to the County.
- 12 2. Tests of electrical and mechanical equipment and appliances shall be conducted in
13 accordance with recognized test codes of the ANSI, ASME, or the IEE, except as
14 may otherwise be stated herein.
- 15 3. The Contractor shall give notice in writing to the County sufficiently in advance of
16 his intention to commence the manufacture or preparation of materials especially
17 manufactured or prepared for use in or as part of the permanent construction. Such
18 notice shall contain a request for inspection, the date of commencement and the
19 expected date of completion of the manufacture or preparation of materials. Upon
20 receipt of such notice, the County shall arrange to have a representative present at
21 such times during the manufacture as may be necessary to inspect the materials; or
22 the County will notify the Contractor that the inspection will be made at a point other
23 than the point of manufacture; or the County will notify the Contractor that inspection
24 will be waived.
- 25 4. When inspection is waived or when the County/Professional so requires, the
26 Contractor shall furnish to the County authoritative evidence in the form of
27 Certificates of Manufacture that the materials to be used in the Work have been
28 manufactured and tested in conformity with the Contract Documents. These
29 certificates shall be notarized and shall include five (5) copies of the results of
30 physical tests and chemical analysis, where necessary, that have been made directly
31 on the product or on similar products of the manufacturer.
- 32 5. The Contractor must comply with these provisions before shipping any material.
33 Such inspections by the County shall not release the Contractor from the
34 responsibility for furnishing materials meeting the requirements of the Contract
35 Documents.

36 B. Cost

- 37 1. County shall employ and pay for the services of an independent testing laboratory to
38 perform testing indicated on the Contract Documents, or at the County's discretion to
39 ensure conformity with the Contract Documents.
- 40 2. The cost of field leakage and pressure tests and shop tests of materials and equipment
41 specifically called for in the Contract Documents shall be borne by the Contractor.
42 Such costs shall be deemed to be included in the Contract price.
- 43 3. The Contractor shall notify the County laboratory a minimum of 48-hours in advance
44 of operations for scheduling of tests. When tests or inspections cannot be performed
45 after such notice, the Contractor shall reimburse County for expenses incurred.

- 1 4. The Contractor shall pay for all work required to uncover, remove, replace, retest,
2 etc., any work not tested due to the Contractor's failure to provide the 48-hours
3 advance notice or due to failed tests. The Contractor shall also provide compensation
4 for the County/Professional's personnel for required re-testing due to failed or
5 rescheduled testing.

6 C. Shop Testing

- 7 1. Each piece of equipment for which pressure, duty, capacity, rating, efficiency,
8 performance, function or special requirements are specified shall be tested in the shop
9 of the manufacturer in a manner which shall conclusively prove that its characteristics
10 comply fully with the requirements of the Contract Documents. No such equipment
11 shall be shipped to the worksite until the County/Professional notifies the Contractor,
12 in writing, that the results of such tests are acceptable.
- 13 2. The manufacturing company shall provide five (5) copies of the manufacturer's actual
14 shop test data and interpreted results signed by a responsible official of the
15 manufacturing company and notarized, showing conformity with the Contract
16 Documents as a prerequisite for the acceptance of any equipment. The cost of shop
17 tests (excluding cost of County's representative) and of furnishing manufacturer's
18 preliminary and shop test data of operating equipment shall be borne by the
19 Contractor and shall be included in the Contract price.

20 D. Field Testing:

- 21 1. The County shall employ and pay for services of an independent testing laboratory to
22 perform testing specifically indicated in the Contract Documents. Employment of the
23 laboratory shall in no way relieve Contractor's obligations to perform the Work of the
24 Contract. The Contractor shall provide compensation for retesting of all failed tests.
- 25 2. The County may at any time during the progress of the Work, request additional
26 testing beyond that which is specified in the Contract. This testing will be at the
27 County's expense. Contractor shall:
- 28 a. Cooperate with laboratory personnel, provide access to the Project.
29 b. Secure and deliver to the laboratory adequate quantities of representative samples
30 of materials proposed to be used and which require testing.
31 c. Provide to the laboratory the preliminary design mix proposed to be used for
32 concrete, and other material mixes, which require control by the testing laboratory.

33 E. Demonstration Tests: Upon completion of the Work and prior to final payment, all
34 equipment and piping installed under this Contract shall be subjected to acceptance or
35 demonstration tests as specified or required to provide compliance with the Contract
36 Documents. The Contractor shall furnish all labor, fuel, energy, water and all other
37 equipment necessary for the demonstration tests at no additional cost to the County.

38 F. Final Inspection: Prior to preparation of the final payment application, a final inspection
39 will be performed by the County to determine if the Work is properly and satisfactorily
40 constructed in accordance with the requirements of the Contract Documents. See also
41 Section 01700 "Project Closeout."

1 G. Inspection by existing utility owners: The Contractor shall pay for all inspections during
2 the progress of the work required and provided by the owner of all existing public
3 utilities paralleling or crossing the Work, as shown on the Drawings. All such inspection
4 fees shall be deemed included in the appropriate Contract Item or items, or if no specific
5 item is provided therefore, as part of the overhead cost of the Work, and no additional
6 payment will be made therefore.

7 H. Inspection by Other Agencies: The Florida Department of Transportation, the Florida
8 Department of Environmental Protection, and other authorized governmental agencies
9 shall have free access to the site for inspecting materials and work, and the Contractor
10 shall afford them all necessary facilities and assistance for doing so. Any instructions to
11 the Contractor resulting from these inspections shall be given through the County. These
12 rights of inspections shall not be construed to create any contractual relationship between
13 the Contractor and these agencies.

14 1.13 PROJECT SITE AND ACCESS

15 A. RIGHT-OF-WAY AND EASEMENTS

- 16 1. The use of public streets and alleys shall be such as to provide a minimum of
17 inconvenience to the public and to other traffic. Any earth or other excavated
18 material shall be removed by the Contractor and the streets cleaned to the satisfaction
19 of the County.
- 20 2. The Contractor shall not enter or occupy private land outside of easements, except by
21 written permission of the property owner.
- 22 3. At the time of the Pre-Construction meetings, the Contractor shall become fully
23 acquainted with the status of all easements. Should easements not be acquired by the
24 County in specific areas of the Work, the Contractor shall sequence and schedule his
25 work therein so as not to interfere with the progress of work in other areas of the
26 Project. Any rescheduling of work due to easement acquisitions shall be performed
27 by the Contractor at no additional cost to the County. The County agrees that it will
28 make every effort to acquire all remaining easements with all speed and diligence
29 possible so as to allow the completion of the Work within the Contract time.

30 B. ACCESS

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

1 1.14 UTILITIES

2 A. UTILITY CONSTRUCTION

- 3 1. Public utility installations and structures shall be understood to include all poles,
4 tracks, pipes, wires, conduits, house service connections, vaults, manholes and all
5 other appurtenances and facilities pertaining thereto, whether owned or controlled by
6 governmental bodies or privately owned by individuals, firms or corporations, used to
7 serve the public with transportation, traffic control, gas, electricity, telephone,
8 sewerage, drainage or water. Other public or private property, which may be affected
9 by the Work, shall be deemed included hereunder.
- 10 2. All open excavations shall be adequately safeguarded by providing temporary
11 barricades, caution signs, lights and other means. The Contractor shall, at his own
12 expense, provide suitable and safe bridges and other crossings for accommodating
13 travel by pedestrians and workmen. Bridges provided for access to private property
14 during construction shall be removed when no longer required.
- 15 3. The length of open trench will be controlled by the particular surrounding conditions,
16 but shall always be confined to the limits described by the County. If any excavation
17 becomes a hazard, or if it excessively restricts traffic at any point, the County may
18 require special construction procedures. As a minimum, the Contractor shall conform
19 to the following restoration procedures:
- 20 a. Interim Restoration: All excavations shall be backfilled and compacted as
21 specified by the end of each working day. For excavations within existing paved
22 areas; limerock base or soil cement base (match existing) shall be spread and
23 compacted to provide a relatively smooth surface free of loose aggregate material.
24 At the end of each workweek, the S-I asphaltic surface course shall be completed
25 and opened to traffic. Contractor shall coordinate his construction activity
26 including density tests and inspections to allow sufficient time to achieve this
27 requirement. All driveway cuts shall be backfilled, compacted, and limerock base
28 spread and compacted immediately after installation. Contractor shall coordinate
29 with the individual property owners prior to removing the driveway section. Any
30 utility crossing an existing roadway, parking lot or other paved area shall be
31 patched by the end of the working day.
- 32 b. All pipe and fittings shall be neatly stored in a location, which will cause the least
33 disturbance to the public. All debris shall be removed and properly disposed of
34 by the end of each working day.
- 35 c. Final Restoration Overlay: After completing all installations, and after testing of
36 the pipe (but no sooner than 30-days after applying the S-I asphaltic surface), final
37 restoration shall be performed. In no event shall final restoration begin after
38 substantial completion. Final restoration shall provide an S-III asphaltic overlay
39 as specified in an uninterrupted continuous operation until completion. Any
40 additional restoration required after testing shall be repaired in a timely manner at
41 no additional cost to the County.
- 42 d. Maintenance of all restored facilities shall be the Contractor's responsibility. This
43 maintenance shall be performed on an on-going basis during the course of
44 construction. The Contractor's Progress Schedule shall reflect the above
45 restoration requirements.

1 e. Additional Restoration for Work in Business or Commercial Districts: The
2 Contractor shall restore all private property, damaged by construction, to its
3 original condition. Access to businesses located adjacent to the project site must
4 be maintained at all times. Contractor may prearrange the closing of business
5 accesses with the business owner. Such prearranged access closing shall not
6 exceed two (2) hours. Property drainage and grading shall be restored within 24-
7 hours of backfilling trench.

8 B. EXISTING UTILITIES

- 9 1. The locations of all existing underground piping, structures and other facilities are
10 shown based on information received from the respective owner. The locations are
11 shown without express or implied representation, assurance, or guarantee that they
12 are complete or correct or that they represent a true picture of underground piping,
13 conduit and cables to be encountered. It is the Contractor's responsibility to verify all
14 existing underground piping, structures and other facilities.
- 15 2. The Contractor shall, at all times, employ acceptable methods and exercise reasonable
16 care and skill so as to avoid unnecessary delay, injury, damage or destruction of
17 existing utility installations and structures; and shall, at all times in the performance
18 of the Work, avoid unnecessary interference with, or interruption of, utility services;
19 and shall cooperate fully with the owners thereof to that end.
- 20 3. When existing facilities are found to be in conflict with the Work, the County
21 reserves the right to modify alignments to avoid interference with existing facilities.
- 22 4. All utilities, which do not interfere with the work, shall be carefully protected against
23 damage. Any existing utilities damaged in any way by the Contractor shall be
24 restored or replaced by the Contractor at his expense as directed by the County. Any
25 existing facilities, which require operation to facilitate repairs, shall be operated only
26 by the owner of the respective utility.
- 27 5. It is the responsibility of the Contractor to ensure that all utility and/or poles, the
28 stability of which may be endangered by the proximity of excavation, be temporarily
29 stayed and/or shored in position while work proceeds in the vicinity of the pole and
30 that the utility or other companies concerned be given reasonable advance notice of
31 any such excavation.

32 C. NOTICES

- 33 1. All governmental utility departments and other owners of public utilities, which may
34 be affected by the Work, will be informed in writing by the Contractor two (2) weeks
35 after the execution of the Contract or Contracts covering the Work. Such notice will
36 be sent out in general, and directed to the attention of the governmental utility
37 departments and other owners of public utilities for such installations and structures
38 as may be affected by the Work.
- 39 2. The Contractor shall comply with Florida Statute 553.851 regarding protection of
40 underground gas pipelines. Evidence of notification to the gas pipeline owner shall
41 be furnished to the County within two (2) weeks after the execution of the Contract.
- 42 3. It shall be the Contractor's responsibility to contact utility companies at least 72-hours
43 in advance of breaking ground in any area or on any unit of the work so maintenance
44 personnel can locate and protect facilities, if required by the utility company.

- 1 4. The Contractor shall give a minimum five (5) working day notice to utility personnel
2 prior to interrupting a utility service (water, sewer, etc.).

3 D. EXPLORATORY EXCAVATIONS

- 4 1. Exploratory excavations shall be conducted by the Contractor for the purpose of
5 locating underground pipelines or structures in advance of the construction. Test pits
6 shall be excavated in areas of potential conflicts between existing and proposed
7 facilities and at piping connections to existing facilities a minimum of 48-hours or
8 1,000-feet in advance of work. If there is a potential conflict, the Contractor shall
9 notify the County/Professional immediately. Information on the obstruction to be
10 furnished by the Contractor shall include: Location, Elevation, Utility Type, Material
11 and Size. Test pits shall be backfilled immediately after their purpose has been
12 satisfied and the surface restored and maintained in a manner satisfactory to the
13 County.

14 E. UTILITY CROSSINGS

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

20 F. RELOCATIONS

- 21 1. Relocations shown on the Drawings: Public utility installations or structures,
22 including but not limited to poles, signs, fences, piping, conduits and drains that
23 interfere with the positioning of the work which are shown on the Drawings to be
24 removed, relocated, replaced or rebuilt by the Contractor shall be considered as part
25 of the general cost of doing the Work and shall be included in the prices bid for the
26 various contract items. No separate payment shall be made therefore.
- 27 2. Relocations not shown on the Drawings
- 28 a. Where public utility installations or structures are encountered during the course
29 of the work, and are not indicated on the Drawings or in the Specifications, and
30 when, in the opinion of the County, removal, relocation, replacement or
31 rebuilding is necessary to complete the Work, such work shall be accomplished
32 by the utility having jurisdiction, or such work may be ordered, in writing by the
33 County, for the Contractor to accomplish.
- 34 b. If such work is accomplished by the utility having jurisdiction, it will be carried
35 out expeditiously and the Contractor shall give full cooperation to permit the
36 utility to complete the removal, relocation, replacement or rebuilding as required.
- 37 c. If such work is accomplished by the Contractor, it will be paid for as a Change
38 Order.
- 39 3. All existing castings, including valve boxes, junction boxes, manholes, hand holes,
40 pull boxes, inlets and similar structures in the areas of construction that are to remain
41 in service and in areas of trench restoration and pavement replacement, shall be
42 adjusted by the Contractor to bring them flush with the surface of the finished work.

- 1 4. All existing utility systems which conflict with the construction of the work herein,
2 which can be temporarily removed and replaced, shall be accomplished at the
3 expense of the Contractor. Work shall be done by the utility unless the utility
4 approves in writing that the Work may be done by the Contractor.

5 1.15 RELATED CONSTRUCTION REQUIREMENTS

6 A. PUBLIC INFORMATION OFFICER

- 7 1. The Contractor shall provide community interaction and coordination through a
8 designated Public Information Officer (PIO). The PIO will provide resolution to
9 complaints and problems from community members affected by the construction for
10 the entire project duration. The PIO will manage a 24-hour hotline phone number for
11 citizens to call. The PIO will field these calls, provide answers to questions, research
12 issues with the project team or appropriate agencies and follow up each complaint in
13 a timely manner. The PIO will maintain a daily diary of call and/or interactions with
14 the community, as well as a complaint log chronicling all issues and proposed
15 resolutions.
16 2. The PIO shall attend the project progress meetings and provide the project team with
17 a report of public issues since the last progress meeting. The PIO will also
18 disseminate roadway closures, sewer hookups, temporary and permanent restoration
19 and other relevant construction information to the community, as well as, when
20 appropriate, to the media, emergency services personnel and other interested
21 agencies.
22 3. The designated PIO shall have previous experience in providing similar services on
23 Orange County Utilities, Orange County Public Works or FDOT construction
24 projects. The PIO shall be fluent in English and Spanish and shall visit the
25 construction site, meeting locations and affected resident's homes as required.

26 B. TRAFFIC MAINTENANCE

- 27 1. Refer to Section 01570 – Maintenance of Traffic

28 C. BARRIER AND LIGHTS

- 29 1. The Contractor shall exercise extreme care in the conduct of the Work to protect
30 health and safety of the workmen and the public. The Contractor shall provide all
31 protective measures and devices necessary, in conformance with applicable local,
32 state and federal regulations. Protective measures shall include but are not limited to
33 barricades, warning lights/flashers and safety ropes.
34 2. All equipment and vehicles operating within 10-feet of the roadway shall have
35 flashing strobe lights attached.

36 D. DEWATERING AND FLOTATION

- 37 1. The Contractor, with his own equipment, shall do all pumping necessary to dewater
38 any part of the work area during construction operations to insure dry working
39 conditions. The Contractor shall take the necessary steps to protect on-site and off-
40 site structures. Damage to any structures due to dewatering shall be repaired or the
41 structures replaced at the Contractor's expense.
42 2. The Contractor shall be completely responsible for any tanks, wetwells or similar

1 structures that may become buoyant during the construction and modification
2 operations due to the ground water or floods and before the structure is put into
3 operation. The proposed final structures have been designed to account for
4 buoyancy; however the Contractor may employ methods, means and techniques
5 during construction which may affect the buoyancy of structures. The Contractor
6 shall take the necessary steps to protect structures. Damage to any structures due to
7 floating or flooding shall be repaired or the structures replaced at the Contractor's
8 expense.

- 9 3. Contractor shall be responsible for any required permits for the discharge of ground
10 water.

11 E. DUST AND EROSION CONTROL

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

29 F. LINES AND GRADES

- 30 1. All Work under this Contract shall be constructed in accordance with the lines and
31 grades shown on the Drawings, or as given by the County/Professional.
32 2. When the location of the Work is dimensioned on the Drawings, it shall be installed in
33 that location; when the location of the Work is shown on a scaled drawing, without
34 dimensions, the Work shall be installed in the scaled location unless the County approves
35 an alternate location for the piping. Where fittings are noted on the Drawings, such
36 notation is for the Contractor's convenience and does not relieve the Contractor from
37 laying and jointing different or additional items where required. The County/Professional
38 may require detailed pipe laying drawings and schedules for project control.
39 3. The Contractor shall, at his own expense, establish all working or construction lines
40 and grades as required from the project control points set by the County, and shall be
41 solely responsible for the accuracy thereof.
42 4. Water main and forcemain shall be installed to provide long uniform gradient or slope
43 to pipe to minimize air pockets and air release valves. The stationing shown on the
44 Drawings for air and vacuum release valve assemblies are approximate and the
45 Contractor shall field adjust these locations to locate these valves at the highest point

- 1 in the pipeline installed. All locations must be accepted by the County.
- 2 5. To insure a uniform gradient for gravity pipe and pressure pipe, all lines shall be
- 3 installed using the following control techniques as a minimum:
- 4 a. Gravity lines; continuous control, using laser beam technology.
- 5 b. Pressure lines; control stakes set at 50-foot intervals using surveyors' level
- 6 instrument.

7 G. TEMPORARY CONSTRUCTION

- 8 1. Temporary fences: If, during the course of the Work, it is necessary to remove or
- 9 disturb any fencing, the Contractor shall at his own expense, provide a suitable
- 10 temporary fence which shall be maintained until the permanent fence is replaced.
- 11 2. Responsibility for Temporary Structures: In accepting the Contract, the Contractor
- 12 assumes full responsibility for the sufficiency and safety of all temporary structures or
- 13 work and for any damage which may result from their failure or their improper
- 14 construction, maintenance or operation.

15 H. DAILY REPORTS

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

38 I. CLEANING

- 39 1. During Construction
- 40 a. During construction of the Work, the Contractor shall, at all times, keep the Site
- 41 free from material, debris and rubbish as practicable and shall remove the same
- 42 from any portion of the Site if, in the opinion of the County, such material, debris,
- 43 or rubbish constitutes a nuisance or is objectionable.

- 1 and curb around the perimeter of the pump station as shown on the drawings.
2 15. Installation of a new 2 inch water meter and service.
3 16. Construction of a Scheme 2 FDOT cast in place gravity retaining wall per FDOT
4 detail 6011 as shown on the drawings.
5

6 PS 3391 (North Orlando Industrial Park)
7

- 8 1. Provide a bypass pumping system to divert wastewater flow around PS 3391 in order to
9 perform the work on the pump station.
10 2. Replacement of the existing pumps at the pump station with two (2) new wastewater
11 submersible pumps. Replacement of pump base plates, guide rails, riser pipes, and
12 pipe supports in the existing wet well.
13 3. Replacement of existing wet well top slab, vent piping and access hatches.
14 4. Demolition and removal of various components of the pump station as shown in
15 Drawings.
16 5. Installation of a fiberglass liner for the existing wet well, including cleaning of the
17 wet well prior to liner installation as indicated in these specifications, disposal of all
18 loose materials, grease/fats, and removal of hydrogen sulfide contamination from the
19 wet well during cleaning.
20 6. Installation of a liner within existing manhole MH 33910001.
21 7. Replacement of the MH 33910001 manhole top as well as demolition and
22 replacement of associated asphalt pavement.
23 8. Replacement of existing 4" discharge piping, valves, and valve vault as shown on the
24 Drawings.
25 9. Replacement of the existing valve vault and access hatches. A liner shall be installed
26 in the new valve vault.
27 10. Installation of a by-pass/pump out connection for the pump station as shown on the
28 Drawings.
29 11. Installation of a 14-foot wide concrete driveway to provide access to PS 3391 as
30 shown on the Drawings.
31 12. Installation of a 16-foot wide access gate as shown on the Drawings.
32 13. Removal and replacement of the existing electrical control panel, electrical
33 equipment, SCADA equipment, telemetry and associated wiring as shown on the
34 Drawings. Existing telemetry pole to remain.
35 14. Remove and replace existing ARV.
36 15. Providing stone in the areas shown on the Drawings.
37 16. Installation of fence and curb around perimeter of pump station.
38 17. Relocate existing sign in the area shown on the drawings.
39 18. Installation of a new 2 inch water meter and 2 inch service as shown on the drawings.
40
41

42 PS 3676 (Country Run)
43

- 44 1. Provide a bypass pumping system to divert wastewater flow around PS 3676 in order to
45 perform the work on the pump station.
46 2. Replacement of the existing pumps at the pump station with two (2) new wastewater
47 submersible pumps. Replacement of pump base plates, guide rails, riser pipes, and

- 1 pipe supports in the existing wet well.
- 2 3. Replacement of existing wet well top slab, vent piping and access hatches.
- 3 4. Replace the existing valve vault top slab and access hatches. Existing valve vault
- 4 shall be coated.
- 5 5. Demolition and removal of various components of the pump station as shown in
- 6 Drawings.
- 7 6. Demolition of the existing concrete driveway and installation of a new 14' wide
- 8 driveway.
- 9 7. Installation of fiberglass liner for the existing wet well, including cleaning of the wet
- 10 well prior to liner installation as indicated in these specifications, disposal of all loose
- 11 materials, grease/fats, and removal of hydrogen sulfide contamination from the wet
- 12 well during cleaning.
- 13 8. Installation of a liner within existing manhole MH 36760001. Cleaning and lining of
- 14 the existing 8" DIP gravity main from MH 36760001 to the existing wet well.
- 15 9. Replacement of the MH 36760001 manhole top as well as demolition and
- 16 replacement of associated asphalt pavement.
- 17 10. Replacement of existing 8" discharge piping, and valves with 6" piping and valves as
- 18 shown on the Drawings.
- 19 11. Installation of a by-pass/pump out connection for the pump station as shown on the
- 20 Drawings.
- 21 12. Installation of a 14-foot wide concrete driveway to provide access to PS 3676 as
- 22 shown on the Drawings.
- 23 13. Installation of a 16-foot wide access gate as shown on the Drawings.
- 24 14. Replace water service as shown on the Drawings.
- 25 15. Removal and replacement of the existing electrical control panel, electrical
- 26 equipment, SCADA equipment, telemetry and associated wiring as shown on the
- 27 Drawings. A new telemetry pole will be provided by OCU and installed by the
- 28 contractor.
- 29 16. Providing stone in the areas shown on the Drawings.
- 30 17. Installation of fence and curb around perimeter of pump station.
- 31 18. Installation of a new 2 inch water service and 2 inch water meter in area shown on the
- 32 drawings.
- 33

34 1.02 CONTRACTOR'S USE OF PREMISES

- 35 A. The Contractor shall assume full responsibility for the protection and safekeeping of
- 36 products and materials at the job site. If additional storage or work areas are required,
- 37 they shall be obtained by the Contractor at no additional cost to the Owner.

38 1.03 SEQUENCE OF WORK

- 39 A. The Contractor shall establish his work sequence based on the use of crews to facilitate
- 40 completion of construction and testing within the specified Contract Time.
- 41 B. The Contractor shall submit a schedule and work sequence to the Owner at least five (5)
- 42 days prior to the Notice to Proceed. Work on all utility lines shall be accomplished so

1 that all facilities will stay in operation.

2 1.04 PUBLIC UTILITY INSTALLATIONS AND STRUCTURES

3 A. Some of the utility contacts are listed on the plans for the Contractor's convenience.

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

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

6

7

END OF SECTION

1 C. The only information or data contained in the geotechnical report and used in the
2 preparation of the Contract Documents that may be properly considered authorized
3 technical data concerning subsurface conditions is found in Appendix A "Geotechnical
4 Report". Such technical data are made available to allow the Contractor to have access to
5 the same information available to the County. The County/Professional do not warrant
6 the accuracy or completeness of any such information or that the Contract Documents
7 identify all the existing relevant reports and/or documents.

8 **1.04 UNDERGROUND UTILITIES**

9 A. Information or data about physical conditions of Underground Utilities, which have been
10 used in the preparation of the Contract Documents, is shown or indicated in the Drawings
11 and technical specifications. Such information and data is based on information and data
12 obtained from record documents or furnished to the County by the owners of those
13 Underground Utilities or by others.

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

15 **PART 3 - EXECUTION**

16 **3.01 EXISTING GROUND SURFACE AND UNDERGROUND CONDITIONS; GENERALLY**

17 A. Where existing ground conditions are shown on the plans hereto attached, the elevations
18 are believed to be reasonably correct but are not guaranteed to be absolutely so, and,
19 together with any schedule of quantities, are presented only as an approximation. The
20 Contractor shall satisfy itself, however, by actual examination of the site of the Work, as
21 to the existing elevations and the amount of work required under the Contract.

22 B. Where test pits and borings have been dug, the results supplied to the County/
23 Professional by the soils Engineer may be given on the plans or are on file in the
24 County/Professional's office and available for review . The County does not guarantee
25 the accuracy or correctness of this information. If the Contractor desires any additional
26 information relating to the soils investigation, contact the County/Professional to obtain
27 such information. County does not guarantee the accuracy or correctness of any such
28 information supplied to the Contractor.

1 C. If, upon notice of a differing subsurface or latent physical condition from the Contractor,
2 the County determines there was no unforeseen condition and unnecessary tests and
3 investigations were conducted solely at the Contractor's request, any unnecessary
4 expenses may be deducted from the Final Payment for the Contract. No increase in
5 Contract Amount or Contract Time will be made if the differing site conditions were
6 known or could have been discovered by the types of examinations that the Contractor, as
7 Bidder, was responsible for. Claims based on groundwater table conditions will not be
8 considered unforeseen subsurface conditions and will not be allowed. Any information
9 indicated in the Contract Documents as to the groundwater table conditions has been
10 provided for general information purposes only and is not intended to represent that the
11 same conditions will exist during the execution of the Work. Further, no increase in
12 Contract Amount or Contract Time will be made for costs incurred prior to the
13 Contractor's written notice as required by the Contract Documents. The County will be
14 allowed at least 10-days to investigate any alleged differing site conditions and to take
15 appropriate action, before the Contractor is entitled to any adjustment in Contract
16 Amount or Contract Time for Delay.

17 3.02 UNDERGROUND UTILITIES:

18 A. The Contractor will be responsible for the safety and protection of, and providing for the
19 repair of any damage done to the Work and existing surface and subsurface structures.
20 The Contractor will be responsible for any damages and injury resulting from the failure
21 to excavate in a careful and prudent manner.

22 B. Contractor shall have full responsibility for locating all underground pipelines, conduits,
23 ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or
24 attachments, and any encasements containing such facilities, including those that convey
25 electricity, gases, steam, liquid petroleum products, telephone or other communications,
26 cable television, water, wastewater, stormwater, other liquids or chemicals, or traffic or
27 other control systems, shown or indicated in the Contract Documents, in advance of
28 construction, coordinating the Work with the actual locations found and making note of
29 the actual locations on the record Drawings. Contractor shall exercise extreme caution
30 when locating underground facilities to minimize the risk of damage from Contractor's
31 activities. The Contractor will immediately notify the County and the owner of any
32 Underground Utilities that are inaccurately identified or located on the Drawings.

33 C. The Contractor will be responsible for any delay and all costs relating to the obligations
34 set forth in this Section, except as provided by allowances specific to Underground
35 Utilities.

36 D. The Contractor will promptly notify the County, in writing, whenever the Contractor
37 discovers that actual physical conditions of Underground Utilities differ materially from
38 those indicated by the Contract Documents or Authorized Technical Data provided with
39 the Contract Documents. Further, the Contractor promptly will notify the County, in
40 writing, whenever the Contractor encounters Underground Utilities not shown or
41 indicated in/through the Contract Documents, and which could not reasonably have been
42 foreseen.

- 1 E. The County and Contractor will follow the provisions of the General Conditions with
2 respect to any conclusions reached by the County after the County compares the actual
3 underground utility conditions with those included in the information provided to the
4 Contractor.

5 3.03 ENVIRONMENTAL PROCEDURES FOR HAZARDOUS MATERIALS

- 6 A. The Contractor will not, at any time, cause or permit any Hazardous Materials to be
7 brought upon, stored, manufactured, blended, handled, or used in, on, or about the Project
8 or the Site for any purpose except as lawful and necessary and in accordance with the
9 Contract Documents. The Contractor will not cause or permit Hazardous Materials to be
10 brought on Site unless they have been specifically pre-identified by the Contractor, and
11 approved in writing in advance by the County.

- 12 B. The Contractor will defend, save, indemnify and hold harmless the County, their agents
13 and employees from and against all liabilities, claims, damages, losses and expenses
14 including attorneys' fees, which arise at any time during or after completion of the Work
15 as a result of or in connection with:

- 16 1. The Contractor's breach of any prohibition or requirement set forth in this Section or,
17 2. Any Hazardous Materials discharged, released, deposited or introduced in the soil or
18 surface or groundwater in, on, under, or about the Work, the Site or other properties
19 as a result of the activities of the Contractor, the Subcontractors and their respective
20 agents and employees in connection with the Work.

- 21 C. This Contractor's indemnity obligation includes without limitation, costs incurred in
22 connection with any investigation of site conditions or any cleanup, remediation,
23 removal, or restoration required by the County or any federal, State, or local Public
24 Agency because of:

- 25 1. The occurrence of any Hazardous Materials present in the soil or surface or
26 groundwater in, on, under, or about the Work or the Site;
27 2. The diminution in value of the Work or the Site;
28 3. Damages for the loss or restriction on use of the Work or of any amenity of the Work
29 or the Property; and/or
30 4. Amounts paid in settlement of claims, penalties, attorneys' fees, court costs,
31 consultant and laboratory fees and experts' fees.

- 32 D. The Contractor will immediately notify the County in writing of any significant release of
33 Hazardous Materials at the Project or the Site, specifying the nature and quantity of the
34 release, the location of the release, and the measures taken to contain and clean up the
35 release and ensure that future releases do not occur.

- 36 E. The Contractor agrees that insulation and any other construction materials containing
37 asbestos or urea formaldehyde will not be used on the Work, and that all Sub-agreements
38 will prohibit the use of construction materials (including, but not limited to, insulation)
39 containing asbestos or urea formaldehyde.

1 3.04 DIFFERING HAZARDOUS MATERIAL CONDITIONS:

- 2 A. If the Contractor unexpectedly encounters material reasonably believed to be Hazardous
3 Material, the Contractor will immediately stop all affected Work, give written notice to
4 the County and take appropriate health and safety precautions. Unless the Contract
5 Documents require otherwise, the Contractor will conduct an investigation. If upon due
6 investigation, the Contractor determines the material a Hazardous Material that may
7 present a danger to persons or the surroundings, the Contractor will recommend a
8 solution to the County. In any such case, the affected Work will be considered to have
9 been under a suspension of Work.
- 10 B. If the Hazardous Material is not required Work under the Drawings and/or Specifications,
11 the County will proceed to have the Hazardous Material removed or rendered harmless
12 through a Change Order or by means of another contract or as the County otherwise
13 deems expedient. Alternatively, the County will terminate the affected Work or Contract
14 for the County's convenience.
- 15 C. If the County did not elect termination, once the Hazardous Material has been removed or
16 rendered harmless, the affected Work will be resumed as directed in writing by the
17 County. Any determination by the Florida Department of Community Health or the
18 Department of Environmental Quality that the Hazardous Material has been removed or
19 rendered harmless will be binding upon the County and Contractor for the purposes of
20 resuming the affected Work.
- 21 D. If the Contractor is responsible for the Hazardous Material, the Contractor will bear its
22 proportionate share of the delay and costs involved in cleaning up the Site and removing
23 and rendering it harmless to the satisfaction of the County and all Political Subdivisions
24 with jurisdiction. The Contractor will be solely responsible if the Hazardous Material
25 was brought to the Site by the Contractor, or results in whole or in part from any violation
26 by the Contractor of any applicable Laws.
- 27 E. If the Contractor is responsible, but fails to take appropriate action, and the County acts
28 accordingly, the Contractor will defend, save, indemnify and hold harmless the County
29 from and against all claims arising from the County's exercise of appropriate action.
- 30 F. If the Contractor is not responsible, the County will issue a Change Order with the
31 necessary changes. The Change Order will adjust Contract Amount and/or Contract
32 Time as made necessary by the changes and resulting unreasonable delay under the
33 circumstances attributable to the County /Professional.

34 3.05 INCIDENTS WITH ARCHAEOLOGICAL FEATURES:

- 35 A. The Contractor will immediately notify in writing, the County and all Federal, State and
36 local agencies with jurisdiction of any Archaeological Feature deposits encountered or
37 unearthed. The Contractor will protect such Archaeological Features in a proper and
38 satisfactory manner. No further disturbance of the Archaeological Features will take
39 place until work is allowed to resume in the affected areas.

1 B. If the County concludes that the Contract Documents require changes because of
2 Archaeological Feature deposits encountered, the County will issue a Change Order with
3 the necessary changes in the Work. The Change Order also will adjust Contract Amount
4 and/or Contract Time as made necessary by those changes and by any resulting
5 unreasonable delay under the circumstances attributable to the County/Professional.
6

7

END OF SECTION

1 **SECTION 01025**

2 **MEASUREMENT AND PAYMENT**

3 **PART 1 - GENERAL**

4 1.01 REQUIREMENTS INCLUDED

5 A. This Section specifies administrative and procedural requirements to define pay items
6 and determine payable amounts, and includes but is not limited to:

- 7 1. General Provisions
- 8 2. Cash Allowances
- 9 3. Work Not Paid for Separately
- 10 4. Measurement for Payment
- 11 5. Partial Payment for Stored Materials and Equipment

12 1.02 GENERAL PROVISIONS

13 A. This specification includes standard descriptions for all bid items. This Contract's
14 specific bid items are listed in the Bid Schedule.

15 B. The total Contract Amount shall cover the Work required by the Contract Documents. All
16 costs in connection with the successful completion of the Work, including furnishing all
17 materials, equipment, supplies, and appurtenances; providing all construction, equipment,
18 and tools; and performing all necessary labor and supervision to fully complete the Work,
19 shall be included in the unit and lump sum prices bid. All Work not specifically set forth
20 as a pay item in the Bid Form shall be considered a subsidiary obligation of the
21 Contractor and all costs in connection therewith shall be included in the prices bid.

22 C. If used, all estimated quantities stipulated in the Bid Schedule or other Contract
23 Documents are approximate and are to be used only (a) for the purpose of comparing the
24 bids submitted for the Work, and (b) as a basis for determining an initial Contract
25 Amount. The actual amounts of Work completed and materials furnished under unit
26 price items may differ from the estimated quantities. The County does not expressly or
27 by implication represent that the actual quantities involved will correspond exactly to the
28 quantities stated in the Bid Schedule; nor shall the Contractor plead misunderstanding or
29 deception because of such estimate or quantities or of the character, location or other
30 conditions pertaining to the Work. Payment to the Contractor will be made only for the
31 actual quantities of work performed or material furnished in accordance with the
32 Drawings and other Contract Documents, and it is understood that the quantities may be
33 increased or decreased as provided in the General Conditions.

- 1 D. If used, the unit prices listed in the Bid Schedule shall include all services, obligations,
2 responsibilities, labor, materials, devices, equipment, royalties and license fees,
3 supervision, temporary facilities, construction equipment, bonds, insurance, taxes, clean
4 up, traffic control, control surveys, field offices, close out, overhead and profit and all
5 connections, appurtenances and any other incidental items of any kind or nature, as are
6 necessary to complete the Work in accordance with the Contract Documents.

- 7 E. Except for mobilization/demobilization and project record documents, payment for Work
8 will be based on the percent of completed work of each item in the Schedule of Values,
9 including stored materials, as determined by the County. Progress of work in each item
10 of the Schedule of Values will be determined separately by the County. However, the
11 County will issue a single payment certificate for progress on the Contract.

- 12 F. The Contractor agrees that it will make no claim for damages, anticipated profits, or
13 otherwise because of any difference between the amounts of work actually performed and
14 materials actually furnished and the estimated amounts therefore.

- 15 G. Where payment by scale weight is specified under certain items, the Contractor shall
16 provide suitable weighing equipment which shall be kept in accurate adjustment at all
17 times and certified. The weighing of all material shall be performed by the Contractor in
18 the presence and under the supervision of the County.

- 19 H. All schedules included in the Contract Documents are given for convenience and are not
20 guaranteed to be complete. The Contractor shall assume all responsibility for the making
21 of estimates of the size, kind, and quantity of materials and equipment included in work
22 to be done under this Contract.

- 23 I. Where pipe fittings are noted on the Drawings, such notation is for the Contractor's
24 convenience and does not relieve the Contractor from laying and jointing different or
25 additional items where required.

- 26 J. All contracts shall be subject to 10% minimum retainage as defined in the General
27 Conditions and the Agreement.

28 1.03 CASH ALLOWANCES

- 29 A. The Contractor shall include in the Total Bid Amount, all cash allowances stated in the
30 Contract Documents. Items covered by these allowances shall be supplied for such
31 amounts and by such persons as the County may direct.

- 32 B. The Contractor will obtain the County's written acceptance before providing equipment,
33 materials or other Work under a cash allowance. Payments under a cash allowance will
34 be made based on actual costs, excluding costs of general conditions, handling,
35 unloading, storage, installation, testing, etc., which will be considered to be included
36 within the Contract Price. Payments within the limits of any Allowance will exclude
37 overhead and profit and bond and insurance premiums, since those costs will be
38 considered to be included within the Contract Amount. The Contractor shall submit
39 appropriate documentation to validate the actual cost of the item.

1 C. The amount of the allowance shall be adjusted accordingly by Change Order to
2 recognize the allowable cost incurred by the Contractor.

3 1.04 WORK NOT PAID FOR SEPARATELY

4 A. Delivery: Payment for equipment delivery, storage or freight shall be included in the pay
5 items including their installation and no other separate payment will be made therefore.

6 B. Bonds: Payment for bonds required by the Contract shall be included in the pay items for
7 the Work covered by the required bonds and no separate payment will be made.

8 C. Preparation of Site: Payment for preparation of site shall be included in pay items
9 proposed for the various items of Work and no separate payment will be made therefore.
10 Preparation of site includes setting up construction plant, offices, shops, storage areas,
11 sanitary and other facilities required by the specifications or state law or regulations;
12 providing access to the site; obtaining necessary permits and licenses; payments of fees;
13 general protection, temporary heat and utilities including electrical power; providing shop
14 and working drawings, certificates and schedules; providing required insurance;
15 preconstruction photographs and videos; clearing and grubbing; removal of existing
16 pavements, sidewalks and curbs; trench excavation, sheeting, shoring and bracing;
17 dewatering and disposal of surplus water; structural fill, backfill, compaction and
18 grading; testing materials and apparatus; maintenance of drainage systems; appurtenant
19 work; record drawing and close-out documentation; cleaning up; and all other work
20 regardless of its nature which may not be specifically referred to in a Bid Item but is
21 necessary for the complete construction of the project set forth by the Contract.

22 D. Permitting & Permit Fees.

23 E. The County reserves the right to delete any item included in the Schedule of Values and
24 decrease the Contract Price by the scheduled amount for the item deleted.

25 1.05 MEASUREMENT FOR PAYMENT

26 A. Methods of Measurement - Generally:

27 1. Units of measurement shall be defined in general terms as follows:

- 28 a. Linear Feet (LF)
- 29 b. Square Feet (SF)
- 30 c. Square Yards (SY)
- 31 d. Cubic Yards (CY)
- 32 e. Each (EA)
- 33 f. Sacks (SK)
- 34 g. Lump Sum (LS)

- 1 2. Unit Price Contracts/Items:
2 a. Linear Feet (LF) shall be measured along the horizontal length of the centerline of
3 the installed material, unless otherwise specified. Pipe shall be measured along
4 the length of the completed pipeline, regardless of the type of joint required,
5 without deduction for the length of valves or fittings. Pipe included within the
6 limits of lump sum items will not be measured.
7 b. Square Feet (SF), Square Yards (SY), Cubic Yards (CY), Each (EA) and Sacks (SK)
8 shall be measured as the amount of the unit of measure installed and compacted
9 within the limits specified and shown in the Specifications and Drawings. Slope
10 angles and elevations shall be measured using land-surveying equipment. Contractor
11 shall provide supporting documentation (i.e. drawings, delivery tickets, invoices,
12 survey calculations, etc.) to verify actual installed quantities.

- 13 B. Lump Sum Contracts/Items - Generally:
14 1. Quantities provided in the Schedule of Values are for the purpose of estimating the
15 completion status for progress payments. Payment will be made for each individual
16 item on a percentage of completion basis as estimated by the Contractor and approved
17 by the County.
18 2. Adjustments to costs provided in the accepted Schedule of Values may be made only
19 by Change Order.
20 3. The County reserves the right to delete any item included in the Schedule of Values
21 and decrease the Contract Price by the scheduled amount for the item deleted.

22 1.06 MEASUREMENT AND PAYMENT ITEMS

23 A. ***Only those bid items included in the Bid Schedule are applicable for this Contract.*** The
24 County has standardized the measurement and payment items. Currently, there are
25 approximately 100 measurement and payment items describing approximately 300 bid
26 items. The bid item numbering system comprises five sections that are divided into 23
27 subsections. The sections and subsections are listed below.
28

- 29 10. General Requirements
30 10.1 General
31 11. Site Work
32 11.1 Miscellaneous
33 11.2 Road Work
34 11.3 Install/Replace Fence or Wall
35 11.4 Bypass Pumping
36 11.5 Abandon or Remove Pipe/Structure
37 12. Pressure Pipes
38 12.1 Pressure Pipe and Fittings and Restrained Joints
39 12.2 Valves
40 12.3 Tapping Sleeve and Valve Assembly
41 12.4 Cut-in Connections to Existing Main
42 12.5 Piping Appurtenances
43 12.6 Directional Drill
44 12.7 Pipe Bursting

- 1 13. Wastewater Collection System
- 2 13.1 Cleaning Sanitary Sewers
- 3 13.2 CCTV Sanitary Sewers
- 4 13.3 Install/Replace Sanitary Sewer
- 5 13.4 Install/Replace Sanitary Manholes
- 6 13.5 Sanitary Manhole Rehabilitation
- 7 13.6 Sanitary Service Laterals and Cleanouts
- 8 13.7 Cured-in-Place Pipe (CIPP) Liner
- 9 13.8 Sanitary Sewer Pipe Bursting
- 10 14. Pump Stations
- 11 14.1 Wastewater Duplex Pump Station
- 12 14.2 Wastewater Triplex Pump Station

13 All of the subsections have bid item measurement and payment descriptions. Several bid
 14 items in the Project Bid Schedule may be described with the same bid item measurement
 15 and payment description in Table A, "Measurement and Payment Items". The bid items
 16 in the Project Bid Schedule are related to the Section 01025 measurement and payment
 17 items as follows:

- 18 1. All of the bid items in the Project Bid Schedule have 8 numerical digits.
- 19 2. Table A, "Measurement and Payment Items" for each of the bid items there are five
 20 numerical digits followed by ".xxx".
- 21 3. The first 5 numerical digits of the bid item in the Project Bid Schedule designate the
 22 measurement and payment item found in Table A, "Measurement and Payment
 23 Items."
- 24
- 25

Table A

BID ITEM	MEASUREMENT AND PAYMENT ITEMS <small>Pg 1</small>
	14 PUMP STATION
	14.1 – Wastewater Duplex Pump Station
1	Reference ID 14.120.111 Duplex Pump Station Rehabilitation(Country Run PS #3676)
	<ul style="list-style-type: none"> a. Measurement: Measurement for this item shall be based on satisfactory rehabilitation of the existing Pump Station complete and ready for continuous operation. b. 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 necessary to rehabilitate the existing pump station as indicated on the Drawings. Work includes but is not necessarily limited to the following: Pump Station improvements and modifications including fencing and gates, rehabilitate and line the existing wetwell, replacement of the wet well and valve vault top slab, coating of the existing valve vault, pumps, motors,

control panel, cables, rails, valves, pressure piping and appurtenances, cleaning and lining of the existing gravity main between manhole 36760001 and the existing wet well, lining of mahole 36760001, and replacement of manhole 36760001 top including associated asphalt pavement restoration as shown on the Drawings. All demolition, removal and disposal of existing facilities as noted in the Drawings including tie-ins, intercepts, conflicts and abandonment of piping, conduits or electrical services. All coordination, materials and equipment, tools, and labor to relocate the existing SCADA control panel, SCADA pole, water service connection, or extend an existing water service connection. All coordination with the electric power company, materials, equipment, tools, labor and fees to install an electrical service connection. Installation of all site and adjacent improvements noted on drawings including driveways and driveway connections, fencing with curb and gate, asphalt and concrete paving, rock fill and sodding. All work required to construct, complete start-up testing and deliver a complete operational Pump Station without interruption of service.

Payment for General Requirements (Section 01001) shall include bonds, permits, and required insurance, project signs, preconstruction audio-video documentation, maintenance of traffic, public information officer, and any other preconstruction expense necessary for the start of the work shall also be included. This Work also consists of the general project management of the Work including but not limited to, field supervision and office management, as well as other incidental cost for management of the Work during duration of the Contract. This work also includes maintenance of the field offices for the duration of the Contract.

Measurement for various items covered under General Requirements, will not be made for payment, and all items shall be included in the lump sum price. This item will be paid upon each payment request made by the Contractor. The Contractor shall attach with the pay request invoices to substantiate the appropriate insurance and bonds have been obtained by the Contractor.

Payment for Mobilization/Demobilization shall include Work consisting of the preparatory Work and operations in mobilizing for beginning Work on the Contract, including, but not limited to, movement of those personnel, equipment, supplied and incidentals to the project site, preparation of submittals, and for the establishment of temporary offices and buildings, safety equipment and first aid supplies, project signs, field surveys, sanitary and other facilities required by these specifications, and State and local laws and regulations. The Work specified in this item also consists of demobilization or the operations normally involved in ending Work on the project including, but not limited to termination and removal of temporary utility service and field offices; demolition and removal of temporary structures and facilities; restoration of the Contractor storage areas; disposal

	<p>of trash and rubbish, and any other post-construction work necessary for the proper conclusion of the Work. This pay item may not exceed 5% of the Total Base Bid amount.</p> <p>Payment for Project Record Documents (Section 01720) shall be based on satisfactory progress of the Contractor to provide Project Record Documents including the certified as-built survey, in accordance with the County requirements and specifications. This pay item shall be a minimum of 1% of the Total Base Bid amount.</p> <p>Payment for Indemnification: In consideration of the Contractor's Indemnity Agreement as set out in the Contract Documents, County specifically agrees to give the Contractor \$33.33 and other good and valuable consideration, receipt of which is acknowledged upon signing of the Agreement.</p>
2	<p>Reference ID 14.120.112 Duplex Pump Station Rehabilitation (North Orlando Industrial Park PS #3391)</p>
	<p>a. Measurement: Measurement for this item shall be based on satisfactory rehabilitation of the existing Pump Station complete and ready for continuous operation.</p> <p>b. 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 necessary to rehabilitate the existing pump station as indicated on the Drawings. Work includes but is not necessarily limited to the following: pump station improvements including wetwell top slab, new lined valve vault, pumps, motors, control panel, SCADA pole, cables, rails, valves, water service connection, pressure piping and appurtenances, lining of manhole 33910001, and replacement of manhole 33910001 top including associated asphalt pavement restoration as shown on the Drawings. All demolition, removal and disposal of existing facilities as noted in the Drawings including tie-ins, intercepts, conflicts and abandonment of piping, conduits or electrical services. All coordination, materials and equipment, tools, and labor to relocate the existing SCADA control panel, SCADA pole, water service connection, or extend an existing water service connection. All coordination with the electric power company, materials, equipment, tools, labor and fees to install an electrical service connection. Installation of all site and adjacent improvements noted on drawings including driveways and driveway connections, fencing with curb and gate, asphalt and concrete paving, rock fill and sodding. All work required to construct, complete start-up testing and deliver a complete operational Pump Station without interruption of service.</p> <p>Payment for General Requirements (Section 01001) shall include bonds, permits, and required insurance, project signs, preconstruction audio-video documentation, maintenance of traffic, public information officer, and any other preconstruction expense necessary for the start of the work shall also</p>

	<p>be included. This Work also consists of the general project management of the Work including but not limited to, field supervision and office management, as well as other incidental cost for management of the Work during duration of the Contract. This work also includes maintenance of the field offices for the duration of the Contract.</p> <p>Measurement for various items covered under General Requirements, will not be made for payment, and all items shall be included in the lump sum price. This item will be paid upon each payment request made by the Contractor. The Contractor shall attach with the pay request invoices to substantiate the appropriate insurance and bonds have been obtained by the Contractor.</p> <p>Payment for Mobilization/Demobilization shall include Work consisting of the preparatory Work and operations in mobilizing for beginning Work on the Contract, including, but not limited to, movement of those personnel, equipment, supplied and incidentals to the project site, preparation of submittals, and for the establishment of temporary offices and buildings, safety equipment and first aid supplies, project signs, field surveys, sanitary and other facilities required by these specifications, and State and local laws and regulations. The Work specified in this item also consists of demobilization or the operations normally involved in ending Work on the project including, but not limited to termination and removal of temporary utility service and field offices; demolition and removal of temporary structures and facilities; restoration of the Contractor storage areas; disposal of trash and rubbish, and any other post-construction work necessary for the proper conclusion of the Work. This pay item may not exceed 5% of the Total Base Bid amount.</p> <p>Payment for Project Record Documents (Section 01720) shall be based on satisfactory progress of the Contractor to provide Project Record Documents including the certified as-built survey, in accordance with the County requirements and specifications. This pay item shall be a minimum of 1% of the Total Base Bid amount.</p> <p>Payment for Indemnification: In consideration of the Contractor's Indemnity Agreement as set out in the Contract Documents, County specifically agrees to give the Contractor \$33.33 and other good and valuable consideration, receipt of which is acknowledged upon signing of the Agreement.</p>
3	<p>Reference ID 14.120.113 Duplex Pump Station Rehabilitation (Oak Meadows PS #3265)</p>
	<p>a. Measurement: Measurement for this item shall be based on satisfactory rehabilitation of the existing Pump Station complete and ready for continuous operation.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and</p>

equipment necessary to rehabilitate the existing pump station as indicated on the Drawings. Work includes but is not necessarily limited to the following: pump station improvements including wetwell, top slab, valve vault, pumps, motors, control panel, SCADA pole, cables, rails, valves, water service connection, pressure piping and appurtenances, cleaning and lining of the existing gravity main between manhole 32650001 and the existing wet well, lining of manhole 32650001, and replacement of manhole 32650001 top including associated asphalt pavement restoration. as shown on the Drawings. All demolition, removal and disposal of existing facilities as noted in the Drawings including tie-ins, intercepts, conflicts and abandonment of piping, conduits or electrical services. All coordination, materials and equipment, tools, and labor to relocate the existing SCADA control panel, SCADA pole, water service connection, or extend an existing water service connection. All coordination with the electric power company, materials, equipment, tools, labor and fees to install an electrical service connection. Installation of all site and adjacent improvements noted on drawings including driveways and driveway connections, fencing with curb and gate, asphalt and concrete paving, rock fill and sodding. All work required to construct, complete start-up testing and deliver a complete operational Pump Station without interruption of service.

Payment for General Requirements (Section 01001) shall include bonds, permits, and required insurance, project signs, preconstruction audio-video documentation, maintenance of traffic, public information officer, and any other preconstruction expense necessary for the start of the work shall also be included. This Work also consists of the general project management of the Work including but not limited to, field supervision and office management, as well as other incidental cost for management of the Work during duration of the Contract. This work also includes maintenance of the field offices for the duration of the Contract.

Measurement for various items covered under General Requirements, will not be made for payment, and all items shall be included in the lump sum price. This item will be paid upon each payment request made by the Contractor. The Contractor shall attach with the pay request invoices to substantiate the appropriate insurance and bonds have been obtained by the Contractor.

Payment for Mobilization/Demobilization shall include Work consisting of the preparatory Work and operations in mobilizing for beginning Work on the Contract, including, but not limited to, movement of those personnel, equipment, supplied and incidentals to the project site, preparation of submittals, and for the establishment of temporary offices and buildings, safety equipment and first aid supplies, project signs, field surveys, sanitary and other facilities required by these specifications, and State and local laws and regulations. The Work specified in this item also consists of

	<p>demobilization or the operations normally involved in ending Work on the project including, but not limited to termination and removal of temporary utility service and field offices; demolition and removal of temporary structures and facilities; restoration of the Contractor storage areas; disposal of trash and rubbish, and any other post-construction work necessary for the proper conclusion of the Work. This pay item may not exceed 5% of the Total Base Bid amount.</p> <p>Payment for Project Record Documents (Section 01720) shall be based on satisfactory progress of the Contractor to provide Project Record Documents including the certified as-built survey, in accordance with the County requirements and specifications. This pay item shall be a minimum of 1% of the Total Base Bid amount.</p> <p>Payment for Indemnification: In consideration of the Contractor's Indemnity Agreement as set out in the Contract Documents, County specifically agrees to give the Contractor \$33.33 and other good and valuable consideration, receipt of which is acknowledged upon signing of the Agreement.</p>

1

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

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

4

END OF SECTION

- 1 3. List each authorized Change Order and use additional sheets if necessary, list Change
2 Order number and dollar amount for the original item of work.
- 3 4. Each item shall have an assigned dollar value for the current pay period and a
4 cumulative value for the project to-date.
- 5 5. Submit stored material log, partial waivers of claims and mechanic liens, and Consent
6 of Surety with each application, as further explained below.

- 7 D. Contractor shall submit a stored material log with each application for payment that
8 identifies the type, quantity, and value of all stored material that tracks when the stored
9 materials were installed and deducts the installed material from the stored quantity at that
10 time. Include original invoices for all stored materials for which payment is requested.

- 11 E. Waivers of Claims and Mechanics Lien (Waivers): With each Application for Payment
12 the Contactor shall submit waivers of claims and mechanic liens from Subcontractors,
13 Sub-subcontractors, and suppliers for the construction period covered by the previous
14 application.
 - 15 1. The Contractor shall submit partial waivers on each item for the amount requested,
16 prior to deduction for retainage, on each item.
 - 17 2. When an application shows completion of an item, the Contractor shall submit final
18 or full waivers.
 - 19 3. The Contractor shall submit the final Application for Payment with, if not already
20 submitted, the final waivers from every entity involved with performance of work
21 covered by the Application that could lawfully be entitled to a payment claim or lien.
 - 22 4. Format of Waiver Forms: The Contractor shall submit executed waivers of claims and
23 liens on forms acceptable to the County.
 - 24 5. The County reserves the right to designate which entities involved in the Work must
25 submit waivers.

- 26 F. Transmittal of Pay Applications: Contractor shall submit four (4) executed copies of each
27 Application for Payment to the County. One (1) copy shall include all waivers of lien
28 and similar attachments.
 - 29 1. The Contractor shall transmit each Pay Application package with a transmittal form
30 that lists attachments and all appropriate information related to the application. The
31 transmittal form shall be acceptable to the County.
 - 32 2. The Contractor shall include a certification with each application stating that all
33 previous payments received from the County under the Contract have been applied by
34 the Contractor to discharge, in full, all obligations of the Contractor in connection
35 with the Work covered by prior applications for payment. The Contractor shall also
36 certify that all materials and equipment incorporated into the Work are free and clear
37 of all liens, claims, security interest, and encumbrances.

- 38 G. Initial Application for Payment Submittal: Administrative actions and submittals that
39 must precede or coincide with submittal of the initial Application for Payment include
40 the following:
 - 41 1. List of Subcontractors
 - 42 2. List of principal suppliers and fabricators
 - 43 3. Schedule of Values
 - 44 4. Contractor's Construction Progress Schedule (accepted)

- 1 5. List of Contractor's staff assignments
- 2 6. Copies of building permits
- 3 7. Copies of authorizations and licenses from governing authorities for performance of
- 4 the Work
- 5 8. Certificates of insurance and insurance policies
- 6 9. Performance and Payment bonds (if required)
- 7 10. Data needed to acquire County's insurance

- 8 H. Monthly Application for Partial Payment Submittals: Administrative actions and
- 9 submittals that must precede or coincide with submittal of Monthly Applications for
- 10 Partial Payment include the following, as applicable:
 - 11 1. Relevant tests
 - 12 2. Progressive As-builts (one (1) paper copy and electronic copy)
 - 13 3. Table 01050-2 Asset Attribute Data Form Examples (one (1) paper copy and
 - 14 electronic copy)
 - 15 4. Table 01050-3 Pipe Deflection Table (one (1) paper copy and electronic copy)
 - 16 5. Table 01050-4 Gravity Main Table (one (1) paper copy and electronic copy)
 - 17 6. An electronic copy of all survey field notes
 - 18 7. Partial Release of Lien
 - 19 8. Partial Consent of Surety
 - 20 9. Site photographs
 - 21 10. Updated Progress Schedule: submit one (1) electronic copy and five (5) copies
 - 22 11. Summary of Values
 - 23 12. Pay Request
 - 24 13. On-Site Storage of materials

- 25 I. Substantial Completion Application for Payment Submittal: Following issuance of the
- 26 Certificate of Substantial Completion, Contractor shall submit an Application for
- 27 Payment. This Application shall reflect any Certificates of Partial Substantial
- 28 Completion issued previously for the County's occupancy of designated portions of the
- 29 Work.
 - 30 1. Administrative actions and submittals that shall precede or coincide with this
 - 31 application include:
 - 32 a. Occupancy permits and similar approvals
 - 33 b. Warranties (guarantees) and maintenance agreements
 - 34 c. Test/adjust/balance records
 - 35 d. Maintenance instructions
 - 36 e. Meter readings
 - 37 f. Start-up performance reports
 - 38 g. Change-over information related to the County's occupancy, use, operation and
 - 39 maintenance
 - 40 h. Final Cleaning
 - 41 i. Application for reduction of retainage and consent of surety
 - 42 j. Advice on shifting insurance coverage
 - 43 k. List of incomplete Work, recognized as exceptions to County's Certificate of
 - 44 Substantial Completion

- 1 J. Final Completion Application for Payment Submittal: Administrative actions and
2 submittals which must precede or coincide with submittal of the final payment
3 Application for Payment include the following:
4 1. Prior to submitting a request for final payment or the County issuing a Certificate of
5 Completion for the Work, the Contractor shall submit the final Record Documents to
6 the County for approval. Retainage funds will be withheld at the County's discretion
7 based on the quality and accuracy of the final Record Documents.
8 2. Written signed statements by the Contractor
9 a. Completion of project close-out requirements
10 b. Completion of items specified for completion after Substantial Completion
11 c. Assurance that unsettled claims are settled
12 d. Assurance that work not complete and accepted is now completed
13 3. Transmittal of Record Documents to the County
14 4. Proof that taxes, fees, and similar obligations have been paid
15 5. Removal of temporary facilities and services has been completed
16 6. Removal of surplus materials, rubbish, and similar elements
17 7. Prepare Application for Final Payment as required in General Conditions

18 1.04 PAY APPLICATION SUBSTANTIATING DATA

19 A. When the County requires substantiating data for a Pay Application, submit data
20 justifying Pay Application line item amounts in question.

21 B. Provide one (1) copy of data with a transmittal letter for each copy of Pay Application
22 submittal. The Pay Application number, date, and line item by number and description
23 shall be clearly stated.

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

25 **PART 3 - EXECUTION (NOT USED)**
26

27 **END OF SECTION**

- 1 2. Submit name, address and telephone number of the Surveyor and/or Engineer, as
2 appropriate to the County for acceptance before starting survey or engineering work.
3 3. Submit written acknowledgement from the Surveyor stating that he has the hardware,
4 software and adequate scope of services in his agreement with the Contractor to fully
5 comply with the requirements of this specification.

6 B. On request, submit documentation verifying accuracy of survey work.

7 C. Surveyor shall submit certified Tables 01050 – 2, 3 and 4.

8 **PART 2 - PRODUCTS**

9 2.01 SURVEY DOCUMENTS

10 A. Survey documents shall comply with the Minimum Technical Standards of Chapter 5J-17
11 of the Florida Administrative Code (FAC) and Table 01050-1 Minimum Survey
12 Accuracies, whichever are more stringent. All coordinates shall be geographically
13 registered in the Florida State Plane Coordinate System using the contract Drawings
14 control points for horizontal and vertical controls.

15 B. The Surveyor shall not copyright any of their work related to this project.

16 C. For ease of calculating pipe deflections in Table 01050-3, begin by providing a unique
17 asset ID for each utility (water, wastewater or reclaimed water) type, numbered
18 sequentially along the pipe run (including changes in direction) from start to finish of the
19 pipe in Table 01050-2 (Pipe Worksheet). Then branches and services of the same utility
20 type can be numbered. It is recommended that each utility numbering format be
21 distinguishable from the other. This will allow organization and convenient sorting after
22 the individual asset table worksheet tabs are combined in the spreadsheet program prior
23 to copying and pasting to the deflection table spreadsheet. The Microsoft Excel
24 spreadsheet template shall be provided by the County.. The numbering system shall be
25 approved by the County before commencing with production of the spreadsheet.
26

**Table 01050-1
Minimum Survey Accuracies**

Type	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
Pipe, at 100-foot maximum intervals	0.1	0.1	Pipe, Pipe at Valves, Pipe at Bore & Jack Casing
Pipe, (PVC) >16-inch at every pipe joint	0.1	0.1	Pipe, Pipe at Valves, Pipe at Bore & Jack Casing
Fittings, Sleeves, Tapping Saddle, Service Saddles, Cap or Plugs.	0.1	0.1	
Pipe, Restrained	0.1	0.1	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	10-foot intervals during the directional drill operation or intervals not to exceed the drilling rod length
Hydrants	0.1	0.1	Operating Nut
Valves (Operating Nut)	0.1	0.1	Operating Nut
Valve (Pipe Location)	0.1	0.1	Top of Pipe at Valve location
Air Release, Blow off, and Backflow Valves	0.1	0.1	Valve Enclosure
Master Meters, Deduct Meters & Wastewater Meters	0.1	0.1	Register
Meter Box	0.1	0.1	
Clean out -	0.1	0.1	
Manhole Rim	0.1	0.1	Manhole – top of rim
Manhole Inverts	N/A	0.01	Pipe Inverts
Pump Station (Public & Private)	0.1	0.01	Wetwell top of slab and Pipe Inverts
Production Well or Monitoring Well	0.1	0.1	Well – top of casing
Grease Interceptor	0.1	0.1	
Oil / Water Separators	0.1	0.1	
Pipe, abandoned in place or removed	0.1	0.1	Limits of Abandoned or Removed Pipe
Existing Utilities and appurtenant structures**	0.1	0.1	underground feature or structure
<p>* Shall conform to the requirements of the "Chapter 5J-17, 'Minimum Technical Standards', FAC", certified by a SURVEYOR.</p> <p>** Existing utilities including but not limited to water, wastewater, reclaimed water, stormwater, fiber optic cable, electric, gas and structures within the limits of construction.</p> <p>*** Fittings rotated in X,Y,Z plane or vertical shall be shot to maintain flowline for the horizontal and vertical locations of the coordinate</p>			
<p>Note: All survey values to be reported to second decimal point (x.xx)</p>			

TABLE 01050-2
Asset Attribute Data Examples

Hydrants Worksheet

ID Number	Plan Sheet #	Easting	Northing	Elevation	Manufacturer	Model #	Comments
FH-1	C-7	518456.40	1483743.63	49.53	Brand B	XJ7-B	
FH-2	C-9	518477.68	1483758.95	54.23	Brand B	XJ7-B	

Valves Worksheet

ID Number	Plan Sheet #	Easting	Northing	Elevation	Valve Type	Main Type	Valve Size	Valve Manufacturer	Valve Model #	# of Turns to Close	Gear Actuator	Gear Ratio	Side Actuator	Actuator Manufacturer	Comments
ARV-1	C300	518060.09	1483231.33	81.72	ARV - Combination	Water Main	2	Brand H	100XT						
ARV-1	C303	518083.55	1483280.50	81.15	ARV - Vacuum Backflow Preventer	Force Main	4	Brand G	1000						
BFP-1	C303	518086.00	1483282.88	78.21		Reclaimed Water Main	8	Brand F	2000 fgs						
BO-9	C405	518089.83	1483289.43	78.20	Blowoff	Water Main	2	Brand E	14 turbo						
BFV-1	C405	518088.11	1483295.00	81.95	Butterfly Gate	Water Main	30	Brand D	230 xls	200	Yes	3 to 1	Yes	Brand C	
GV-3	C405	518132.54	1483372.75	81.23		Water Main	16	Brand C	2225846	300	Yes	3 to 1	NO		
LS-W1	C405	576779.36	1539706.97	64.30	Line Stop	Water Main	16	Brand B	76r44						
PV-22	C405	576880.60	1539718.32	64.52		Force Main	12	Brand A	Z100	200	Yes	3 to 1	Yes	Brand A	

Manhole Worksheet

ID Number	Plan Sheet #	Easting	Northing	Rim Elevation	Invert Elev N	Invert Elev NE	Invert Elev E	Invert Elev SE	Invert Elev S	Invert Elev SW	Invert Elev W	Invert Elev NW	Manufacturer	Comments
SAN-MH01	AT-2	475216.00	1501637.12	115.89							111.28		Del Zotto	
SAN-MH02	AT-2	474885.63	1501636.02	114.98									Del Zotto	
SAN-MH03	AT-2	474849.33	1501600.22	115.18		109.96			109.86				Del Zotto	
SAN-MH04	AT-2	474850.21	1501416.85	115.91	109.19		110.42		108.56				Del Zotto	
SS-1	C1.05A	478117.70	1501622.99	118.13					113.73				Del Zotto Products of Florids Inc.	Del Zotto Products of Florids Inc.
SS-2	C1.05A	478116.77	1501534.19	117.79	113.41				113.38				Del Zotto Products of Florids Inc.	Del Zotto Products of Florids Inc.
SS-3	C1.05	478111.28	1501152.49	116.45	111.98				111.94				Del Zotto Products of Florids Inc.	Del Zotto Products of Florids Inc.
SS-4	C1.05A	478105.19	1500781.07	115.72	110.76			110.75					Del Zotto Products of Florids Inc.	Del Zotto Products of Florids Inc.

Meter Worksheet

ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Comments
MM-1	C-6	576533.64	1539520.08	58.01	Water Main	
RWMM-1	C-6	576937.42	1539598.78	64.84	Reclaimed Water Main	

Fitting Worksheet

ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Fitting Type	Comments
FM-1	C-3	572399.28	1539339.13	46.27	Force Main	Bend 11 1/4°	
FM-2	C-3	574840.74	1539856.91	51.73	Force Main	Bend 22-1/2°	
RW-1	C-4	574887.22	1539849.64	51.75	Reclaimed Water Main	Cross	
RW-2	C-4	574904.30	1539849.56	48.98	Reclaimed Water Main	Reducer	
WM-1	C-5	572532.38	1539848.16	54.42	Water Main	Tapping Saddle	
WM-2	C-5	572631.00	1539337.10	45.27	Water Main	Tee	

Cleanout Worksheet

ID Number	Plan Sheet #	Easting	Northing	Elevation	Comments
CO-1	C-6	576533.64	1539520.08	58.01	
CO-2	C-6	576937.42	1539598.42	64.84	Sanitary Service

1 **Pipes Worksheet**

Asset Attribute Table Examples												
A	C	D	E	F	G	H	I	J	K	L	M	
ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Type of Shot	Construction Method	Material	Pressure Class	Manufacturer	Comments	
1												
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	DIP	Class 250	Brand B	
5	RW-2	C-7	517732.85	1482338.10	80.94	Reclaimed Water Main	Restraint Joint Limit	Open Cut	DIP	Class 250	Brand B	
6	WM-1	C-9	573309.07	1539372.90	56.10	Water main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
7	WM-2	C-9	573308.75	1539375.00	54.66	Water main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
8	FMDD-1	C-4	504345.94	1488969.20	114.14	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
9	FMDD-2	C-4	504360.86	1488970.50	112.74	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
10	FMDD-3	C-4	504377.19	1488971.20	108.14	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
11	FM-9	C-4	504480.47	1488952.90	105.24	Force Main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
12												

2
3 **Pump Station Worksheet**

Asset Attribute Table Examples					
A	C	D	E	F	G
ID Number	Plan Sheet #	Easting	Northing	Elevation	Comments
1					
2	PS-1	C-40	517914.35	1482906.56	83.91
3					

4
5 **Well Worksheet**

Asset Attribute Table Examples						
A	C	D	E	F	G	I
ID Number	Plan Sheet #	Easting	Northing	Elevation	Well Type	Comments
1						
2					Well	
3					Monitoring Well	
4						

6
7 **Easements Worksheet**

Asset Attribute Table Examples						
A	C	D	E	F	G	H
ID Number	Plan Sheet #	Easting	Northing	Elevation	Boundary Corner Type	Comments
1						
2	Corner-1	C-8	463484.59	1511029.72	Pump Station Tract	N.W. CORNER
3	Corner-2	C-8	463523.24	1511040.01	Pump Station Tract	N.E. CORNER
4	Corner-3	C-8	463480.45	1511015.23	Pump Station Tract	S.W. CORNER
5	Corner-4	C-8	463526.97	1511025.49	Pump Station Tract	S.E. CORNER
6					Easement	
7					Property	
8						

8
9 **Existing OC Utility Crossing**

Asset Attribute Table Examples							
A	C	D	E	F	G	H	I
ID Number	Plan Sheet #	Easting	Northing	Existing Pipe Elevation	Proposed Crossing Elevation	Existing Main Type	Comments
1							
2							
3	CR-02	AT-1	474767.95	1500585.09	98.20	106.20	Force Main
4	CR-03	AT-1	475239.63	1500596.35	99.10	113.88	Force Main
5	CR-04	AT-1	475239.61	1500588.49	94.30	112.45	Reclaimed Water Main
6	Conf-1	C-750	463464.47	1511013.75	100.54	104.88	Water main
7	Conf-2	C-750	463163.91	1510693.49	98.32	103.57	Storm Main
8							

10
11 **Grease Interceptor**

Asset Attribute Table Examples						
A	C	D	E	F	G	H
ID Number	Plan Sheet #	Easting	Northing	Elevation	Volume (Gallons)	Comments
1						
2	GI-1	C-400	508387.30	1487203.18	89.70	1000.00
3						
4						

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TABLE 01050-3
Pipe Deflection Data 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	
--	---	--

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'	Radius of Curve**	Average Offset Angle***	Average Offset****	
					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

3

*Uses law of cosines to determine angle ABC and Ø.
 $\text{angle } ABC = \arccos((AB^2 + BC^2 - AC^2) / (2 * AB * BC))$
 $180 - \text{angle } ABC = \text{angle } \phi$
 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

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

*** 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.

**** Uses average offset angle and laying length of pipe.

4

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**TABLE 01050-4
Gravity Main Table**

Downstream		Upstream		Length (ft)	Gravity Main Diameter (inches)	Design Slope (%)	Const. Slope (%)	Allowable Minimum Constructed Slope (%)
Manhole Number	Invert Elev.	Manhole Number	Invert Elev.					
					8	0.31		0.28
					10	0.24		0.21
					12	0.20		0.17

5 **PART 3 - EXECUTION**

6 3.01 SURVEY FIELD WORK

7 A. Locate, reference, and preserve existing horizontal and vertical control points and
8 property corners shown on the Drawings prior to starting any construction. If the
9 Surveyor performing the work discovers any discrepancies that will affect the Project, the
10 Contractor must immediately report these findings to the County. All survey work shall
11 meet the requirements as defined in Florida Administrative Code 5J-17. Reference and
12 preserve all survey points during Construction. If survey points are disturbed, it is the
13 responsibility of the Surveyor to reset the points at the Contractor's expense. Copies of
14 the Surveyor's field notes and/or electronic files for point replacement shall be provided
15 to the County.

16 1. The Surveyor shall locate all improvements for the project As-Built Asset Attribute Data
17 using State Plane Coordinates as the horizontal datum and the benchmark referenced on
18 the Drawings as the vertical datum. The County will provide electronic files of the
19 Drawings to be used by the Surveyor.

20 2. The construction layout shall be established from the reference points shown or listed
21 on the Drawings. The accuracy of any method of staking shall be the responsibility of
22 the Contractor. All construction layout staking shall be done such as to provide for
23 easy verification of the Work.

24 B. All control points shall be protected by the Contractor from disturbance. If the
25 monuments are disturbed, any Work that is governed by these monuments shall be held
26 in abeyance until the monuments are reestablished by the Surveyor and approved by the
27 County. The accuracy of all the Contractor's stakes, alignments and grades is the
28 responsibility of the Contractor. However, the County has the discretionary right to check

- 1 the Contractor's stakes, alignments, and grades at any time.
- 2 C. Use survey control points to layout such work tasks including but not limited to:
- 3 1. Clearing, grubbing, work limits, right-of-way lines and easements
- 4 2. Locations for pipelines and all associated structures and appurtenances
- 5 D. The Surveyor shall reference and replace any project control points, boundary corners,
- 6 benchmarks, section corners, and right-of-way monuments that may be lost or destroyed,
- 7 at no additional cost to the County. Establish replacement points based on the original
- 8 survey control.

9 3.02 SURVEY DOCUMENTS DELIVERABLES

- 10 A. Tables 01050-2 Asset Attribute Data, 01050-3 Pipe Deflection Data, shall conform with
- 11 Section 01027 "Application for Payment" and Section 01720 "Project Record
- 12 Documents."
- 13 B. Provide a minimum of three (3) signed and sealed survey sets for all Clearances, Partial
- 14 Clearances and final as-built / record drawings submittals including digital media
- 15 comprising of asset table, deflection table, manhole table, CADD drawings and scanned
- 16 pdf to the County.
- 17 C. Provide at minimum monthly progressive as-built documents including hardcopy and
- 18 digital submittal to the County.
- 19

20 **END OF SECTION**

SECTION 01065
PERMITS AND FEES

PART 1 - GENERAL

1.01 REQUIREMENTS

A. General

1. Upon Notice of Award, obtain and pay for all appropriate and applicable permits and licenses as provided for in the General Conditions, except as otherwise provided herein.
2. Schedule all inspections and obtain all written approvals of the agencies required by the permits and licenses.
3. Strictly adhere to the specific requirements of the governmental unit(s) or agency(cies) having jurisdiction over the Work. Whenever there is a difference in the requirements of a jurisdictional body and the Contract Documents, the more stringent shall apply.
4. A copy of the permits obtained by the County are furnished in Appendix C "Permits Obtained by County" of these specifications.
5. Unless otherwise specified, the cost of work specified in the various sections of Division 1, will not be paid for separately but the cost therefore shall be considered incidental to and included in the bid prices of the various Contract items.

B. Building Permit (Orange County)

1. The County will pay the general building permit fee and any related impact fees or assessments to be paid to Orange County for the issuance of that permit only.
2. The Contractor shall pay all fees associated with obtaining Orange County trade permits and any and all inspection fees for the Orange County Building Department providing inspections for this project. The Contractor shall apply for and obtain the building permits from Orange County and schedule and obtain final approval from the building inspectors.
3. Information on Orange County Building Department fees is included in the Instructions to Bidders in Division 0.
4. The Contractor shall be responsible for scheduling all permit inspections and obtaining inspection approval from Orange County, as required by the building and sub-discipline construction permits.

C. Construction Dewatering Permit

The Contractor shall apply and pay for all fees associated with obtaining Florida Department of Environmental Protection District Office construction dewatering permits, if required. The Contractor shall provide all materials and equipment to comply with the permit requirements at no additional cost to the County.

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

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

3

4

5 **END OF SECTION**

1 **SECTION 01070**

2 **ABBREVIATIONS AND SYMBOLS**

3 **PART 1 - GENERAL**

4 1.01 REQUIREMENTS INCLUDED

5 A. Reference to the following standards of any technical society, organization or body shall
6 be construed to mean the latest standard, code or specification or tentative specification
7 adopted and published at the date of advertisement for bids, even though reference has
8 been made to an earlier standard. Such reference is hereby made a part of the Contract
9 the same as if herein repeated in full and in the event of any conflict between any of these
10 specifications, standard codes or tentative specifications and the Contract Documents, the
11 most stringent shall govern.
12

AA	Aluminum Association
AASHTO	American Association of State Highway and Transportation Officials
ABPA	Acoustical and Board Products Association
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturer's Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AI	The Asphalt Institute
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AIMA	Acoustical and Insulating Materials Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	American Moving and Conditioning Association
ANSI	American National Standards Institute
API	American Petroleum Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASA	American Standards Association (now ANSI)
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSCBC	American Standard Safety Code for Building Construction
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWBP	American Wood Preservers Board
AWS	American Welding Society
AWWA	American Water Works Association

CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard
DOT Spec	Standard Specification for Road and Bridge Construction –
FDOT	Florida Department of Transportation
FAC	Florida Administrative Code
FS	Federal Standard
IEEE	Institute of Electrical and Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association
NACE	National Association of Corrosion Engineers
NASSCO	National Association of Sewer Service Companies
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NEC	National Electrical Code
NECA	National Electrical Contractor's Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPT	National Pipe Threads
NSF	National Science Foundation
OSHA	U.S. Department of Labor, Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PS	United States Products Standards
SAE	Society of Automotive Engineers
SDI	Steel Decks Institute
SJI	Steel Joists Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Structural Steel Painting Council
UL	Underwriter's Laboratories, Inc.
USASI	United States of American Standards Institute (Now ANSI)

1 B. UNITS OF MEASUREMENT
2

CU FT	cubic feet
CU IN	cubic inch(es)
CY	cubic yard(s)
DegC	degree(s) Centigrade
DegF	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)

1 C. 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 Gauge
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

END OF SECTION

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1 D. Applicable Standard Specifications: The Contractor shall construct the Work specified
2 herein in accordance with the requirements of the Contract Documents and the referenced
3 portions of those referenced codes, standards, and specifications listed.

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

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

6 **END OF SECTION**

1 **SECTION 01200**
2 **PROJECT MEETINGS**

3 **PART 1 - GENERAL**

4 1.01 REQUIREMENTS INCLUDED

- 5 A. Contractor participation in pre-construction conferences, progress meetings and specially
6 called meetings.

7 1.02 MEETINGS CALLED BY THE COUNTY

- 8 A. The County will schedule and administer a pre-construction conference, periodic
9 progress meetings and specific topic meetings throughout the progress of the Work. The
10 County will:

- 11 1. Prepare and distribute a notification of the meeting to required attendees.
12 2. Establish, prepare and distribute an agenda with the notification.
13 3. Make physical arrangements for the meetings.
14 4. Preside at meetings.
15 5. Prepare and distribute minutes of meetings including significant proceedings and
16 decisions, within 15 working days after each meeting. Minutes will be forwarded to
17 all participants and to parties affected by decisions made at the meeting.

- 18 B. Representatives of the Contractor, Subcontractors and suppliers attending meetings shall
19 be qualified and authorized to act on behalf of the entity each represents.

- 20 C. The meeting location will generally be a central site, convenient for all parties,
21 designated by the County.

- 22 D. All meetings shall be digitally recorded with files provided to all requesting parties.

23 1.03 PRE-CONSTRUCTION CONFERENCE

- 24 A. Attendance:

- 25 1. County
26 2. Contractor and superintendent
27 3. Subcontractors as appropriate to the agenda
28 4. Representatives of suppliers and manufacturers as appropriate to the agenda
29 5. County MBE/WBE representative
30 6. Other agency representatives (FDEP, EPA, City, etc.)
31 7. Surveyor – recommended but required if Surveyor has not previously performed
32 work for the County
33 8. Others as requested by the County or Contractor

- 1 B. Suggested Agenda:
- 2 1. Distribution and discussion of:
- 3 a. List of major Subcontractors and suppliers
- 4 b. Construction schedules
- 5 c. Contact information
- 6 2. Organizational arrangement of Contractor's forces and personnel, and those of
- 7 Subcontractors, material and equipment suppliers, and the County
- 8 3. Critical work sequencing
- 9 4. Major equipment deliveries
- 10 5. Project coordination
- 11 a. Designation of responsible personnel
- 12 b. Channels and procedures for communication
- 13 6. Procedures and processing of:
- 14 a. Field decisions
- 15 b. Proposal requests
- 16 c. Submittals
- 17 d. Change orders
- 18 e. Applications for payment/Schedule of Values
- 19 f. Contractor quality control
- 20 g. Submittal of Shop Drawings, project data and samples
- 21 7. Adequacy of distribution of Contract Documents
- 22 8. Procedures for maintaining as built and record documents
- 23 9. Use of premises:
- 24 a. Office, work and storage areas
- 25 b. County's requirements
- 26 c. Housekeeping
- 27 10. Temporary construction facilities
- 28 11. Temporary utilities
- 29 12. Safety and first aid procedures
- 30 13. Rules and regulations
- 31 14. Security procedures
- 32 15. Place, date and time for regular progress meetings
- 33 16. Completion time for Contract and liquidated damages

34 1.04 PROGRESS MEETINGS

- 35 A. The County shall schedule progress meetings at least once per month as required by
- 36 progress of the Work with the first meeting approximately one (1) month after the pre-
- 37 construction meeting.
- 38 B. Attendance:
- 39 1. County
- 40 2. Contractor
- 41 3. Subcontractors as appropriate to the agenda
- 42 4. Suppliers as appropriate to the agenda
- 43 5. Others as appropriate

- 1 C. The Contractor's representative is to attend the project meetings and have the authority to
2 act on behalf of the entity represented on field related matters. Contractor's
3 representative is to study previous meeting minutes and current agenda items, in order to
4 be prepared to discuss pertinent topics and provide specific information including but not
5 limited to:
6 1. Status of submittals and actions necessary to expedite them
7 2. Status of activities behind schedule and actions necessary to regain the approved
8 schedule
9 3. Status of materials and equipment deliveries and action necessary to expedite
10 materials and equipment and maintain the approved schedule
11 4. Status of open RFI's and actions necessary to address them
- 12 D. To the maximum extent practicable, the Contractor is to assign the same personnel to
13 represent the Contractor at Progress Meetings throughout the progress of the work.
- 14 E. The Contractor is to provide a current Shop Drawing submittal log at each progress
15 meeting.
- 16 F. The Contractor is to provide copies of the updated Progress Schedule at each project
17 meeting in accordance with the General Conditions including a 3 week look ahead
18 schedule for upcoming events.
- 19 G. Suggested Agenda:
20 1. Review and approve minutes from previous meeting
21 2. Review of work progress since previous meeting to include current As-Builts
22 3. Contractor's/Subcontractor's workforce and equipment
23 4. Progressive As-Built Drawings
24 5. Surveyor's submittals
25 a. As-Built Asset Attribute Data Table (see Table 01050-2)
26 b. Pipe Deflection Table (see Table 01050-3)
27 c. Gravity Main Table (see Table 01050-4)
28 6. Field observations, problems and conflicts
29 7. Construction progress and problems which impede construction schedule
30 8. Shop Drawing submittal status
31 9. Requests for Information (RFI) status
32 10. Change Order status
33 11. Review of off site fabrication and delivery schedules
34 12. Corrective measures and procedures to regain approved schedule
35 13. Revisions to construction schedule
36 14. Job progress and schedule for succeeding work period
37 15. Coordination of schedules
38 16. Maintenance of quality standards
39 17. Review submittal schedule; expedite as required
40 18. Pending requests for information, changes and substitutions
41 19. Review proposed changes for effect on construction schedule and completion date
42 20. Pay application status
43 21. Other business

- 1 H. Revision to Minutes:
2 1. Unless minutes are challenged, in writing, prior to the next regularly scheduled
3 Progress Meeting, they will be accepted as properly summarizing the discussions and
4 decisions of the meeting.
5 2. Persons challenging minutes shall reproduce and distribute copies of the challenge to
6 all indicated recipients of the particular set of minutes.
7 3. Challenge to minutes shall be settled as priority portion of "old business" at next
8 regularly scheduled meeting.

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

10 **PART 3 - EXECUTION (NOT USED)**
11

12 **END OF SECTION**

1 1.02 REVIEW OF SHOP DRAWINGS AND SAMPLES

- 2 A. The County /Professional's review of Shop Drawings, Data, and Samples as submitted by
3 the Contractor will be to determine if the items(s) generally conform(s) to the information
4 in the Contract Documents and is/are compatible with the design concept. The
5 County/Professional's review and exceptions, if any, will not constitute an approval of
6 dimensions, connections, quantities, and details of the material, equipment, device, or
7 item shown.
- 8 B. The review of drawings and schedules will be general, and shall not be construed:
9 1. As permitting any departure from the Contract Documents
10 2. As relieving the Contractor of responsibility for any errors, including details,
11 dimensions, and materials
12 3. As approving departures from details furnished by the County/Professional, except as
13 otherwise provided herein
- 14 C. If the drawings or schedules as submitted describe variations and show a departure from
15 the Contract Documents which the County/Professional finds to be in the interest of the
16 County and to be so minor as not to involve a change in Contract Price or Contract Time,
17 the County/Professional may return the reviewed drawings without noting an exception.
- 18 D. "Approved As Noted": Contractor shall incorporate County/Professional's comments into
19 the submittal before release to manufacturer. The Contractor shall send a letter to the
20 County/Professional acknowledging the comments and their incorporation into the Shop
21 Drawing.
- 22 E. "Amend and Resubmit": Contractor shall resubmit the Shop Drawing to the
23 County/Professional. The resubmittal shall incorporate the County/Professional's
24 comments highlighted on the Shop Drawing.
- 25 F. "Rejected": Contractor shall correct, revise and resubmit Shop Drawing for review by
26 County/Professional.
- 27 G. Resubmittals will be handled in the same manner as first submittals. For resubmittals the
28 Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to
29 revisions other than the corrections requested by County/Professional on previous
30 submissions. The Contractor shall make any corrections required by the
31 County/Professional.
- 32 H. If the Contractor considers any correction indicated on the Drawings to constitute a
33 change to the Drawings or Specifications, the Contractor shall give written notice thereof
34 to the County/Professional.

- 1 I. When the Shop Drawings have been completed to the satisfaction of the
2 County/Professional, the Contractor shall carry out the Construction in accordance
3 therewith and shall make no further changes therein except upon written instructions
4 from the County/Professional.
- 5 J. No partial submittals will be reviewed. Submittals not deemed complete will be stamped
6 "Rejected" and returned to the Contractor for resubmittal. Unless otherwise specifically
7 permitted by the County/Professional, make all submittals in groups containing all
8 associated items for:
9 1. Systems
10 2. Processes
11 3. As indicated in specific Specifications Sections
12 All drawings, schematics, manufacturer's product data, certifications, and other Shop
13 Drawing submittals required by a system specification shall be submitted at one time
14 as a package to facilitate interfaces checking.
- 15 K. Only the County/Professional shall utilize the color "red" in marking Shop Drawing
16 submittals.
- 17 L. Failure to comply with any of the above may result in the rejection of Shop Drawings.

18 1.03 PRODUCT DATA

- 19 A. Submit not less than 6-copies, unless approved by the County/Professional. Mark each
20 copy to identify applicable products, models, options and other data. Supplement
21 manufacturers' standard data to provide information unique to the Work.

22 1.04 MANUFACTURERS' INSTRUCTIONS

- 23 A. When required in an individual Specification Section, submit manufacturer's printed
24 instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing,
25 in quantities specified for product data.

26 1.05 SAMPLES

- 27 A. Submit full range of manufacturers' standard colors, textures and patterns for the County's
28 selection. Submit samples for selection of finishes within 30-days after Award of
29 Contract. All color and finish selections must be submitted by the Contractor in a single
30 submission, properly labeled and identified.
- 31 B. Submit samples to illustrate functional characteristics of the product, with integral parts
32 and attachment devices. Coordinate submittal of different categories for interfacing
33 work.

- 1 C. Submit the number of samples specified in the respective Specification section, but no
2 less than two (2). After review one (1) will be retained by the County. Reviewed
3 samples that may be used in the Work are indicated in the Specification Section.
- 4 D. Samples shall be delivered to the County as directed. The Contractor shall prepay
5 shipping charges on samples. Materials or equipment for which samples are required
6 shall not be used in the Work until approved by the County/Professional.
- 7 E. Samples shall be of sufficient size to clearly illustrate:
8 1. Functional characteristics of the product, with integrally related parts and attachment
9 devices
10 2. Full range of color, texture and pattern
11 3. Each sample shall have a label indicating:
12 a. Name of Project
13 b. Name of Contractor and Subcontractor
14 c. Material or equipment represented
15 d. Place of origin
16 e. Name of product and brand (if any)
17 f. Location in Project
18 g. Specification title and number
19 h. Submittal number
20 i. Note: Samples of finished materials shall have additional marking that will
21 identify them under the finished schedules.
- 22 F. The Contractor shall prepare a transmittal letter, in triplicate (3) for each shipment of
23 samples containing the information required in paragraph herein. The Contractor shall
24 enclose a copy of this letter with the shipment and send a copy of this letter to the
25 County/Professional. Approval of a sample shall be only for the characteristics or use
26 named in such approval and shall not be construed to change or modify any Contract
27 requirements.
- 28 G. Approved samples not destroyed in testing shall be sent to the County or stored at the site
29 of the Work. Approved samples of the hardware in good condition may be incorporated
30 in the Work if requested in writing by the Contractor and approved in writing by the
31 County/Professional. Samples that failed testing or were not approved will be returned to
32 the Contractor at the Contractor's expense, if so requested at time of submission.

33 1.06 FIELD SAMPLES

- 34 A. Provide field samples of finishes as required by individual Specifications sections. Install
35 the sample completely and finished. Acceptable samples in place may be retained in
36 completed Work.

37 1.07 DRAWINGS, PRODUCT DATA AND CERTIFICATES

- 38 A. Each letter of transmittal shall identify each and every item transmitted by title, drawing
39 number, revision number and date.

- 1 B. The County generally will not check dimensions, quantities or schedules, except in cases
2 where the information is lacking in the Specifications.
- 3 C. The following is applicable to submitted drawings, data and certificates:
4 1. Show relation to adjacent structures or materials.
5 2. Clearly identify field dimensions.
6 3. Show required dimensions and clearances.
7 4. Performance characteristic and capabilities shall accompany original Shop Drawing
8 submittals.
9 5. Wiring diagrams and controls shall accompany original Shop Drawing submittals.
10 6. Installation instructions shall accompany original Shop Drawing submittals.
11 7. Each submittal shall identify applicable Standards, such as ASTM number or Federal
12 Specification number.
13 8. All information not pertinent shall be removed from the submittal, or shall be crossed
14 out.
- 15 D. When resubmission is required, the County/Professional will return only two (2) marked
16 up copies. A third submission from the same manufacturer will not be accepted.

17 1.08 SUBSTITUTIONS

- 18 A. The substitution requirements of this Section are in addition to the requirements of the
19 General Conditions and Supplementary Conditions.
- 20 B. When a particular product is specified or called for, it is intended and shall be understood
21 that the proposal tendered by the Bidder includes those products in his Bid. Substitutions
22 will only be considered in cases where original materials are unavailable or in an instance
23 where substitute can be proven superior in its planned application
- 24 C. The intent of these specifications is to provide the County with a quality facility without
25 discouraging competitive bidding. For products specified only by reference standards,
26 performance and descriptive methods, without naming manufacturer's products, the
27 Contractor may provide the products of any manufacturer complying with the Contract
28 Documents, subject to the review of product data by the County/Professional as specified
29 herein.
- 30 D. The County/Professional's approval is required for substitutions.
- 31 E. The Contract is based on the materials, equipment and methods described in the Contract
32 Documents.
- 33 F. The County/Professional will consider proposals for substitution of materials equipment
34 and methods only when such proposals are accompanied by full and complete technical
35 data and all other information required by the County/Professional to evaluate the
36 proposed substitution.

1 G. Do not substitute materials, equipment or methods unless such substitution has been
2 specifically approved for this Work by the County/Professional in writing. The
3 Contractor must provide a submittal per this Section specifically requesting approval of
4 the substitution. Failure to specifically identify the requested substitution may invalidate
5 approval of a submittal.

6 1.09 AVAILABILITY OF SPECIFIED ITEMS

7 A. Verify prior to bidding that all specified items will be available in time for installation
8 during Construction for orderly and timely progress of the Work.

9 B. In the event that specified items will not be available, notify the County/Professional
10 prior to receipt of proposals.

11 1.10 OPERATING MANUALS

12 A. Submit all manuals in accordance with requirements of Divisions 2 through 16 of the
13 Contract Specifications and Section 01700 "Project Closeout."

14 1.11 WARRANTIES, GUARANTEES AND BONDS

15 A. Provide as required by Technical Sections of the Specifications and Sections 01700
16 "Project Closeout" and Section 01740 "Warranties and Bonds."

17 1.12 CADD FILES

18 A. The Professional's CADD files will be available on a limited basis to qualified firms at
19 the County's prerogative. The procedure for requesting such files is noted elsewhere in
20 these documents and there is a cost associated with handling and reproduction.
21 Recipients are cautioned that these files may not accurately show actual conditions as
22 constructed. Users are responsible to verify actual field conditions.

23 B. The Professional's Drawings are to be used only for background information. If the
24 Professional's Drawings are just reproduced and resubmitted (e.g. for ductwork
25 drawings) they will be rejected.

26 C. Copies of data furnished by the County/Professional to Contractor or Contractor to
27 County/Professional that may be relied upon are limited to the printed copies (also known
28 as hard copies). Files in electronic media format of text, data, graphics, or other types are
29 furnished only for the convenience of the receiving party. Any conclusion or information
30 obtained or derived from such electronic files will be at the user's sole risk. If there is a
31 discrepancy between the electronic files and the hard copies, the hard copies govern.

1 D. Because data stored in electronic media format can deteriorate or be modified
2 inadvertently or otherwise without authorization of the data's creator, the party receiving
3 electronic files agrees that it will perform acceptance tests or procedures within 60-days,
4 after which the receiving party shall be deemed to have accepted the data thus
5 transferred. Any errors detected within the 60-day acceptance period will be corrected by
6 the transferring party.

7 E. When transferring documents in electronic media format, the transferring party makes no
8 representations as to long-term compatibility, usability, or readability of documents
9 resulting from the use of software application packages, operating systems, or computer
10 hardware differing from those used by the data's creator.

11 1.13 PROGRESS PHOTOGRAPHS

12 A. Photographs and digital pictures shall be in color. Provide 1 copy of each digital picture
13 on each of three (3) CDs and provide 1 print of each photograph in two (2) separate
14 albums.

15 B. Photographs shall be from locations to illustrate the condition of Construction and state
16 of progress adequately.

17 C. Provide up to 12 digital photographs of views randomly selected by the County, taken
18 prior to any construction and prior to each scheduled Application for Payment.

19 D. Deliver electronic images, prints, and negatives to the County.

20 E. Each print shall be single weight paper with glossy finish and the overall dimension shall
21 be 7-1/2-inch x 10-inches (19.05 x 25.4 cm). The print shall be clear, sharp and free of
22 distortion after the enlargement from the negative.

23 F. Provide loose-leaf albums for each set of photographs to hold prints with a maximum of
24 50-leaves per binder.

25 G. Each print shall be protected by flexible, transparent acetate or plastic sheet protector
26 leaves with metal reinforced holes. Two (2) extra leaves shall be provided in each
27 binder.

28 H. Capture and provide digital, ortho-rectified, true-color, aerial photographs of the
29 complete project site prior to start of Construction and at final completion. A final 6-inch
30 or less ground pixel resolution is required. If using traditional photography, the photos
31 will need to be captured at an appropriate scale and scanned at a high enough dpi to yield
32 a final ground pixel size of 6-inches or less. If captured digitally, a final 6-inches or less
33 ground sample distance is required. The final orthorectified photos shall use a projection
34 of NAD 27, State Plane West and all vertical reference shall be NAVD 88, US feet. All
35 orthophoto mosaics shall meet a final accuracy of plus or minus 5-feet.

- 1 I. Provide a total of four (4) true-color, color balanced orthophoto mosaic prints. Three (3)
2 prints each of the pre and post construction (final completion) orthophoto mosaics, for a
3 total of six (6). Each orthophoto mosaic print shall be on double-weight paper with
4 glossy finish and shall have overall dimensions of 36-inches x 58-inches. Two (2) copies
5 of each of the digital orthophoto mosaics shall be supplied in Geotiff format on disk for
6 each time period (pre and post construction). The final color balanced, true-color
7 orthophoto mosaics will be projected in NAD 27, State Plane West and all vertical
8 reference shall be NAVD 88, US feet and shall meet a final accuracy of plus or minus 5-
9 feet.
- 10 J. The Contractor shall provide before and after photographs of each portion of the site.
11 The below ground facilities shall include all equipment, walls, floor, piping, supports and
12 entrance. At major locations, photographs shall include before, during, and after prints
13 and all prints shall be placed in binders in ascending date order to show the Work as it
14 progresses.
- 15 K. Descriptive Information:
16 1. Each photograph shall have a permanent title block on the back and shall contain the
17 typed information and arrangement as follows:
18 a. ORANGE COUNTY, FLORIDA
19 b. (ENTER PROJECT NAME)
20 c. BID No. (Enter Bid Number)
21 d. CONTRACTOR: (Name of Contractor)
22 e. DATE: (When photo was taken)
23 f. PHOTO NO.: (Consecutive Numbers)
24 g. PHOTO BY: (Firm Name of Photographer)
25 h. LOCATION: (Description of Location and View)
26 2. The Contractor shall provide the Professional with a written description of each
27 photograph. This description shall be included in the binders and a copy shall be
28 submitted with the CDs.

29 1.14 PROJECT RECORD DOCUMENTS

30 Project Record Documents shall be submitted in accordance with Section 01720 "Project
31 Record Documents" of these specifications.

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

33 **PART 3 - EXECUTION**

34 3.01 SUBMITTAL PROCEDURES

35 A. Article 9 of the General Conditions contains additional provisions regarding submittals.

- 1 B. Preliminary Shop Drawing Data: Within 20-days after the Award of the Contract or
2 before the Pre-Construction Meeting, the Contractor shall submit to the
3 County/Professional a complete listing of manufacturers for all items for which Shop
4 Drawings are to be submitted.
- 5 C. Shop Drawing Submittal Schedule: Within 30-days after the Notice to Proceed, the
6 Contractor shall submit to the County/Professional a complete schedule of Shop
7 Drawings submittals with the respective dates for submission, the beginning of
8 manufacture, testing and installation of materials, supplies and equipment, noting those
9 submittals critical to the progress schedule.
- 10 D. Submittal Log: An accurate updated log of submittals will be maintained by the
11 Contractor and subject to review by the County/Professional at each scheduled progress
12 meeting.
- 13 E. If the Contractor considers any correction indicated on the Drawings to constitute a
14 change to the Contract Drawings or specifications, the Contractor shall give written
15 notice thereof to the County/Professional. This does not constitute a change order until
16 accepted by the County.
- 17 F. Shop Drawing and submittal data shall be reviewed by the County/Professional for each
18 original submittal and first resubmittal; thereafter review time for subsequent resubmittals
19 shall be charged to the Contractor. The Contractor shall reimburse the County for
20 services rendered by the County/Professional at the rate multiplied by the County's
21 Professional multiplier based on the fee schedule provided to the County for this Project.
22 If a County engineer is performing any portion of the review, this fee is based upon the
23 hourly rate of the engineer times the County's multiplier for overhead, benefits, and
24 expenses. The Contractor agrees that the County shall deduct such charges from the
25 Contract Amount by a deductive Change Order.
- 26 G. Contractor Shop Drawing and Sample submittals shall include 5 copies in addition to any
27 other copies that the Contractor wants returned. The County will retain 5 copies of
28 approved submittals.
- 29 H. Identify Project, Project Number, date, dates of previous submittals, Contractor, Sub-
30 Contractors, suppliers with their addresses, pertinent Drawings by sheet and detail
31 number, and Specification Section number, as appropriate. Identify all deviations from
32 the Contract Documents. Provide space for Contractor and Professional review stamps.
- 33 I. Contractor's delivery of Shop Drawings for review shall follow a reasonable sequence, as
34 is necessary to support the dates on the Progress Schedule and avoid an overload of Shop
35 Drawings awaiting review at any one time. Coordinate submittal of related items.

- 1 J. Submit Shop Drawings per the schedule of Shop Drawing submittals, inserted in 1 loose-
2 leaf binder, with tabs and index to the County/Professional. All individual submittal
3 sheets inserted in said binder must be clearly marked and referenced to proper paragraph
4 and subparagraph of specifications. Cross out any items on sheets which constitute
5 information not pertaining to equipment specified. Clearly mark all components that are
6 provided as "optional" by manufacturer. Shop Drawings shall be approved by the
7 Contractor prior to submittal to the County/Professional. Shop Drawings will be
8 reviewed by the County/Professional. After County/Professional approval, reproduce
9 and distribute in accordance with requirements herein.
- 10 K. All submissions of Shop Drawings, brochures and catalog cuts shall be accompanied by a
11 transmittal letter listing the Drawings submitted by number and title.
- 12 L. When engineering calculations and/or professional certification of performance criteria of
13 materials, systems, and/or equipment are required, the County is entitled to rely upon the
14 accuracy and completeness of such calculations and certifications submitted by the
15 Contractor. Calculations, when required, shall be submitted in a neat, clear and in an
16 easy to follow format. Such calculations and/or certifications shall be signed and sealed
17 by a Professional Engineer registered in the State of Florida.
- 18 M. Distribute copies of reviewed submittals to concerned parties. Instruct recipients to
19 promptly report any inability to comply with provisions.
- 20 N. Prior to submission of Shop Drawings and samples, the Contractor shall stamp and sign
21 the submittals. Any submission which, upon examination by the County, shows evidence
22 of not having been thoroughly checked, or is not in compliance with the provisions of this
23 Section will be returned to the Contractor for completion before it will be considered for
24 review.
- 25 O. Notify the County of the need for making any changes in the arrangement of piping,
26 connections, wiring, manner of installation, etc., which may be required by the material
27 or equipment Contractor proposes to supply.
- 28 P. On resubmittals, direct specific attention in writing or on the revised Drawings or sample
29 to revisions other than the corrections required by County on previous submissions.
- 30 Q. All drawings, schematics, manufacturer's product data, certifications and other drawing
31 submittals required for a system specification shall be submitted at one time as a package
32 to facilitate interface checking.
- 33 R. The County will distribute Shop Drawings as follows for the indicated action taken:
34

SHOP DRAWING SUBMITTAL DISTRIBUTION

Representative Party	No Exception Taken or Make Correction Noted			Rejected or Revise & Resubmit		
	Submittal Transmittal	Shop Drawing	Review Comment Sheet	Submittal Transmittal	Shop Drawing	Review Comment Sheet
Engineer	2 Copies	File Copy	1 Copy	Original	File Copy	1 Copy
Contractor (see Note 1)	2 Copies	1 Copy Each Submittal	1 Copy	1 Copy	All Copies Except Engineers	1 Copy
County	1 Copy	1 Copy Each Submittal	1 Copy	1 Copy	None	1 Copy
Inspector	2 Copies	1 Copy Each Submittal	1 Copy	1 Copy	None	1 Copy
Project Record Data (see Note 2)	1 Copy	1 Copy Each Submittal	1 Copy	1 Copy	None	1 Copy

NOTES:

1. Contractor shall distribute additional copies to Subcontractors as required.
2. Stored by Contractor to be furnished to County upon closeout.

- 2 S. All Shop Drawings shall be accompanied with a transmittal letter providing the following
3 information:
4 1. Project Title and Contract Number
5 2. Date
6 3. Contractor's name and address
7 4. The number of each Shop Drawing, project data, and sample required
8 5. Notification of Deviations from Contract Documents
9 6. Submittal Log Number conforming to specification section numbers
10 a. Submit each specification section separately.
11 b. Identify each Shop Drawing item required under respective specification section.
12 c. Identify resubmittal using specification section followed by A (first resubmittal),
13 B (second resubmittal)...etc.

14 3.02 CONTRACTOR'S REVIEW

- 15 A. Contractor's Responsibility for Coordination: Where the dimension, size, shape, location,
16 capacity or other characteristic affects another item, and where the Contractor selects,
17 fabricates or installs related or adjacent products to be used, the Contractor shall be
18 responsible for coordination of related items. The Contractor shall insure that a proper
19 exchange of information takes place prior to or during preparation of each submittal and
20 that submittals reflect such coordination. The notation "verify" or "coordinate" on the
21 Drawings indicates the necessity for Contractor coordination in the particular instances
22 used.

- 1 B. Contractor's Checking: When checking submittals from Subcontractors and suppliers, the
2 Contractor shall mark all sets, indicating his corrections and comments in blue or green.
3 Copies marked in red may be returned for revision.
- 4 C. The Contractor is responsible to deliver and pick-up all submittals in a timely manner at
5 the County/Professional's designated office. The Contractor is responsible for all related
6 costs and expenses for the transmittal of such submittals.

7 3.03 COUNTY'S / PROFESSIONAL'S REVIEW

- 8 A. Corrections or comments made on Shop Drawings during review do not relieve the
9 Contractor from compliance with the requirements of Drawings and Specifications. This
10 check is only for review of general conformance with the design concept of this Project
11 and general compliance with information given in Contract Documents. Any
12 substitutions or changes shall be properly noted.
- 13 B. No action will be taken on "rough-in" Shop Drawings for plumbing and electrical
14 connections when the items of equipment are not included in the same submittal.
- 15 C. Review Time:
- 16 1. On a normal basis, each submittal will be returned to the Contractor within 15
17 working days of the date it is received. Some submittals may require additional time.
- 18 2. If, for any reason, the above schedule cannot be met, the Contractor will be so
19 informed within a reasonable period and the Schedule of Submittals revised. If the
20 specific submittal affects the critical path, the Contractor shall immediately notify the
21 County/Professional in writing. In the event of separate submittals of individual
22 components of a system, these submittals may be held until all components of the
23 system are submitted, and the Contractor will be so notified.
24

25 **END OF SECTION**

- 1 4. CPM Schedule: The Progress Schedule based on the Critical Path Method (CPM) of
2 scheduling. The term Critical Path means any continuous sequence of Activities in
3 the Progress Schedule controlling, because of their sum duration, the Early Date of a
4 pertinent, specified Contract Time.
- 5 5. Early/Late Dates: Early/late times of performance, based on CPM calculations, for an
6 Activity in the Progress Schedule. Early Dates will be based on proceeding with all
7 or part of the Work on the date when the corresponding Contract Time commences to
8 run. Late Dates will be based on completing all or part of the Work on the
9 corresponding Contract Time, even if the Contractor plans early completion.
- 10 6. Milestones: Key, pre-determined points of progress in the completion of a facility,
11 denoting interim targets in support of the Contract Times. Milestones may pinpoint
12 targets for key excavation and substructure events, significant deliveries, critical path
13 transition from superstructure to piping and electrical rough in and building
14 enclosure. Also, hook-up of mechanical and electrical equipment, availability of
15 power for testing, equipment shakedown, training of County personnel, start up,
16 Substantial Completion and other events of like import.
- 17 7. Official Schedule: The Initial or most recent Revision Submittal accepted by the
18 County or returned as no resubmittal required and the basis for Payment Submittals
19 until another Revision Submittal is submitted and accepted. The accepted Initial
20 Submittal is also the As-Planned Schedule.
- 21 8. Payment Submittal: A monthly Progress Schedule update reflecting progress and
22 minor adjustments on the Activities, sequencing and restraints for Work remaining.
- 23 9. Total Float: Days by which an activity may slip from its Early Dates without
24 necessarily extending a pertinent Contract Time. Total Float at least equals Contract
25 Float. Total Float may also be calculated and reported in working Days. When an
26 activity is delayed beyond Early Dates by its Total Float it becomes a Critical Path
27 activity and if delayed further will impact a Contract Time.

28 1.03 QUALITY ASSURANCE

- 29 A. The Contractor may self-perform the Work covered by this Section or employ a
30 Subcontractor, subject to the County's consent. Employment of a scheduling
31 Subcontractor shall not in any way alter or reduce the Contractor's obligations under the
32 Contract Documents.
- 33 B. The Contractor will obtain a written interpretation from the County, if the Contractor
34 believes that the selection of activities, logic ties and/or restraints requires a written
35 interpretation of the Contract Documents. With each submission, the Contractor will
36 point out by specific, written notation, any Progress Schedule feature that may reflect
37 variations from any requirements of the Contract Documents.
- 38 C. It is the Contractor's responsibility to obtain information directly from each Subcontractor
39 and Supplier when scoping their respective Activities, Values, logic ties and restraints.

1 D. Neither Acceptance nor Review of any Progress Schedule will relieve the Contractor
2 from the obligation to comply with the Contract Times and any sequence of Work
3 indicated in or required by the Contract Documents and to complete, within the Contract
4 Times, any Work omitted from that Progress Schedule.

5 E. Neither Acceptance nor Review of any Progress Schedule will imply approval of any
6 interpretation of or variation from the Contract Documents, unless expressly approved by
7 the County through a written interpretation or by a separate, written notation on the
8 returned Progress Schedule Submittal.

9 1.04 MILESTONES AND SCHEDULE RECOVERY

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

13 B. Whenever any Activity slips by 14 or more Days from the Late Date for an activity in the
14 Official Schedule, Milestone Dates selected by the County, or a pertinent Contract Time,
15 the Contractor will deliver a Revision Submittal documenting the Contractor's schedule
16 recovery plan and/or a properly supported request for an extension in the Contract Time.
17 The narrative will identify the Delay and actions taken by the Contractor to recover
18 schedule, whether by adding labor, Subcontractors or construction equipment, activity re-
19 sequencing, expediting of submittals and/or deliveries, overtime or shift Work, and so
20 forth. Activity shortening and overlapping shall be explained as to their basis (and be
21 supported by increases in resources).

22 C. Upon evaluation of that Revision Submittal, if the County determines there is sufficient
23 cause, the County may withhold liquidated damages or provide a notice of intent to do so,
24 if schedule is indeed not recovered, and/or may give a notice of default.

25 1.05 PROGRESS SCHEDULE SOFTWARE

26 A. The scheduling software employed by the Contractor to process the Progress Schedule
27 will be the current version of Primavera P6.0®, or Primavera® Contractor 5.0 CPM
28 scheduling software.

29 B. If the Contractor intends to use companion schedule reporting, analysis or graphics
30 software tools, the Contractor will furnish to the County descriptive materials and
31 samples describing such software tools.

32 1.06 NON-PERFORMANCE

33 A. The County may refuse to recommend all or any part of any payment, if the Contractor
34 fails, refuses or neglects to provide the required Progress Schedule information on a
35 timely basis. Partial payments without a properly updated Progress Schedule shall be
36 returned to the Contractor as non-conforming.

1 B. If justified under the circumstances, the County also may prepare alternate Progress
2 Schedules, as appropriate, and deduct from the Contract Amount all related costs by
3 Change Order and/or take other action commensurate with the breach.

4 1.07 REPORTS, SCHEDULES AND PLOTS

5 A. Schedule Reports will include Activity (ID) code and description, duration, calendar,
6 Early Dates, Late Dates and Total Float. Separate Schedule Reports will tabulate, for
7 each Activity, all preceding and succeeding logic types and lead times, whether CPM
8 Plots displaying logic ties are appended or not.

9 B. CPM Schedule Plots will be plotted on a suitable time scale and identify the Contract
10 Times, Critical Paths, phases and work areas on 24-inch x 36-inch or smaller sheets.
11 Activities will be shown on the Early Dates with Total Floats noted by Late Date flags.
12 For Payment and Revision Submittals plot a target comparison based on the current
13 Official Schedule.

14 C. The Activity Value report will tabulate Activity code and description and Activity Value,
15 percent complete and earned value as calculated by the scheduling software. Cash flow
16 plots shall be provided showing the monthly and cumulative actual and planned earned
17 values with curves shown for Early and Late Dates in the schedules. For Payment and
18 Revision Schedule submittals, the cash flow curves shall also plot the most current
19 Official Schedule planned earnings curves.

20 D. Each submittal shall include listings of all added and deleted activities, logic, constraints,
21 Activity Value changes and update information vs. the previous Progress Schedule
22 submittal. This list may be manually prepared or generated by accessory software that
23 will generate such listings.

24 1.08 NARRATIVE REQUIREMENTS

25 A. The Initial Submittal narrative will describe the Contractor's approach to prosecution of
26 the Work and the basis for determination of activity durations, sequence and logic,
27 including the Contractor's management of the site, e.g., lay down, staging, parking, etc.;
28 Contractor's phasing of the Work; use of crewing and construction equipment;
29 identification of non-work County/Professional's, shifts, weekend Work and multiple
30 calendars applied to activities and an explanation of the basis for restraint dates.

31 B. Revision and Payment Submittal narratives will explain any changes to the approach or
32 planning referred to in Paragraph A above on account of any change, delay, schedule
33 recovery, substitution and/or Contractor-initiated revision occurring since the previous
34 submittal.

35 C. Each narrative will list the Critical Path Activities and compare Early and Late Dates
36 against Contract Times and Milestone Dates. Narratives shall also recap progress and
37 Days gained or lost vs. the current Official Schedule, and identify delays, their extent and
38 causes.

1 D. The Initial Submittal narrative will describe all delays occurring since Contract Award
2 and all pending and anticipated "or equal" and substitution proposals. Payment and
3 Revision Submittal narratives will describe any new delays and shall certify that the
4 Contractor has not been delayed, as of the cut off date, by any acts or omissions of the
5 County, except as otherwise specifically stated.

6 1.09 ACTIVITY REQUIREMENTS

7 A. Separate activities will identify permits, design when included in the Work, construction,
8 Submittal preparation and review (and resubmission and re-review), deliveries (site or
9 storage), testing, start-up, commissioning and Punch List.

10 B. Activities will be detailed to the extent required to show the transition of trade Work.
11 Activities will delineate the progression of the Work.

12 C. Activities will not combine separate or non-concurrent items of Unit Price or lump sum
13 Work.

14 D. Activity durations will equal the Work Days required to sufficiently complete the Work
15 designated by the Activity, (i.e., when finish-to-start successors could start, even if the
16 Activity is not quite 100% complete). Installation Activities will last from 10 to 40
17 workdays. Submittal review activity durations shall conform to specified timeframes.

18 E. Activities will be assigned consistent descriptions and identification codes. Sort codes
19 will group Activities by meaningful schemes.

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

28 1.10 FLOAT TOLERANCES AND FLOAT OWNERSHIP

29 A. Any Progress Schedule with Early Dates after a Contract Time will yield negative Total
30 and Contract Floats, whether shown/calculated or not. Any Revision Submittal with less
31 than negative 20-days of Float will be returned as "Revise and Resubmit," unless a time
32 extension is requested or the County assesses liquidated damages or gives notice of intent
33 to do so, in the event schedule is not recovered.

34 B. Float calculated from the definitions given in this Section supersede any conflicting Float
35 values in any early completion Progress Schedule.

1 C. Neither the County nor the Contractor own the Float time, the Project owns the Float
2 time. Neither the County nor the Contractor use of positive Total Float will impact a
3 Contract Completion Date or justify an extension of Contract Time.

4 1.11 SUBMITTALS

5 A. Each Progress Schedule Submittal will consist of a narrative, 5 copies of the required
6 reports and plots and an optical ROM data disk with the Contractor's corresponding
7 schedule and schedule layout files in Primavera ".XER" format.

8 B. The County will review Progress Schedule Submittals and return a review copy within
9 14-days after receipt and the Contractor shall, if required, resubmit within 7-days after
10 return of the review copy.

11 C. Requirements for the Initial Submittal:

12 1. Within 20-days after receipt of Notice to Proceed and prior to commencing Work on
13 the Project, prepare and submit to the County the Initial Submittal of the Progress
14 Schedule for the Work. The Initial Submittal will show the Work as awarded,
15 without delays, Change Orders or substitutions.

16 a. Activity Values will prorate Schedule of Values costs and/or pay items through to
17 Activities. Provide a cross-reference listing with two parts; a part that will list
18 each activity with the respective amounts allocated from each Schedule of Values
19 and Unit Price Item making up the total value of each activity and a second part
20 that will list the Schedule of Values and Unit Price Items with the respective
21 amounts allocated from each activity that make up the total value of each item.

22 2. After the As-Planned Schedule is established, the County will select Milestones and
23 record the Milestone Early and Late Dates. As the Official Schedule evolves,
24 Milestone Dates will be revised accordingly.

25 3. If the County refuses to endorse the Initial Submittal (or a resubmission) as
26 "Resubmittal Not Required," the As-Planned Schedule will not be established. In that
27 event, the Contractor will continue to submit Payment and Revision Submittals
28 reflecting progress and the Contractor's approach to remaining Work. The County
29 will rely on the available Payment and Revision Submittals, subject to whatever
30 adjustments it determines appropriate.

31 D. Requirements for Payment Submittals:

32 1. Payment Submittals with progress up to the closing date and updated Early Dates and
33 Late Dates for progress and remaining Activities will be due with each Progress
34 Payment. As-built data will consist of actual dates, percent complete, earned
35 payment, changes, Delays and other significant events occurring before the closing
36 date.

37 2. Activity percent complete and earned value should indicate a level of completion that
38 corresponds to the Application for Progress Payment for the same period. The earned
39 value should be calculated by the scheduling software as Activity Value times percent
40 complete. Explanation should be provided whenever the cumulative earned value of
41 activities in a Payment Submittal is not within 10% of the value of Work completed
42 as represented in the corresponding Application for Progress for Payment.

- 1 3. At the Contractor's option, a Payment Submittal may overlay minor adjustments on
2 activities and sequencing for Work remaining. This excludes Activity re-scoping to
3 reflect Delays, changes, schedule recovery or substitutions.

4 E. Requirements for Revision Submittals:

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

27 F. Retrospective Delay Analysis.

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

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

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

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END OF SECTION

SECTION 01370
SCHEDULE OF VALUES

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PART 1 - GENERAL

1.01 DEFINITION

- A. Schedule of Values: Schedule that divides the Contract Amount into pay items, such that the sum of all pay items equals the Contract Amount for the Work, or for any portion of the Work having a separate specified Contract Amount.

1.02 REQUIREMENT

- A. The Schedule of Values established as provided in the General Conditions will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to the County. Progress payments on account of Unit Price Work will be based on the number of units completed and shall be prorated by the percent complete on the number of units installed not meeting all requirements of the Contract including testing
- B. No payment will be made for Work performed on a lump sum contract or a lump sum item until the appropriate Schedule of Values is approved by the County.
- C. The equitable value of Work deleted from a lump sum contract or lump sum item shall be determined from the approved Schedule of Values.

1.03 SUBMITTALS

- A. Submit 3 copies of a Preliminary Schedule of Values within 15-days after the recommended award of the Contract.
- B. Submit 3 copies of a proposed final Schedule of Values within 20-days after receipt of Notice to Proceed as per the General Conditions.
- C. Submit the Schedule of Values, typed, on EJCDC 1910-8-E form or Orange County forms or spreadsheets provided by County. The Contractor's standard form or electronic media printout will be considered for acceptability by the County.
- D. List installed value of each major item of Work and each subcontracted item of Work as a separate line item to serve as a basis for computing values for Progress Payments. Round off values to nearest dollar.
- E. Coordinate listings with the Progress Schedule.
- F. For items on which payments will be requested for stored materials or equipment, list sub-values for cost of stored products with taxes paid and provide corresponding schedule of value item number. Stored materials quantities shall not exceed installed

- 1 quantities on bid tab or as required by the Contract Documents.
- 2 G. Submit a sub-schedule for each separate stage of Work specified in Section 01010
3 "Summary of Work."
- 4 H. The sum of values listed shall equal the total Contract Amount for the Work or the
5 Contract Amount for a part of the Work with a separate Contract Amount provided for by
6 the Contract Documents.
- 7 I. When the County requires substantiating information, submit data justifying line item
8 amounts in question.

9 **1.04 UNIT PRICE CONTRACTS**

- 10 A. For unit price contracts, the bid item prices on the Project Bid Schedule shall be used as the
11 basis for the schedule of values. The Contractor shall resubmit the bid item prices in the
12 format described herein, and may, at its option, or if requested by the County, divide the
13 items in the Project Bid Schedule into sub-items to provide a more detailed basis of payment.

14 **1.05 LUMP SUM CONTRACTS**

- 15 A. For lump sum contracts, if the Work involves separate facilities, e.g. multiple pump
16 stations, the cost of the Work shall be separated by each facility and into schedule of
17 value items. Break principal subcontract amounts down into these items; The lump sum
18 cost for each facility shall be submitted individually and split into the schedule of values
19 listed in items 1 through 17.
- 20 1. Mobilization/Demobilization at 5% of the base bid for the pump station.
 - 21 2. Project Record Documents at 1% of the base bid for the pump station.
 - 22 3. Indemnification at \$100.00 divided by the number of pump stations in the project.
 - 23 4. Demolition of existing pump station
 - 24 5. Bypass pumping
 - 25 6. Wetwell structure, liner, top slab, hatch covers and appurtenances
 - 26 7. Valve vault structure, hatch covers and appurtenances, drain piping and appurtenances
 - 27 8. Wetwell (mechanical): 316 stainless steel piping and appurtenances, pumps and base plates
 - 28 9. Valve vault (mechanical): piping, valves, and appurtenances
 - 29 10. Yard piping, fittings, valves, and appurtenances (outside of structures)
 - 30 11. Site work and access drive
 - 31 12. Chain link fence and gates
 - 32 13. Masonry walls and gates
 - 33 14. Odor control equipment, related piping, monitoring equipment, etc.
 - 34 15. Generator, fuel storage tank and related piping
 - 35 16. Electrical control panel, wiring, and connections
 - 36 17. Start-up and testing

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

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

END OF SECTION

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1 **SECTION 01380**

2 **AUDIO – VISUAL DOCUMENTATION**

3 **PART 1 - GENERAL**

4 1.01 PURPOSE AND DESCRIPTION OF WORK

- 5 A. The purpose of the audio - visual documentation is to provide the County with regularly
6 documented audio - visual records of the Construction process from the existing
7 conditions through final completion.

8 1.02 PRE-CONSTRUCTION VIDEO REQUIREMENTS INCLUDED

- 9 A. The Contractor shall employ a professional videographer to take a Pre-Construction
10 video of the entire site including the areas of adjacent properties within 100-feet of the
11 limits of Work and shall be made within 30-days of Work beginning. Special attention
12 shall be made to show the existing paved roads, shoulders, signs, and other existing
13 features.

- 14 B. The Contractor shall submit a quality audio-video recording documenting Pre-
15 Construction field conditions for the entire project. When the Work includes
16 construction of water, wastewater, reuse, or other lines in the vicinity of any street or
17 road, the Contractor shall take digital audio-video recordings of existing conditions along
18 both sides of the street or road. The Pre-Construction video shall be submitted to the
19 County and accepted prior to commencing any Work or using any Contractor laydown
20 areas.

- 21 C. Electronic digital photography shall also be used as necessary to record and facilitate
22 resolution of on-site issues through the transmission of electronic photographs by e-mail
23 from the site to the Professional's and County's offices.

24 **PART 2 - PRODUCTS**

25 2.01 AUDIO-VIDEO RECORDING

- 26 A. Each audio-video recording shall be saved on appropriate DVD media viewable on
27 standard DVD players or computer.

- 1 B. Each DVD shall contain the following information and arrangement at the beginning as a
2 title screen:
3 Orange County, Florida
4 PROJECT NAME
5 PROJECT NUMBER
6 CONTRACTOR: (Name of Contractor)
7 DATE: (When photo was taken)
8 VIDEO BY: (Firm Name of Videographer)
9 LOCATION: (Description of Location(s) and View(s))
- 10 C. Each DVD recording section shall begin with an audio description of the County's name,
11 Contract name and number, Contractor's name, date and location information such as
12 street name, direction of travel, viewing side, etc.
- 13 D. Information appearing on the video recording must be continuous and run simultaneously
14 by computer generated transparent digital information. No editing or overlaying of
15 information at a later date will be acceptable.
- 16 E. Digital information to appear in the upper left corner shall be as follows:
17 1. Name of Contractor
18 2. Day, date and time
19 3. Name of Project & Specification Number
- 20 F. Time must be accurate and continuously displayed on the video record
- 21 G. Written documentation must coincide with the information on the DVD so as to make
22 easy retrieval of locations at a later date.
- 23 H. The video system shall have the capability to transfer individual frames of video
24 electronically into hard copy prints or photographic negatives.
- 25 I. Audio shall be recorded at the same time as the video recording and shall have the same
26 information as on the viewing screen. Special commentary shall be given for unusual
27 conditions of buildings, sidewalks and curbing, foundations, trees and shrubbery,
28 structures, equipment, pavement, etc.
- 29 J. All DVDs and boxes shall bear labels with the following information:
30 1. DVD Number
31 2. County's Name
32 3. Date of Recording
33 4. Project Name and Number
34 5. Location and Standing Limit of Video

35 2.02 CONSTRUCTION PHOTOGRAPHS

- 36 A. The Contractor shall employ a competent photographer to take construction record
37 photographs periodically during the course of the Work.

- 1 B. Prints: Date imprinted 8-inch x 10-inch high resolution glossy single weight color print
2 paper; 5 sets, bound in 3-ring binders to be provided to the County with each respective
3 Application for Payment and distributed by the County as follows:
4 1. County (2 sets)
5 2. Engineer (1 set)
6 3. Contractor (1 set)
7 4. Project Record Data (1 set stored by Contractor to be furnished to County upon
8 Closeout)

9 **PART 3 - EXECUTION**

10 3.01 VIDEO VIEWS REQUIRED

- 11 A. Complete coverage shall include all surface features within 100-feet of the Work area to
12 be used by the Contractor and shall be supported by appropriate audio description made
13 simultaneously with video coverage. Such coverage shall include, but not be limited to,
14 all existing driveways, sidewalks, curbs, ditches, roadways, landscaping, trees, culverts,
15 headwalls, and retaining walls, equipment, structures, pavements, manholes, vaults,
16 handrails, etc. located within the work zone. Video coverage shall extend to the
17 maximum height of all structures within this zone.
- 18 B. The video recorder shall take special efforts to point out and provide audio commentary
19 on cracking, breakage, damage, and other defects in existing features.
- 20 C. All video recording shall be done during times of good visibility. No video recording
21 shall be done during periods of visible precipitation, or when more than 10% of the
22 ground area is covered with standing water, unless otherwise authorized by County.
- 23 D. Prior to commencement of audio-video recording, the Contractor shall notify the County
24 in writing within 48-hours of the audio-video recording. The County may provide a
25 designated representative to accompany and observe all video recording operations.
26 Audio-video recording completed without a County Representative present will be
27 unacceptable unless specifically authorized by the County.

28 3.02 AUDIO-VIDEO REQUIREMENTS

- 29 A. Major Locations:
- 30 1. The Contractor shall provide color digital video of each major facility and structures
31 and facilities adjacent to the Construction before construction starts.
- 32 2. All videos shall be recorded with character generator operating with date, time, and
33 location on screen. During video recording, the Contractor shall narrate video
34 explaining what is being shown. All master videos shall be delivered to the County.

- 1 3. The audio and video portions of the recording shall maintain viewer orientation. To
2 this end, overall establishing views of all visible house and business addresses shall
3 be used. In areas where the proposed construction location will not be readily
4 apparent to the video recording viewer, highly visible yellow flags shall be placed, by
5 the Contractor, in such a fashion as to clearly indicate the proposed centerline of
6 Construction. When conventional wheeled vehicles are used as conveyances for the
7 recording system, the vertical distance between the camera lens and the ground shall
8 not exceed 10-feet. The camera shall be firmly mounted such that transport of the
9 camera during the recording process will not cause an unsteady picture.
- 10 4. All video recording shall be done during time of good visibility. No video recording
11 shall be done during precipitation, mist or fog. The recording shall only be done
12 when sufficient sunlight is present to properly illuminate the subjects of recording and
13 to produce bright, sharp video recordings of those subjects.
- 14 5. The average rate of travel during a particular segment of coverage shall be directly
15 proportional to the number, size and value of the surface features within that
16 construction area's zone of influence. The rate of speed in the general direction of
17 travel of the vehicle used during taping shall not exceed 44-feet per minute.

18 3.03 PHOTOGRAPHS

- 19 A. A minimum of 3 views (top, upstream, and downstream) each shall generally be taken
20 prior to backfilling pipelines or structures. Photographs shall be provided for:
- 21 1. Utility conflicts/relocations
22 2. Manholes
23 3. Pump stations
24 4. Boring and jacking
25 5. Directional drilling pipe entrance and exit
26 6. Valve installation
27 7. Air release valve installation
28 8. Fire hydrant assembly
- 29 B. Photo Identification
- 30 1. Name of Project
31 2. Name of Structure
32 3. Orientation of View
33 4. Date & Time of Exposure
34 5. Film numbered identification of exposure
35

36 **END OF SECTION**

1 D. The Contractor is responsible for the Quality of his own work and shall designate a
2 qualified individual, to be approved by the County, who will ensure that all work is
3 performed in strict accordance with the Contract Documents. This quality representative
4 shall inspect the work for the Contractor and provide to the County and the Contractor a
5 report outlining all work accomplished, all inspections, and all testing performed for all
6 days when work is performed. The objective of this report is to provide "Objective
7 Evidence of Compliance" by the Contractor with the requirements of the Contract.

8 1.03 TIME OF INSPECTION AND TESTS

9 A. Samples and testing required under these Specifications shall be furnished and prepared
10 in ample time for the completion of the necessary tests and analyses before said articles
11 or materials are to be used. Except as otherwise provided in the Contract Documents,
12 performance of the required tests will be by the Contractor and all costs therefore will be
13 borne by the Contractor at no cost to the County. Whenever the Contractor is ready to
14 backfill, bury, cast in concrete, hide, or otherwise cover any Work under this Contract,
15 the County shall be notified not less than 24-hours in advance to request inspection
16 before beginning any such Work of covering. Failure of the Contractor to notify the
17 County at least 24-hours in advance of any such inspections shall be reasonable cause for
18 the County to order a sufficient delay in the Contractor's schedule to allow time for such
19 inspection, any remedial, or corrective work required, and all costs of such delays,
20 including its impact on other portions of the Work, shall be borne by the Contractor.

21 1.04 SAMPLING AND TESTING

22 A. When not otherwise specified, all sampling and testing shall be in accordance with the
23 methods prescribed in the current standards of the ASTM, as applicable to the class and
24 nature of the article or materials considered. However, the County reserves the right to
25 use any generally accepted system of inspection which, in the opinion of the County, will
26 ensure the County that the quality of the workmanship is in full accord with the Contract
27 Documents.

28 B. Any waiver of any specific testing or other quality assurance measures, whether or not
29 such waiver is accompanied by a guarantee of substantial performance as a relief from
30 the specified testing or other quality assurance requirements as originally specified, and
31 whether or not such guarantee is accompanied by a performance bond to assure execution
32 of any necessary corrective or remedial work, shall not be construed as a waiver of any
33 technical or qualitative requirements of the Contract Documents.

34 C. Notwithstanding the existence of such waiver, the County shall reserve the right to make
35 independent investigations and tests as specified in the following paragraph and, upon
36 failure of any portion of the Work to meet any of the qualitative requirements of the
37 Contract Documents, shall be reasonable cause for the County to require the removal or
38 correction and reconstruction of any such Work.

1 D. In addition to any other inspection or quality assurance provisions that may be specified,
2 the County shall have the right to independently select, test, and analyze, at the expense
3 of the County, additional test specimens of any or all of the materials to be used. Results
4 of such tests and analyses shall be considered along with the tests or analyses made by
5 the Contractor to determine compliance with the applicable specifications for the
6 materials so tested or analyzed provided that wherever any portion of the Work is
7 discovered, as a result of such independent testing or investigation by the County which
8 fails to meet the requirements of the Contract Documents, all costs of such independent
9 inspection and investigation and all costs of removal, correction, reconstruction, or repair
10 of any such Work shall be borne by the Contractor.

11 1.05 RIGHT OF REJECTION

12 A. The County shall have the right at all times and places to reject any articles or materials
13 to be furnished hereunder which, in any respect, fail to meet the requirements of the
14 Contract Documents, regardless of whether the defects in such articles or materials are
15 detected at the point of manufacture or after completion of the Work at the site. If the
16 County or inspector, through an oversight or otherwise, has accepted materials or Work
17 which is defective or which is contrary to the Contract Documents, such material, no
18 matter in what stage or condition of manufacture, delivery, or erection, may be rejected
19 by County.

20 B. Contractor shall promptly remove rejected articles or materials from the site of the Work
21 after notification or rejection.

22 C. All costs of removal and replacement of rejected articles or materials, as specified herein,
23 shall be borne by the Contractor.

24 D. If the Contractor fails to remove or replace defective work after notification to do so, the
25 County may have the work removed and replaced by others and deduct all costs from the
26 Contractor's pay requests.

27 1.06 TESTING LABS

28 A. All geotechnical testing laboratory services for field testing will be paid by the County.
29 The lab(s) shall function as independent lab(s) and report independently to the County
30 and the Contractor. The test lab(s) may not approve or allow any deviation from the
31 Contract Documents.

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

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

34 **END OF SECTION**

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- 1 1. To provide access to work to be tested.
 - 2 2. To obtain and handle samples at the Project site or at the source of the product to be
 - 3 tested.
 - 4 3. To facilitate inspections and tests.
 - 5 4. For storage and curing of test samples.
- 6 G. Notify County sufficiently in advance of operations to allow for laboratory assignment of
- 7 personnel and scheduling of tests. When tests or inspections cannot be performed after
- 8 such notice, reimburse County for laboratory personnel and travel expenses incurred..
- 9 The following field testing schedule summarizes the responsibilities of various tests that
- 10 may be required by the Contract Documents.

11

TEST	NOTES	PAID FOR
Soil Compaction	A. Pipe Work: Every 300 ft. at each lift of compaction B. Structures: As a minimum one test per 2000 SF of fill area per lift, or at least 2 tests per structure, per lift. As specified in material specifications sections	County
Low Pressure Air Exfiltration	Each section of gravity sewer pipe between manholes or lift station	Contractor
Hydrostatic Pressure	All segments of pressure piping (24-hour test).	Contractor
Hydrostatic Leakage	All segments of pressure piping (2-hour test).	Contractor
Bacteriological	As required by local and state agencies	County
Asphaltic Concrete Paving	As required by County	County
LBR	Each 600 SY of pavement	County
Concrete	Slump test each delivery, cylinders every 20 CY	County
Asbestos	Environmental testing of materials	County
All Other Testing	As specified in various sections of the Project Manual	As Indicated

- 12 H. Employ and pay for the services of the same or a separate, equally qualified independent
- 13 testing laboratory to perform additional inspections, sampling and testing required for the
- 14 Contractor's convenience.
- 15 I. If the test results indicate the material or equipment complies with the Contract
- 16 Documents, the County shall pay for the cost of the testing laboratory. If the tests and
- 17 any subsequent retests indicate the materials and equipment fail to meet the requirements
- 18 of the Contract Documents, the Contractor shall pay for the laboratory costs directly to
- 19 the County or the total costs shall be deducted from any payments due to the Contractor.

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

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

22 **END OF SECTION**

1 **PART 3 - EXECUTION**

2 3.01 GENERAL

3 A. The Contractor shall have all materials, equipment and labor necessary to complete the
4 repair, replacement, or rehabilitation on the job site prior to isolating the gravity main
5 segment, manhole, or pump station. The Contractor will demonstrate that the temporary
6 bypass pumping system is in good working order and is sufficiently sized to successfully
7 handle flows by performing a test run for a period of 24-hours prior to beginning the
8 Work.

9 3.02 TRAFFIC CONSIDERATIONS

10 A. The Contractor shall locate bypass pumping suction and discharge lines so as to not cause
11 undue interference with the use of streets, private driveways, and alleys, to include the
12 possible temporary trenching of piping at critical intersections. Additional traffic
13 maintenance requirements are found in Section 01570 "Maintenance of Traffic".

14 3.03 BYPASS OPERATION

15 A. The Contractor shall submit a bypass plan to the County and the bypass plan must be
16 approved before the bypass is operational to perform the Work. Contractor shall
17 maintain the wastewater system flow and no surcharging will be allowed to occur out of
18 the system.

19 B. Where Work requires the main or pump station to be taken out service after normal
20 working hours and bypass pumping is being used; the Contractor shall be responsible for
21 monitoring the bypass operation 24-hours per day, 7-days per week. Any electronic
22 monitoring in lieu of on-site monitoring must be detailed in the comprehensive written
23 bypass plan.

24 C. The Contractor shall ensure that no damage will be caused to private property as a result
25 of bypass pumping operations. The Contractor will complete the Work as quickly as
26 possible and pass all tests and inspections before discontinuing bypassing operations and
27 returning flow to the wastewater manhole, main, or pump station.

28 D. During bypassing, no wastewater will be leaked, dumped, or spilled in or onto, any area
29 outside of the existing wastewater system.

30 E. The Contractor shall immediately notify the County should a sanitary sewer overflow
31 (SSO) occur. The Contractor shall take the necessary action to wash down, clean up and
32 disinfect the spillage area to the satisfaction of the County or other governmental agency.

33 F. The Contractor shall cease bypass operations and return flows to the new and/or existing
34 sewer when directed by the County. When bypass operations are complete, all bypass
35 piping shall be drained into the wastewater system prior to disassembly.

1 3.04 CONTRACTOR LIABILITY

2 A. The Contractor shall be responsible for all required pumping, equipment, piping, and
3 appurtenances to accomplish the bypass and for any and all damage that results directly
4 or indirectly from the bypass pumping equipment, piping and/or appurtenances. The
5 Contractor shall also be liable for all County personnel labor and equipment costs,
6 penalties and fines resulting from sanitary sewer overflows. It is the intent of these
7 specifications to require the Contractor to establish adequate bypass pumping as required
8 regardless of the flow condition.
9

10 **END OF SECTION**

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1 **SECTION 01560**

2 **EROSION AND SEDIMENTATION CONTROL**

3 **PART 1 - GENERAL**

4 1.01 WORK INCLUDED

5 A. The Work specified in this Section consists of designing, providing, maintaining and
6 removing temporary erosion and sedimentation controls as necessary to protect the Work
7 and prevent sedimentation from the Contractor's activities from entering water bodies or
8 enter other parts of the County's or other property owners sites outside the Construction
9 limits.

10 B. Temporary erosion controls include, but are not limited to; grassing, mulching, netting,
11 watering and reseeded on-site surfaces and soil and borrow area surfaces, and providing
12 interceptor ditches at end of berms and at those locations which will ensure that erosion
13 during Construction will be either eliminated or maintained within acceptable limits as
14 established by the regulatory agencies having jurisdiction.

15 C. Temporary sedimentation controls include, but are not limited to; silt dams, traps,
16 barriers, and appurtenances at the foot of sloped surfaces which will ensure that
17 sedimentation pollution will be either eliminated or maintained within acceptable limits
18 as established by the regulatory agencies having jurisdiction.

19 1.02 REQUIREMENTS

20 A. The Contractor is responsible for providing effective temporary erosion and sediment
21 control measures during Construction or until final controls become effective.

22 B. The Contractor shall be responsible for filing Notice of Intent for Construction Activities
23 with regulatory agencies (SJRWMD, SFWMD, and FDEP) as required by law, if
24 thresholds are expected to be exceeded.

25 C. The areas of unstabilized soil cover shall be minimized at all times to limit erosion and
26 sedimentation.

27 1.03 SUBMITTALS:

28 A. The Contractor shall prepare and submit an Erosion and Sedimentation Control Plan
29 (Stormwater Pollution Prevention Plan) for County review and approval. The Plan shall
30 be in effect throughout the Construction duration.

1 **PART 2 - PRODUCTS**

2 2.01 EROSION CONTROL

3 A. Seed: Scarified Argentine Bahia.

4 B. Sod: Bermuda grass, Argentine Bahia grass, Pensacola Bahia grass or St. Augustine.
5 Grassing and Sodding Materials: As specified in Section 981 FDOT Specification for
6 Road & Bridge Construction.

7 C. Netting: Polypropylene mesh netting 5/8-inch x 3/4-inch (16 x 19mm) mesh with
8 interwoven curlax fibers as manufactured by American Excelsior Company or equal.
9 Netting: Fabricated of material in conformance with Section 985 FDOT Specification for
10 Road & Bridge Construction.

11 2.02 SEDIMENTATION CONTROL

12 A. Bales: Clean, synthetic hay type. Minimum dimensions of 14-inch by 18-inch by 36-
13 inches at the time of placement.

14 B. Netting: Fabricated of material in conformance with Section 985 FDOT Specification for
15 Road & Bridge Construction.

16 C. Sediment Control Fencing (Silt Fencing): As manufactured by American Excelsior
17 Company or equal.

18 D. Filter stone: Crushed stone conforming to Florida Department of Transportation
19 Specifications.

20 E. Concrete block: Hollow, non-load bearing type.

21 F. Concrete: Exterior grade not less than 1-inch thick.

22 G. Turbidity Barriers: Floating or staked as required.

23 **PART 3 - EXECUTION**

24 3.01 TEMPORARY EROSION CONTROL

25 A. See Section 02578 "Solid Sodding."

26 3.02 SEDIMENTATION CONTROL

27 A. Install and maintain silt fences and dams, traps, barriers, and appurtenances as shown on
28 the approved descriptions and working Drawings. Replace deteriorated hay bales and
29 dislodged filter stone. Repair portions of any devices damaged at no additional expense
30 to the County.

- 1 B. Install all sediment control devices in a timely manner to ensure the control of sediment.
2 At sites where exposure to sensitive areas is likely, complete installation of all sediment
3 control devices before starting earthwork.
- 4 C. Use approved temporary erosion control features to correct conditions that develop
5 during Construction that were not foreseen when the Erosion and Sedimentation Control
6 Plan was first approved.

7 3.03 PERFORMANCE

- 8 A. Should any of the temporary erosion and sediment control measures employed by the
9 Contractor fail to produce results that comply with the requirements of the Regulatory
10 agency having jurisdiction, the County or the Professional, the Contractor shall
11 immediately take whatever steps necessary to correct the deficiency at its own expense to
12 protect the Work and any adjacent property to the site, as well as to prevent
13 contamination of any river, stream, lake, tidal waters, reservoir, canal or other water
14 impoundments.
- 15 B. The side slope areas with unstabilized or unprotected soil cover shall be minimized at all
16 times to limit erosion and sedimentation.
- 17 C. Incorporate permanent erosion control features into the Project at the earliest practical
18 time.
- 19 D. Remove temporary erosion and sedimentation controls when the Work is complete and in
20 accordance with the Erosion and Sedimentation Control Plan (Stormwater Pollution
21 Prevention Plan) and the Notice of Intent for Construction Activities filed with regulatory
22 agencies.

23 3.04 MAINTENANCE OF EROSION AND CONTROL FEATURES

- 24 A. Provide routine maintenance of permanent and temporary erosion control features, at no
25 expense to the County, until the Project is complete and accepted.
26

27 **END OF SECTION**
28

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1 **SECTION 01570**

2 **MAINTENANCE OF TRAFFIC**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

5 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, variable message boards, uniformed
8 police officers, warning devices, temporary pavement markings, temporary sidewalk,
9 delineators, etc., to maintain vehicular and pedestrian traffic through and adjacent to the
10 project area. These measures and actions shall be taken to safely maintain the accessibility of
11 public and construction traffic by preventing potential construction hazards. . All materials,
12 work and incidental costs related to Maintenance of Traffic will be paid for at the contract
13 lump sum price.

14 1.02 REQUIREMENTS

- 15 A. The Traffic Control Plan shall conform to the following standards:
- 16 1. Standard Specifications for Road and Bridge Construction, latest edition including all
17 subsequent supplements issued by the Florida Department of Transportation,
18 (FDOT).
- 19 2. Manual on Uniform Traffic Control Devices for Streets and Highways by U.S.
20 Department of Transportation, Federal Highway Administration.
- 21 3. Right-of-Way Utilization Regulations, Orange County, Florida, latest edition.
- 22 B. All references to the respective agencies in the above referenced standards shall be
23 construed to also include the municipality as applicable for this Work.
- 24 C. Sequence the Work in a manner that will minimize disruption of vehicular and pedestrian
25 access through and around the construction area.
- 26 D. Traffic planning and control for the maintenance and protection of pedestrian and
27 vehicular traffic affected by the Contractor's Work includes, but is not limited to:
- 28 1. Construction and maintenance of any necessary detour equipment and facilities.
- 29 2. Providing necessary facilities for access to residences and businesses.
- 30 3. Furnishing, installing, and maintenance of traffic control and safety devices (e.g.
31 signage, barricades, barriers, message boards, etc.), and flag persons as appropriate
32 during Construction.
- 33 4. Control of water runoff, dust and any other special requirements for safe and
34 expeditious movement of traffic.

- 1 E. Planning, maintenance and control of traffic shall be provided at the Contractor's
2 expense. The Contractor will bear all expense of maintaining the vehicle and pedestrian
3 traffic throughout the work area.
- 4 F. The Contractor will ensure all personnel involved in traffic control are and capable of
5 communicating with the public. The Contractor may be required to hire off-duty
6 uniformed police officers, in addition to flag persons, to direct and maintain traffic.
7 Locations and conditions requiring such uniformed police officers shall be as directed by
8 the County. The Contractor shall be required to utilize uniformed police officers for
9 work within FDOT maintained ROW, road closures affecting school traffic and during all
10 night work involving a road closure or crossing on nonresidential roads.
- 11 G. The Contractor will remove temporary equipment and facilities when no longer required,
12 restore grounds to original, or to specified conditions.

13 1.03 SUBMITTALS

- 14 A. Submit at Contractor's own expense a Traffic Control Plan for approval by the
15 controlling roadway agency (FDOT, Orange County Public Works or other local
16 government) having jurisdiction over the road for approval.
 - 17 1. The Traffic Control Plan will detail procedures and protective measures proposed by
18 the Contractor to provide for protection and control of traffic affected by the Work
19 consistent with the following applicable standards:
 - 20 a. Standard Specifications for Road and Bridge Construction, latest edition including
21 all subsequent supplements issued by the Florida Department of Transportation,
22 (FDOT Spec.).
 - 23 b. Manual of Traffic Control and Safe Practices for Street and Highway
24 Construction, Maintenance and Utility Operations, FDOT.
 - 25 c. Right-of-Way Utilization Regulations, Orange County, Florida, latest edition.
- 26 B. All references to the respective agencies in the above referenced standards shall be
27 construed to also include the municipality as applicable for this Work.
- 28 C. The Traffic Control Plan will be signed and sealed by a Professional Engineer registered
29 in the state of Florida and shall include proposed locations and time durations of the
30 following, as applicable:
 - 31 1. Pedestrian and public vehicular traffic routing.
 - 32 2. Lane and sidewalk closures, other traffic blockage and lane restrictions and
33 reductions anticipated to be caused by construction operations. Show and describe
34 the proposed location, dates, hours and duration of closure, vehicular and pedestrian
35 traffic routing and management, traffic control devices for implementing pedestrian
36 and vehicular movement around the closures, and details of barricades.
 - 37 3. Location, type and method of shoring to provide lateral support to the side of an
38 excavation or embankment parallel to an open travel-way.
 - 39 4. Allowable on-street parking within the immediate vicinity of worksite.
 - 40 5. Access to buildings immediately adjacent to worksite.
 - 41 6. Driveways blocked by construction operations.

- 1 7. Temporary traffic control devices, temporary pavement striping and marking of
- 2 streets and sidewalks affected by construction
- 3 8. Temporary commercial and industrial loading and unloading zones.
- 4 9. Construction vehicle reroutes, travel times, staging locations, and number and size of
- 5 vehicles involved.

6 D. Obtain and submit prior to erection, or otherwise impacting traffic, all required permits
7 from all authorities having jurisdiction, including Orange County Public Works, if
8 applicable.

9 **PART 2 - PRODUCTS**

10 2.01 MATERIALS AND EQUIPMENT

11 A. The Contractor shall furnish, erect, and maintain all necessary traffic control devices,
12 including flag person, in accordance with the Manual of Uniform Traffic Control Devices
13 for Streets and Highways published by the U.S. Department of Transportation, Federal
14 Highway Administration.

15 1. FLAG PERSONS

- 16 a. All flag persons used on this Project will adhere to the following requirements:
- 17 b. Any person acting as a flag person on this Project will have attended a training
- 18 session taught by a Contractor's qualified trainer before the start date of this
- 19 Contract.
- 20 c. The Contractor's qualified trainer will have completed a "Flag person Train the
- 21 Trainer Session" in the 5-years previous or before the start date of this Contract
- 22 and will be on file as a qualified flag person trainer.
- 23 d. The flag person trainer's name and Qualification Number will be furnished by the
- 24 Contractor at the Pre-Construction meeting. The Contractor will provide all flag
- 25 persons with the Flag Person Handbook and will observe the rules and regulations
- 26 contained therein. This handbook will be in the possession of all flag person
- 27 while flagging on the Project.
- 28 e. Flag persons will not be assigned other duties while working as authorized flag
- 29 persons.
- 30 f. Any person replacing flag person for break shall have the same training.

31 **PART 3 - EXECUTION**

32 3.01 NOTIFICATIONS

33 A. The Contractor will notify individual owners, owner's agents, and tenants of buildings
34 affected by the construction, with copies to the county, 72-hours in advance of any
35 construction activities.

36 B. The Contractor shall notify residents and pedestrians via variable message boards no later
37 than 10 days prior to the closure of any road, lane or pedestrian thoroughfare.

- 1 C. The Contractor shall notify Emergency Management Services agencies, Lynx and OCPS
2 no less than 7 days prior to such closures or whenever roads are impassable.
- 3 D. Implement closing of vehicle or pedestrian thoroughfare in accordance with the
4 construction drawings and the approved Traffic Control Plan.
- 5 E. The Contractor will immediately notify the County of any vehicular or pedestrian safety
6 or efficiency problems incurred as a result of the construction of the Project.

7 3.02 GENERAL TRAFFIC CONTROL

- 8 A. The Contractor will sequence and plan construction operations and will generally conduct
9 Work in such a manner as not to unduly or unnecessarily restrict or impede normal
10 traffic.
- 11 B. Unless otherwise provided, all roads within the limits of the Work will be kept open to all
12 traffic by the Contractor. The Contractor will keep the portion of the project being used
13 by public traffic, whether it is through or local traffic, in such condition that traffic will
14 be adequately accommodated.
- 15 C. The Contractor will be responsible for installation and maintenance of all traffic control
16 devices and requirements for the duration of the construction period. Necessary
17 precautions for traffic control will include, but not be limited to, warning signs, signals,
18 lighting devices, markings, barricades, canalizations, and hand signaling devices.
- 19 D. The Contractor will provide and maintain in a safe condition temporary approaches or
20 crossings and intersections with trails, roads, streets, businesses, parking lots, residences,
21 garages and farms.
- 22 E. The Contractor will provide emergency access to all residences and businesses at all
23 times. Residential and business access will be restored and maintained at all times
24 outside of the Contractor's normal working hours.
- 25 F. Traffic is to be maintained on one section of existing pavement, proposed pavement, or a
26 combination thereof. Alternating one-way traffic may be utilized and limited to a
27 maximum length of 500-feet during construction hours. Lane width for alternating one-
28 way traffic will be kept to a minimum width of 10-feet, or as directed by the County.
- 29 G. Travel lanes and pedestrian access will be kept reasonably smooth, dry, and in a suitable
30 condition at all times.
- 31 H. The Contractor will make provisions at all "open cut" street crossings to allow for free
32 passage of vehicles and pedestrians, either by bridging or other temporary crossing
33 structures. Such structures will be of adequate strength and proper construction and will
34 be maintained by the Contractor in such a manner as not to constitute an undue traffic
35 hazard.

- 1 I. The Contractor will keep all signs in proper position, clean, and legible at all times. Care
2 will be taken so that weeds, shrubbery, construction materials, equipment, and soil are
3 not allowed to obscure any sign, light, or barricade. Signs that do not apply to
4 construction conditions should be removed or adjusted so that the legend is not visible to
5 approaching traffic.
- 6 J. The County may determine the need for, and extent of, additional striping removal and
7 restriping.
- 8 K. Excavated material, spoil banks, construction materials, equipment and supplies will not
9 be located in such a manner as to obstruct traffic, as practicable. The Contractor will
10 immediately remove from the site all demolition material, exercising such precaution as
11 may be directed by the County. All material excavated shall be disposed of so as to
12 minimize traffic and pedestrian inconvenience and to prevent damage to adjacent
13 property.
- 14 L. During any suspension, the Contractor will make passable and open to traffic such
15 portions of the Project and/or temporally roadways as directed by the County for
16 accommodation of traffic during the anticipated period of suspension. Passable
17 conditions will be maintained until issuance of an order for the resumption of
18 construction operations. When Work is resumed, the Contractor will replace or renew
19 any Work or materials lost or damaged because of such temporary use in every respect as
20 though its prosecution had been continuous and without interferences.

21 3.03 TEMPORARY SHORING

- 22 A. Use shoring to maintain traffic when it is necessary to provide lateral support to the side
23 of an excavation or embankment parallel to an open travel-way. Provide shoring when a
24 theoretical 2:1 or steeper slope from the bottom of the excavation or embankment
25 intersects the existing ground line closer than 5-feet (1.5 m) from the edge of pavement of
26 the open travel-way.
- 27 B. The Contractor will furnish, install, and remove sheeting, shoring, and bracing necessary
28 to maintain traffic at locations shown on the Traffic Control Plan and other locations
29 determined during construction.
30

31 **END OF SECTION**

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1 **SECTION 01580**

2 **PROJECT IDENTIFICATION AND SIGNS**

3 **PART 1 - GENERAL**

4 1.01 REQUIREMENTS INCLUDED

- 5 A. The Contractor shall furnish, install, and maintain all sign materials including sign posts,
6 weighted stands, brackets, any required mounting hardware, and miscellaneous materials
7 required for temporary signs for the purpose of:
8 1. Project Identification.
9 2. Informational signs to direct traffic
10 3. On-site safety signs as appropriate for the Work
- 11 B. Remove temporary signs on completion of Construction prior to obtaining Certificate of
12 Occupancy and Substantial Completion.
- 13 C. Allow no other signs to be displayed without written approval of the County.

14 1.02 SUBMITTALS

- 15 A. Submit complete Shop Drawings identifying locations, material, layout, sign content, font
16 type and size, and sample colors. Make sign and lettering to scale, clearly indicating
17 condensed lettering if used. The sign details will be submitted to the County for approval
18 prior to fabrication.
- 19 B. Submit method of erection to include materials, fasteners, and other items to assure
20 compliance with the requirements for wind pressures as required by the authorities
21 having jurisdiction.
- 22 C. Submit signs in accordance with any details provided in the Drawings.
- 23 D. Prior to erection obtain and submit all required permits from the authorities having
24 jurisdiction.

25 1.03 PROJECT IDENTIFICATION SIGN

- 26 A. Provide 1 painted sign at the site, or at each end of the Work if a linear project, or at each of
27 the separate sites of Work, if applicable. The sign will be not less than 32-square feet area,
28 with a minimum dimension of 4-feet and painted graphics with content to include:
29 1. Title of Project
30 2. Orange County Government name and logo
31 3. Names and titles of the Board of County Commissioners, County Administrator,
32 Director of Orange County Utilities Department, the Consulting Engineer, and the
33 Contractor

- 1 B. Erect on the site at a lighted location of high public visibility, adjacent to main entrance
2 to site, as approved by the County. The sign must be located 5-feet from all rights-of-
3 way and 20-feet from all property lines.

4 1.04 INFORMATIONAL SIGNS

- 5 A. All signs and other traffic control devices shall conform to the requirements for shape,
6 color, size, and location as specified in the latest Manual on Uniform Traffic Control and
7 Safe Streets and Highways and the Florida Manual of Traffic Control and Safe Practices
8 for Street and Highway Construction, Maintenance and Utility Operations. Information
9 as to the above may be obtained from FDOT Division engineers.

10 **PART 2 - PRODUCTS**

11 2.01 SIGN MATERIALS

- 12 A. Structure and Framing: New construction grade lumber, structurally adequate and
13 suitable for exterior application and specified finish.

- 14 B. Sign Panels: New A-B Grade, exterior type, APA DF plywood with inset hardwood
15 edges and mitered corners, standard large sizes to minimize joints.

- 16 1. Thickness: As required by standards to span framing members, to provide even,
17 smooth surface without waves or buckles, minimum 3/4-inch.

- 18 C. Rough Hardware: Galvanized steel, of sizes and types to enable sign assemblies to resist
19 wind pressures as required by the authorities having jurisdiction but not less than a wind
20 velocity of 50-mph.

- 21 1. Use minimum 1/2-inch diameter button head carriage bolts to fasten sign panels to
22 supporting structures. Bolt heads to be painted to match sign face.

- 23 D. Paint: Exterior quality, as specified in Division 9 or as a minimum as specified herein.

- 24 1. Primer and finish coat: exterior, semi-gloss, alkyd enamel.

- 25 2. Colors for structure, framing, sign surfaces, and graphics: As shown on the Drawings
26 or as selected by the County.

- 27 E. Safety Sign Number Tags

- 28 1. Removable aluminum or galvanized steel, with 4-inch high, blue numerals and steel
29 tag hooks.

30 **PART 3 - EXECUTION**

31 3.01 PROJECT IDENTIFICATION SIGN

- 32 A. Install project identification signs within 10-days of the Notice to Proceed date. Failure
33 to erect the signs may be reason to delay approval of the initial Application for Payment.

- 1 B. Paint exposed surfaces of supports, framing, and surface material; one (1) coat of primer
2 and two (2) coats of finish paint.
- 3 C. Set signs plumb and level and solidly brace as required to prevent displacement during
4 the Construction period. If mounted on posts, sink posts 3-feet to 4-feet below grade,
5 leaving a minimum of 8-feet of each post above grade for mounting the sign.
- 6 D. Install informational signs at a height for optimum visibility, on ground mounted poles or
7 attached to temporary structural surfaces.

8 3.02 MAINTENANCE

- 9 A. Maintain signs and supports in a neat, clean condition; repair damages to structure,
10 framing, or sign.
- 11 B. Relocate informational signs as required by the progress of the Work.
- 12 C. Poorly maintained, defaced, damaged, or dirty signs shall be replaced, repaired, or
13 cleaned without delay.
- 14 D. Special care must be taken to ensure that construction materials and dust are not allowed
15 to obscure the face of a sign.
- 16 E. Signs not in effect shall be covered or removed.

17 3.03 REMOVAL

- 18 A. Remove signs, framing, supports, and foundations at Substantial Completion of the
19 Work.
- 20 B. Leave areas clean and patch as required to remove any traces of temporary signs.
21

22 **END OF SECTION**

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- 1 C. Provide and maintain 0.25-watt/sq ft H.I.D. lighting to interior Work areas after dark for
2 security purposes.
- 3 D. Provide branch wiring from power source to distribution boxes with lighting conductors,
4 pigtails, and lamps as required.
- 5 E. Maintain lighting and provide routine repairs.
- 6 F. Permanent building lighting may be used during Construction.

7 1.04 TEMPORARY HEAT AND COOLING

- 8 A. Provide and pay for heating and cooling as required to maintain specified conditions for
9 Construction operations or as required for proper conduct of operations included in the Work.
- 10 B. Prior to operation of permanent equipment for temporary purposes, verify that installation is
11 approved for operation, equipment is lubricated and temporary filters are in place. Provide and
12 pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.
- 13 C. Maintain minimum ambient temperature of 50°F and maximum relative humidity of 50%
14 in areas where Construction is closed in and final finishes are to be placed, unless
15 indicated otherwise in specifications.

16 1.05 TEMPORARY VENTILATION

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

19 1.06 TEMPORARY WATER SERVICE

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

25 1.07 TEMPORARY SANITARY FACILITIES

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

29 1.08 BARRIERS

- 30 A. Provide barriers to prevent unauthorized entry to Construction areas and to protect
31 existing facilities and adjacent properties from damage from Construction operations.

- 1 B. Provide barricades required by governing authorities for public rights-of-way.
- 2 C. Provide protection for plant life designated to remain. Replace damaged plant life.
- 3 D. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

4 1.09 FENCING

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

15 1.10 ACCESS ROADS

- 16 A. Provide and maintain uninterrupted public access to existing buildings. Construction
17 activities will not interfere with access. If Contractor fails to maintain public access after
18 2 written notices within a 24-hour period, the County reserves the right to correct such
19 situation and back charge the Contractor.
- 20 B. Construct and maintain temporary roads accessing public thoroughfares to serve
21 Construction area.
- 22 C. Extend and relocate access roads as Work progress requires. Provide detours necessary
23 for unimpeded traffic flow.
- 24 D. Provide and maintain access to fire hydrants, free of obstructions.
- 25 E. Designated existing on-site roads may be used for Construction traffic. Repair or restore
26 any damaged areas caused as a result of Construction activity. Such repair will be to a
27 like-new condition.

28 1.11 PARKING

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

1 1.12 FIELD OFFICES (FOR UTILITIES DEPARTMENT)

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

31 1.13 SPECIFIC REQUIREMENTS FOR THE FIELD OFFICES

- 32 Provide the following for the exclusive use of the County: (Unless otherwise noted, the quantity
33 should be sufficient for the duration of the Work.)
- 34 A. Office Furnishings: The furniture will be delivered and placed as directed by the County.
- 35 B. Desks: Flat top, double pedestal, with one box and one file drawer in each pedestal, 60-inches
36 by 30-inches. Total quantity will be three (3).

- 1 C. Chairs: Three (3) office-type chairs, adjustable heights, on rollers, with armrests.
- 2 D. Conference Table and Chairs: One (1) table (3-feet by 8-feet minimum), scratch and stain
3 resistant and 15 meeting-type chairs.
- 4 E. Drawing Table: Two (2) plywood or standard drawing tables, 3-feet by 6-feet, with all required
5 appurtenances and 2 extended height stools suitable for use at the drawing tables.
- 6 F. Printer: One(1) - All in one color inkjet printer capable of printing, scanning and coping
7 Ledger, Legal and Letter sizes. Standard interfaces shall include Hi-Speed USB 2.0,
8 Wireless (802.11b/g/n), Ethernet. Minimum requirements include: 35 page automatic
9 document feeder, printing 20 color copies per minute at 6000 x 1200 dpi resolution, scan
10 resolution 2400 x 2400 dpi, flat bed document glass size Ledger (11" x 17") with standalone
11 copy features, minimum of 250 sheet input capacity cassettes and 2 additional complete set
12 of ink cartridges. Brother MFC-J6710DW or equal. Printers to be retained by the County..
13 All warranties, maintenance, servicing and sufficient appropriate ink/toner cartridges and
14 paper for the duration of the Work.
- 15 G. One (1) each refrigerator, microwave, coffee machine, and toaster oven.
- 16 1. Provide Internet connection in each of the four offices in the field trailer. The
17 connection shall be at least 5.0 Mbps of download speed or greater. Provide office
18 with a wireless network 802.11 n with minimum of 8 concurrent users in addition to
19 the network requirements. Wireless network shall allow additional portable
20 computers to gain internet access within the office.
- 21 H. File Cabinets, Storage, Bookcases:
- 22 1. Three (3) Lateral Files: HON 600 Series, or equal, 42-inch wide, four-drawer.
- 23 2. Two (2) steel vertical, hanging mobile plan stands, with approximately 12-hanging
24 clamps. Provide all required clamps, of sufficient length to hold the Contract Drawings.
- 25 3. Storage: Two (2) industrial grade steel cabinets, locking handles, 36-inches wide by 18-
26 inches deep by 72-inches high.
- 27 4. Bookcases: Three (3) HON metal bookcases, or equal, 34-1/2-inches wide by 12-5/8-
28 inches deep by 71-inches high, color to be selected by the Engineer.
- 29 I. Miscellaneous Field Supplies:
- 30 1. One (1) minimum/maximum digital thermometer, with batteries for the duration of the
31 Work.
- 32 2. One (1) rain gauge.

33 1.14 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

- 34 A. Remove all temporary utilities, equipment, facilities, and materials prior to submitting Final
35 Application for Payment.
- 36 B. Remove temporary underground installations to minimum depth of 2-feet and re-grade site.
- 37 C. Clean and repair damage caused by installation or use of temporary Work.

1 D. Restore any existing facilities used during Construction to original condition, unless
2 otherwise directed in other sections of Contract Documents. Restore existing landscaping,
3 drainage, paving, etc. to an "as-was" condition, unless otherwise directed in other sections of
4 Contract Documents.

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

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

7 **END OF SECTION**

1 **SECTION 01610**

2 **DELIVERY, STORAGE AND HANDLING**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

5 A. This Section specifies the general requirements for the delivery, handling, storage and
6 protection for all items required in the construction of the Work.

7 B. Deliver, handle and store products in accordance with manufacturer's recommendations
8 and by methods and means that will prevent damage, deterioration, and loss including
9 theft and protect against damage from climatic conditions. Control delivery schedules to
10 minimize long-term storage of products at the site and overcrowding of construction
11 spaces. In particular, provide delivery/installation coordination to ensure minimum
12 holding or storage times for products recognized to be flammable, hazardous, easily
13 damaged, or sensitive to deterioration, theft and other sources of loss. Damaged or
14 defective items, in the opinion of the County, will be replaced at no cost to the County.

15 1.02 REQUIREMENTS

16 A. The Contractor is responsible for all material, equipment and supplies sold and delivered
17 to the County under this Contract until final inspection of the Work and acceptance
18 thereof by the County.

19 B. All materials and equipment to be incorporated in the Work will be handled and stored by
20 the Contractor before, during and after shipment in a manner to prevent warping,
21 twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any
22 kind whatsoever to the material or equipment.

23 C. All materials and equipment, which in the opinion of the County, have become so
24 damaged as to be unfit for the use intended or specified, will be promptly removed from
25 the site of the Work, and the Contractor will receive no compensation for the damaged
26 materials or equipment or for its removal.

27 D. In the event any such material, equipment and supplies are lost, stolen, damaged or
28 destroyed prior to final inspection and acceptance, the Contractor will replace same
29 without additional cost to the County.

30 1.03 DELIVERY

31 A. Transport and handle items in accordance with manufacturer's instructions.

- 1 B. The County and the Contractor's project superintendent must be on-site to accept all
2 deliveries shipped directly to the job site. If the project superintendent is not present for a
3 delivery, that delivery may be rejected by the County. If any delivery is rejected due to
4 non-availability of the Contractor's project superintendent, delivery shall be rescheduled
5 at no additional cost to the County.
- 6 C. Schedule delivery to reduce long-term on-site storage prior to installation and/or
7 operation. Under no circumstances will materials or equipment be delivered to the site
8 more than 1-month prior to installation without written authorization from the County.
- 9 D. Coordinate deliveries in order to avoid delay in, or impediment of, the progress of the
10 Work.
- 11 E. Schedule deliveries to the site not more than 1-month prior to scheduled installation
12 without written authorization from the County.
- 13 F. Coordinate delivery with installation to ensure minimum holding time for items that are
14 hazardous, flammable, easily damaged or sensitive to deterioration.
- 15 G. All items delivered to the site will be unloaded and placed in a manner that will not
16 hamper the Contractor's normal construction operation or those of Subcontractors and
17 other Contractors and will not interfere with the flow of necessary traffic.
- 18 H. Deliver products in undamaged condition, in manufacturer's original containers or
19 packaging, with identifying labels intact and legible. Maintain packaged materials with
20 seals unbroken and labels intact until time of use.
- 21 I. Immediately on delivery, inspect shipments with the County to ensure compliance with
22 requirements of Contract Documents and accepted submittals, and that products are
23 properly protected and undamaged. If the Contractor does not notify the County
24 regarding the delivery and the County rejects any part of the delivery, there will be no
25 additional cost to the County for the material to be returned. For items furnished by
26 others (i.e. County), perform inspection in the presence of the County. Provide written
27 notification to the County of any problems.
- 28 J. Promptly remove damaged material and unsuitable items from the job site, and promptly
29 replace with material meeting the specified requirements, at no additional cost to the
30 County.

31 1.04 STORAGE AND HANDLING

- 32 A. Provide equipment and personnel to handle products by methods recommended by the
33 manufacturer to prevent soiling or damage to products or packaging, with seals and labels
34 intact and legible.
- 35 B. The Contractor is responsible for securing a location for on-site storage of all material
36 and equipment necessary for completion of the Work. The location and storage layout
37 will be submitted to the County at the Pre-Construction conference.

- 1 C. Manufacturer's storage instructions will be carefully studied by the Contractor and
2 reviewed with the County. These instructions will be carefully followed and a written
3 record of this kept by the Contractor.
- 4 D. All material delivered to the job site will be protected from dirt, dust, dampness, water,
5 and any other condition detrimental to the life of the material from the date of delivery to
6 the time of installation of the material and acceptance by the County.
- 7 E. When required or recommended by the manufacturer, the Contractor will furnish a
8 covered, weather protected storage structure providing a clean, dry, non-corrosive
9 environment for all mechanical equipment valves, architectural items, electrical and
10 instrumentation equipment, and special equipment to be incorporated into this Project.
- 11 F. Arrange storage in a manner to provide easy access for inspection. Make periodic
12 inspections of stored products to assure that products are maintained under specified
13 conditions and free from damage or deterioration.
- 14 G. Should the Contractor fail to take proper action on storage and handling of equipment
15 supplied under this Contract within 7-days after written notice to do so has been given,
16 the County retains the right to correct all deficiencies noted in previously transmitted
17 written notice and deduct the cost associated with these corrections from the Contract
18 Amount. These costs may be comprised of expenditures for labor, equipment usage,
19 administrative, clerical, engineering, and any other costs associated with making the
20 necessary corrections.

21 1.05 SPECIFIC STORAGE AND HANDLING

22 (Additional specific storage and handling requirements may be found in the specification
23 sections addressing the material requirements.)

- 24 A. All mechanical and electrical equipment and instruments subject to corrosive damage by
25 the atmosphere if stored outdoors (even though covered by canvas) will be stored in a
26 weather tight building to prevent damage. The building may be a temporary structure on
27 the site or elsewhere, but it must be satisfactory to the County. The building will be
28 provided with adequate ventilation to prevent condensation. Maintain temperature and
29 humidity within range required by manufacturer.
- 30 1. All equipment will be stored fully lubricated with oil, grease and other lubricants
31 unless otherwise instructed by the manufacturer. Mechanical equipment to be used in
32 the Work, if stored for longer than 90-days, will have the bearings cleaned, flushed
33 and lubricated prior to testing and startup, at no extra cost to the County.
- 34 2. Moving parts will be rotated a minimum of once weekly to ensure proper lubrication
35 and to avoid metal-to-metal "welding." Upon installation of the equipment, the
36 Contractor will start the equipment, at least half load, once weekly for an adequate
37 period of time to ensure that the equipment does not deteriorate from lack of use.

- 1 3. Lubricants will be changed upon completion of installation and as frequently as
2 required thereafter during the period between installation and acceptance. New
3 lubricants will be put into the equipment at the time of acceptance. Prior to
4 acceptance of the equipment, the Contractor will have the manufacturer inspect the
5 equipment and certify that its condition has not been detrimentally affected by the
6 long storage period. Such certifications by the manufacturer will be deemed to mean
7 that the equipment is judged by the manufacturer to be in a condition equal to that of
8 equipment that has been shipped, installed, tested and accepted in a minimum time
9 period. As such, the manufacturer will guaranty the equipment equally in both
10 instances. If such a certification is not given, the equipment will be judged to be
11 defective. It will be removed and replaced at the Contractor's expense.
- 12 4. Electric motors provided with heaters will be temporarily wired for continuous
13 heating during storage. Upon installation of the equipment, the Contractor will start
14 the equipment, at least half load, and once weekly for an adequate period of time to
15 insure that the equipment does not deteriorate from lack of use.
- 16 B. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent
17 mixing with foreign matter.
- 18 C. Cement and lime will be stored under a roof and off the ground and will be kept
19 completely dry at all times.
- 20 D. Brick, block and similar masonry products will be handled and stored in a manner to
21 minimize breakage, chipping, cracking and spilling to a minimum.
- 22 E. Precast Concrete will be handled and stored in a manner to prevent accumulations of dirt,
23 standing water, staining, chipping or cracking.
- 24 F. All structural and miscellaneous steel and reinforcing steel will be stored off the ground
25 or otherwise to prevent accumulations of dirt or grease, and in a position to prevent
26 accumulations of standing water and to minimize rusting. Beams will be stored with the
27 webs vertical.
- 28 G. Metals will be stored dry, all under cover and vented to prevent build-up of humidity, all
29 off ground to provide air circulation.
- 30 H. Lumber will be stacked to provide air circulation. Store materials for which maximum
31 moisture content is specified in an area where moisture content can be maintained.
- 32 I. Gypsum wallboard systems will be stored to protect all metal studs, furring, insulation
33 boards, batts, accessories and gypsum board to prevent any type of damage to these
34 materials. Rusted material components, damp or wet insulation or gypsum boards will
35 not be accepted.

1 J. Acoustical materials will be delivered to the job site in unbroken containers labeled and
2 clearly marked. Materials will not be removed from containers until ready to install, but
3 will be stored in dry area with cartons neatly stacked. Before installation, acoustical
4 board will be stored for not less than 24-hours in the Work area at the same temperature
5 and relative humidity.

6 K. Linear items will be stored in dry area with spacers to provide ventilation. Stack linear
7 items to prevent warping, complying with manufacturer's instructions.

8 L. Paints and other volatile materials will be stored within approved safety containers. No
9 glass jugs will be permitted. Storage areas will be equipped with not less than 2 fire
10 extinguishers (CO2 type) sufficient to discharge a distance of 25-feet when fully charged
11 and have current tags. No other building materials will be stored in this area. Used rags
12 will be removed daily. Clean rags will be stored in metal closed containers.

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

14 **PART 3 - EXECUTION (NOT USED)**
15

16 **END OF SECTION**

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1 **SECTION 01650**

2 **PUMP STATION START-UP AND TESTING**

3 **PART 1 - GENERAL**

4 1.01 SCOPE OF WORK

- 5 A. The Contractor will conduct preliminary testing of pump station facilities, products and
6 equipment. If the preliminary field tests disclose any items furnished under this Contract
7 which do not comply with the requirements of the Contract Documents, the Contractor
8 shall make all changes, adjustments and replacements required prior to Start-up
9 Demonstration and Acceptance Testing.
- 10 B. The Contractor shall arrange qualified instruction by the manufacturer's representative
11 for the County's designated operating and maintenance personnel in operation,
12 adjustment and maintenance of products, equipment and systems.
- 13 C. The Contractor shall furnish all labor, fuel, energy, lubrication, water, and all other
14 materials, equipment, tools and instruments necessary for the Start-up Demonstration and
15 Acceptance Testing unless otherwise specified.
- 16 D. The startup and final check out shall demonstrate and ensure to the County the complete
17 operating pump station system. The Contractor shall provide documentation certifying
18 proper installation, testing and operation of all prescribed equipment and systems.

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

20 **PART 3 - EXECUTION**

21 3.01 PUMP STATION START-UP TESTING AND INSPECTION

- 22 A. The Contractor shall notify the County at least 10 normal working days prior to start-up.
- 23 B. The following shall have been successfully met prior to pump station start-up:
24 1. A walk through letter of acceptance received
25 2. All wire checks conducted
26 3. Video of gravity main inspections completed
27 4. FDEP Clearances received
28 5. FDEP placard for fuel tank if applicable
29 6. Completed Appendix B "Pump Station Start-Up" form
30 7. Certified Boundary Survey and As-Built Survey
31 8. The Contractor shall conduct preliminary testing of equipment prior to start-up testing
32 and make all changes, adjustments and replacements required; and

1 9. The liner(s) shall meet the testing requirements of the Contract Documents and a
2 letter or form signed by the County that testing was witnessed and approved.

3 C. The intent of the start-up testing is for the Contractor to demonstrate to the County that
4 the Work will function as a complete and operable system under normal as well as
5 emergency operating conditions and the pump station is ready for acceptance.

6 D. The Contractor shall furnish all labor, fuel, energy, lubrication, water and all other
7 materials, equipment, tools, and instruments necessary for pump station start-up testing
8 and inspection. All material used shall be listed on the Appendix D "List of Approved
9 Products." All required certification letters, spare parts and supplies shall be provided to
10 the County. Listed below is a partial checklist of requirements to be met.

- 11 1. The Contractor shall coordinate startup activities with the County, the manufacturer's
12 representatives and Subcontractors. A factory representative knowledgeable in the
13 mechanical and electrical equipment furnished shall inspect and supervise a start-up
14 of their respective equipment. A minimum of 1 full business day shall be provided
15 for the testing. Additional time may be necessary due to faulty or incomplete Work.
16 Upon satisfactory completion of the equipment testing and inspection, the factory
17 representative(s) shall issue the required manufacturer's warranty certificates.
- 18 2. Initiate start-up of each system in accordance with the operation and maintenance
19 manual. Demonstrate that all of the components of a system are operating under their
20 own controls as designated without overheating or overloading any parts and without
21 objectionable vibration as determined by the County.
- 22 3. Observe the system operation and make adjustments as necessary to optimize the
23 system performance. Coordinate with County for any adjustments desired or
24 operational problems requiring debugging.
- 25 4. All functions of the pump station mechanical and electrical equipment shall be tested
26 and inspected for operation and workmanship. All equipment shall be properly
27 installed and meet the design performance requirements.
- 28 5. The pumps shall be flow tested at the pump station start-up to verify their
29 performance meets the design requirements and the manufacturer's pump curve.
- 30 6. Furnish 2 printed copies and 3 electronic copies in Acrobat "pdf" format of the
31 Operation and Maintenance Manual for the pump station to the County.
- 32 7. A pump station start-up report shall be completed. See Appendix B "Pump Station
33 Start-Up Report Form."
- 34 8. The Contractor shall bear the entire expense of rectifying Work installed.
- 35 9. The Contractor shall furnish the County with a written certification signed by the
36 Manufacturer's representative that the equipment has been properly installed and
37 lubricated, is in accurate alignment, is free from undue stress imposed by piping or
38 mounting bolts, and has been operated under full load conditions and that satisfactory
39 operation has been obtained.

40 E. Re-testing

41 If the start-up testing does not meet the requirements, the deficiencies shall be corrected
42 and the testing procedure will be rescheduled again.

1 F. FDEP fuel tank placard

2 When a generator fuel tank is required, the Contractor shall submit documentation that
3 the facility has passed the FDEP fuel tank compliance inspection and that a properly
4 completed "Storage Tank Facility Registration Form" has been submitted to the Florida
5 Department of Environmental Protection including all applicable fees. The placard
6 shall be provided to the County.

7 G. Acceptance

- 8 1. The pump station shall be accepted based on the pump station functioning as a
9 complete and operable system under normal as well as emergency operating
10 conditions, the approved construction documents have been met and any deficiencies
11 that were observed and noted have been corrected.
12 2. The Contractor shall ensure all fuel, lubrication, and all other materials for operation
13 are replenished.
14

15 **END OF SECTION**

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- 1 A. In the progress payment request that coincides with or is the first request following, the date
2 substantial completion is claimed, show 100% completion or list incomplete items, the value
3 of incomplete Work, and reasons for the Work being incomplete. Inspection procedures
4 include supporting documentation for completion as indicated in these Contract Documents.
- 5 B. Submit a statement showing an accounting of changes to the Contract Sum.
- 6 C. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements,
7 final certifications and similar documents in accordance with Section 01740 "Warranties
8 and Bonds."
- 9 D. Obtain and submit lien releases enabling the County's full, unrestricted use of the Work
10 and access to services and utilities.
- 11 E. Consult with County before submitting Record Documents in accordance with Section
12 01720 "Project Record Documents."
- 13 F. Submit Operation and Maintenance Manuals.
- 14 G. Make final changeover of permanent locks. Submit keys and keying schedule.
- 15 H. Deliver tools, spare parts, extra stock, and similar items.
- 16 I. Complete final cleaning requirements necessary for Substantial Completion.

17 1.05 FINAL CLEANING.

18 Complete the following cleaning operations prior to Substantial Completion or Owner occupancy.

- 19 A. Remove from job site all tools, surplus materials, construction equipment, storage sheds,
20 debris, waste and temporary services.
- 21 B. Clean the site, including landscape development areas, of rubbish, litter and other foreign
22 substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits.
23 Rake grounds that are neither paved nor planted, to a smooth even-textured surface.
- 24 C. Structures:
 - 25 1. Visually inspect exterior surfaces and remove all traces of soil, waste materials,
26 smudges and other foreign matter.
 - 27 2. Remove all traces of splashed materials from adjacent surfaces.
 - 28 3. Ensure exterior surfaces have a uniform degree of cleanliness.
 - 29 4. Visually inspect interior surfaces and remove all traces of soil, waste materials,
30 smudges and other foreign matter.
 - 31 5. Remove paint droppings, spots, stains and dirt from finished surfaces.
 - 32 6. Remove labels that are not permanent labels.
 - 33 7. Clean transparent materials, including mirrors and glass in doors and windows.
34 Remove glazing compound and other substances that are noticeable vision-obscuring
35 materials. Replace chipped or broken glass and other damaged transparent materials.

- 1 8. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition,
2 free of stains, films and similar foreign substances. Leave concrete floors broom
3 clean.
- 4 9. Wipe surface of mechanical and electrical equipment. Remove excess lubrication and
5 other substances. Clean light fixtures and lamps.
- 6 10. Clean permanent filters of ventilating systems and replace disposable filters if units
7 were operated during construction. Clean ducts, blowers and coils if units were
8 operated without filters during construction.

9 1.06 OPERATION AND MAINTENANCE MANUALS

- 10 A. The Contractor will submit the proposed format, content and tab structure for all
11 Operating and Maintenance Manuals for the County's review and approval. The tab
12 structure for Operating and Maintenance Manuals will follow specification division
13 format as accepted by the Construction Specification Institute. After the County
14 approves the proposed format, content, and tab structure for the Operating and
15 Maintenance Manuals, the Contractor will create and deliver 5 complete sets.
- 16 B. Operation and Maintenance documentation is required for each piece of mechanical,
17 electrical, communications, instrumentation and controls, pneumatic, hydraulic,
18 conveyance, and special construction. If required by the technical specifications, provide
19 Operation and Maintenance documentation for any other product not listed in the
20 foregoing.
- 21 C. The requirements of this Section are separate, distinct and in addition to product
22 submittal requirements that may be established by other Sections of the Specifications.
23 Owner's manuals, manufacturer's printed instructions, parts lists, test data and other
24 submittals required by other Sections of the Specifications may be included in the
25 Operating and Maintenance Manuals provided that they are approved and are formatted
26 in a manner consistent with the requirements of this Section.
- 27 D. Deliver Operation and Maintenance Manuals directly to the County.
- 28 E. Operating and Maintenance Manual documents must include, but are not limited to, table
29 of contents, approved submittals, manufacturer's operating and maintenance instructions,
30 brochures, Shop Drawings, performance curves and data sheets annotated to indicate
31 equipment actually furnished (e.g. identifying impeller size, model, horsepower, etc),
32 procedures, wiring and control diagrams, records of factory and field tests and
33 device/controller settings and calibration, program lists or data compact discs,
34 maintenance and warranty terms and contact information, spare parts listings, inspection
35 procedures, emergency instructions, and other Operating and Maintenance documentation
36 that may be useful to the County. The material and equipment data required by this
37 Section must include all data necessary for the proper installation, removal, normal
38 operation, emergency operation, startup, shutdown, maintenance, cleaning, adjustment,
39 calibration, lubrication, assembly, disassembly, repair, inspection, trouble-shooting, and
40 warranty service of the equipment or materials.

- 1 F. The Contractor must bind the Operating and Maintenance Manual documents in heavy-
2 duty, 3-ring vinyl-covered binders including pocket folders for folded sheet information.
3 Mark binder identification on both the front and spine of each binder. Binder information
4 must list the project title, identify separate structures or locations as applicable, identify
5 the general subject matter covered in the manual and must include the words
6 "OPERATING AND MAINTENANCE INSTRUCTIONS".
- 7 1. The Contractor must submit the Operating and Maintenance documents on three-hole
8 punched, 8-1/2-inch x 11-inch sheets or on three-hole punched sheets that are
9 foldable in multiples of 8-1/2-inch x 11-inch. The three-hole punched edge will be
10 the left 11-inch edge.
 - 11 2. The Contractor may request waivers to the size requirement for specific instances.
12 The Contractor's waiver request must be in writing to the County. The Contractor's
13 waiver request must include a justification for seeking the waiver.
- 14 G. The Contractor must provide an electronic version of the complete and final Operating
15 and Maintenance Manuals in original electronic file format on compact disc or DVD.
16 The Contractor must also provide one (1) electronic pdf file of each bound Operating and
17 Maintenance Manual that represents each Manual's content. The electronic pdf file must
18 match the Operating and Maintenance Manual content and organizational structure.

19 1.07 SUBSTANTIAL COMPLETION INSPECTION PROCEDURES

- 20 A. Upon receipt of the Contractor's request for inspection, the County will either proceed
21 with inspection or advise the Contractor of incomplete prerequisites.
- 22 B. Following the initial inspection, the County will either prepare the certificate of
23 Substantial Completion, or advise the Contractor of Work which must be performed
24 before the certificate will be issued. The County will repeat the inspection when
25 requested in writing and when assured that the Work has been substantially completed.
- 26 C. Results of the completed inspection will form the initial "punch list" for final acceptance.

27 1.08 PREREQUISITES FOR FINAL ACCEPTANCE.

28 Complete the following before requesting the County's final inspection for certification of
29 final acceptance, and final payment. List known exceptions, if any, in the request.

- 30 A. Submit the final payment request with final releases and supporting documentation not
31 previously submitted and accepted. Include certificates for insurance for products and
32 completed operations where required.
- 33 B. Submit written certification that:
- 34 1. The County's final punch list of itemized Work to be completed or corrected, stating
35 that each item has been completed or otherwise resolved for acceptance.
 - 36 2. The Contract Documents have been reviewed and Work has been completed in
37 accordance with Contract Documents.

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1 **SECTION 01720**

2 **PROJECT RECORD DOCUMENTS**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

5 A. The purpose of the Project Record Documents is to provide the County with factual
6 information regarding all aspects of the Work, both concealed and visible.

7 B. To insure the Work was constructed in conformance with the Contract Drawings, the
8 following survey documents are required to be prepared and certified by a Surveyor as
9 per Spec Section 01050 Surveying and Field Engineering:

- 10 1. Asset Attribute Data Form
11 2. Pipe Deflection Table
12 3. Gravity Main Data
13 4. Boundary Survey and Survey Map Report for pump stations and easements with
14 constructed improvements

15
16 The Asset Attribute Data and Pipe Deflection Table forms can be found on the County's
17 web site:

18 [http://www.orangecountyfl.net/WaterGarbageRecycling/UtilitiesCapitalImprovementPro](http://www.orangecountyfl.net/WaterGarbageRecycling/UtilitiesCapitalImprovementProgram.aspx)
19 [gram.aspx](http://www.orangecountyfl.net/WaterGarbageRecycling/UtilitiesCapitalImprovementProgram.aspx)

20 1.02 DEFINITIONS

21 A. As-Built Drawings: Drawings prepared by the Contractor's Surveyor depicting the actual
22 location of installed utilities for the completed Work.

23 B. Record Documents: All documents in subsections 1.04 and 2.02 in this specification.

24 C. Boundary Survey: Boundary survey, map and report certified by a Surveyor shall be provided
25 that meets the requirements of Chapter 5J-17 'Minimum Technical Standards', FAC.

26 D. Surveyor: Contractor's Surveyor that is licensed by the State of Florida as a Professional
27 Surveyor and Mapper pursuant to Chapter 472, F.S.

28 E. Survey Map Report: As a minimum the Survey Map Report shall identify any corners
29 that had to be reset, measurements and computations made, pump station and easement
30 boundary issues, locations of constructed improvements outside boundaries, and
31 accuracies obtained.

32 1.03 QUALITY ASSURANCE

33 A. Delegate the responsibility for maintenance of the Record Documents to one person on

- 1 the Contractor's staff as approved by the County.
- 2 B. Thoroughly coordinate changes within the Record Documents, making adequate and
3 proper entries on each page of specifications and each sheet of Drawings and other
4 documents where such entry is required to show progress and changes properly.
- 5 C. Make entries within 24-hours after receipt of information has occurred.

6 **1.04 RECORD DOCUMENTS AT SITE**

- 7 A. Maintain at the site and always available for County's use one (1) record copy of:
8 1. Construction Contract, Drawings, Specifications, General Conditions, Supplemental
9 Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract
10 Documents
11 2. Change Orders, Verbal Orders, and other modifications to Contract
12 3. Written instructions by the County as well as correspondence related to Requests for
13 Information (RFIs)
14 4. Accepted Shop Drawings, Samples, product data, substitution and "or-equal" requests
15 5. Field test records, inspection certificates, manufacturer certificates and construction
16 photographs
17 6. Paper copies of the Progressive As-Built Drawings
18 7. Current Surveyor's tables for the Assets Attribute Data, Pipe Deflection Data, and
19 Gravity Main Data
- 20 B. Maintain the documents in an organized, clean, dry, legible condition and protected from
21 deterioration, loss and damage until completion of the Work, transfer of all record data to
22 the final As-built Drawings for submittal to the County.
- 23 C. Store As-Built Documents and samples in Contractor's office apart from documents used
24 for construction. Do not use As-Built document for construction purposes. Label each
25 document "AS-BUILT" in neat large printed letters. File documents and samples in
26 accordance with CSI/CSC format.
- 27 D. Record information concurrently with construction progress. Do not conceal any Work
28 until required information is recorded.

29 **PART 2 - PRODUCTS**

30 **2.01 AS-BUILT DRAWINGS**

- 31 A. Maintain the electronic As-Built Drawings to accurately record progress of Work and
32 change orders throughout the duration of the Contract.
- 33 B. Date all entries. Enter RFI No., Change Order No., etc. when applicable.
- 34 C. Call attention to the entry by highlighting with a "cloud" drawn around the area affected
35 or other means. In the event of overlapping changes, use different colors for entries of

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

28 2.02 RECORD DOCUMENTS

- 29 A. Three (3) paper copy sets and three (3) digital media sets of the following final Record
30 Documents below.
- 31 B. The following documents shall be signed and sealed by the Surveyor:
- 32 1. Asset Attribute Data Form (see Specification Section 01050 "Surveying and Field
33 Engineering," Table 01050-2 for an example)
 - 34 2. Boundary Survey of fee simple sites (pump station, etc.) and permanent easements
35 with the respective Survey Map Reports
 - 36 3. Boundary Survey and Survey Map Report for the location of constructed pipes within
37 any easements and right-of-way. As a minimum the Survey Map Report shall
38 identify or describe the locations where the pipe centerline was constructed within 3-
39 feet of the easement or right-of-way boundary, where the pipe was constructed
40 outside the easement or right-of-way boundary, any corners that had to be reset,
41 measurements and computations made, pump station boundary issues, and accuracies

- 1 obtained. Survey map report shall be dated after the Work within the right-of-ways
2 or easements have been completed.
- 3 4. Gravity Main Table (see Specification Section 01050 "Surveying and Field
4 Engineering", Table 01050-4 for an example)
- 5 5. Pipe Deflection Table (see Specification Section 01050 "Surveying and Field
6 Engineering" Table 01050-3 for an example). An electronic blank table will be
7 supplied by the County.
- 8 C. Digital sets of the final Record Documents including but not limited to:
- 9 1. Scanned digital copies of the final As-Built Drawings
- 10 2. Electronic Survey documents electronically sealed by the Surveyor
- 11 3. Final Record Documents
- 12 4. Digital file of As-Built Drawing in the Engineer's current version of AutoCAD file
13 (dwg) format
- 14 D. Pump station site Boundary Survey and Map Report.
- 15 E. New Boundary Survey to re-establish easement corners, right-of-way monuments, or
16 pump station site corners with monuments if destroyed by the Work.
- 17 F. Scanned Documents: Scan Record Documents reflecting changes from the Contract
18 Documents.
- 19 G. The scanned "As-Built" Drawing sets shall be complete and include the title sheet,
20 plan/profile sheets, cross-sections, and details. Each individual sheet contained in the
21 printed set of the As-Built Drawings shall be included in the electronic drawings, with
22 each sheet being converted into an individual tif (tagged image file). The plan sheets
23 shall be scanned in tif format Group 4 at minimum of 400 dpi resolution to maintain
24 legibility of each drawing. Then, the tif images shall be embedded into a single pdf
25 (Adobe Acrobat) file representing the complete plan set. Review all Record Documents
26 to ensure a complete record of the Project.
- 27 H. Provide an encompassing digital AutoCAD file that includes all the information of the
28 As-Built Drawings and any other graphical information in the As-Built Drawings. It
29 shall include the overall Work, utility system layout and associated parcel boundaries and
30 easements. Feature point, line and polygon information for new or altered Work and all
31 accompanying geodetic control and survey data shall be included. The surveyor's
32 certified As-Built Asset Attribute Data shall be added to the As-Built Drawings and
33 Surveyor shall electronically seal the data in a comma-delineated ASCII format (txt).

34 **PART 3 - EXECUTION**

35 3.01 PRE-CONSTRUCTION MEETING

- 36 A. Pre-construction Meeting: It is recommended that the Surveyor attend the Pre-
37 construction meeting. At the pre-construction meeting the Contractor shall be provided
38 with a blank electronic version of the spreadsheet for the tables: Asset Attribute Data and

1 Pipe Deflection. The Contractor's surveyor shall use these tables to input the data and
2 shall not alter the table format or formulas.

3 3.02 CONSTRUCTION PROGRESS MEETINGS

4 A. Contractor shall provide progressive Record Documents described below:

- 5 1. Construction Contract, As-Built Drawings, Specifications, General Conditions,
6 Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all
7 other Contract Documents.
- 8 2. Specifications and Addenda: Record manufacturer, trade name, catalog number and
9 supplier of each product and item of equipment actually installed as well as any
10 changes made by Field Order, Change Order or other.
- 11 3. Change orders, verbal orders, and other modifications to Contract.
- 12 4. Written instructions by the County as well as correspondence related to Requests for
13 Information (RFIs).
- 14 5. Accepted Shop Drawings, samples, product data, substitution and "or-equal" requests.
- 15 6. Field test records, inspection certificates, manufacturer certificates and construction
16 photographs.
- 17 7. As-Built Asset Attribute Data Form: Surveyor shall obtain field measurements of
18 vertical and horizontal dimensions of constructed improvements. The monthly
19 submittal shall include the Surveyor's certified statement regarding the constructed
20 improvements being within the specified accuracies as described in Specification
21 Section 01050 "Surveying and Field Engineering", Table 01050-1 Minimum Survey
22 Accuracies or if not, indicating the variances.
- 23 8. Gravity Main Table: Surveyor shall prepare and update a Gravity Main Table to
24 include as a minimum the pipe segment identification, pipe lengths, manhole inverts
25 and tops, and slopes for gravity mains. Surveyor shall certify the data entered are
26 correct and indicate if the minimum slopes have not been met.
- 27 9. Pipe Deflection Table: Surveyor shall input the type of pipe, pipe manufacturer, PVC
28 manufacturer deflection allowance, allowable angle of offset and radius of curvature,
29 laying length of pipe, and coordinates. Surveyor shall certify the data entered are
30 correct and indicate if the deflection allowance, offset or radius of curvature exceeds
31 the manufacturer's recommendations.

32 3.03 FINAL RECORD DOCUMENTS SUBMITTAL

- 33 A. Submit the Final Record Documents within 20-days after Substantial Completion.
- 34 1. Participate in review meetings as required and make required changes and promptly
35 deliver the Final Record Documents to the County.
- 36

37 **END OF SECTION**

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1 **SECTION 01730**

2 **PUMP STATION OPERATION AND MAINTENANCE MANUAL**

3 **PART 1 - GENERAL**

4 1.01 REQUIREMENTS INCLUDED

- 5 A. Section includes the submittal process for the operation and maintenance manual and the
6 manual shall contain the technical information required for proper installation, operation
7 and maintenance of process, electrical and mechanical equipment and systems.

8 1.02 SUBMITTAL SCHEDULE

- 9 A. Operation and Maintenance Manual Schedule
10 1. Initial submittal within 60-days after date Shop Drawings are approved.

11 1.03 PREPARATION OF SUBMITTALS

- 12 A. General
13 1. Materials are provided for County's use, reproduction and distribution as training and
14 reference materials within County's organization.
15 2. Applicable to hard copy or electronic media.
16 3. Applicable to materials containing copyright notice as well as those with no copyright
17 notice.
18 4. Notify manufacturer of this intended use of materials provided under the Contract.
19 5. Number each Operation and Maintenance Manual transmittal with the original root
20 number of the associated Shop Drawing.
21 6. Identify resubmittals with the original number plus a suffix letter starting with "A."
22 7. Submittal format:
23 a. Interim submittals: Submit two (2) paper copies until manual is approved.
24 b. Final submittals:
25 (1) Within 30-days of receipt of approval, submit one (1) additional paper copy
26 and two (2) electronic copies on Compact Disc (CD-ROM) in Portable
27 Document Format (PDF).
28 8. Compact discs to be secured in jewel cases.
29 9. Electronic copies will be reviewed for conformance with the approved paper copy
30 and the electronic copy (PDF) requirements of this Specification.
31 10. Non-conforming CDs will be returned with comments.
32 11. Provide final CDs within 30-days of receipt of comments.
33 12. Paper copy submittals:
34 a. Submit Operation and Maintenance Manuals printed on 8-1/2 inch x 11 inch size
35 heavy first quality paper with standard three-hole punching and bound in
36 appropriately sized three-ring (or post) vinyl view binders with clear overlays
37 front, spine and back.

- 1 b. Provide binders with titles inserted under clear overlay on front and on spine of
- 2 each binder.
- 3 c. As space allows, binder titles shall include, but not necessarily be limited to:
- 4 (1) Project Name
- 5 (2) Related Specification Number
- 6 (3) Equipment Name(s) and
- 7 (4) Project Equipment Tag Numbers
- 8 d. Provide a Cover Page for each manual with the following information:
- 9 (1) Manufacturer(s)
- 10 (2) Date
- 11 (3) Project Owner and Project Name
- 12 (4) Specification Section
- 13 (5) Project Equipment Tag Numbers
- 14 (6) Model Numbers
- 15 (7) Engineer
- 16 (8) Contractor
- 17 e. Provide a Table of Contents or Index for each manual.
- 18 f. Use plastic-coated dividers to tab each section of each manual per the manual's
- 19 Table of Contents/Index for easy reference.
- 20 g. Provide plastic sheet lifters prior to first page and following last page.
- 21 h. Reduce Drawings or diagrams bound in manuals to an 8-1/2 inch x 11 inch or 11
- 22 inch x 17 inch size.
- 23 i. Where reduction is not practical to ensure readability, fold larger Drawings
- 24 separately and place in vinyl envelopes which are bound into the binder.
- 25 j. Identify vinyl envelopes with Drawing numbers.
- 26 k. Mark each sheet to clearly identify specific products and component parts and
- 27 data applicable to the installation for the Project.
- 28 l. Delete or cross out information that does not specifically apply to the Project.

29 B. Electronic copy submittals:

- 30 1. Electronic copies of the approved paper copy Operation and Maintenance Manuals
- 31 are to be produced in Adobe Acrobat's Portable Document Format (PDF) Version
- 32 {5.0} or higher.
- 33 2. Do *not* password protect and/or lock the PDF document.
- 34 3. Drawings or other graphics must be converted to PDF format and made part of the
- 35 PDF document.
- 36 4. Scanning to be used only where actual file conversion is not possible.
- 37 5. Rotate pages that must be viewed in landscape to the appropriate position for easy
- 38 reading.
- 39 6. Images only shall be scanned at a resolution of 300 dpi or greater.
- 40 7. Perform Optical Character Recognition (OCR) capture on all images.
- 41 8. Achieve OCR with the "original image with hidden text" option.
- 42 9. Word searches of the PDF document must operate successfully to demonstrate OCR
- 43 compliance.
- 44 10. Create bookmarks in the navigation frame, for each entry in the Table of
- 45 Contents/Index.

- 1 11. Normally three levels deep (i.e., "Chapter," "Section," "Sub-section").
- 2 12. Thumbnails must be generated for each PDF file.
- 3 13. Set the opening view for PDF files as follows:
 - 4 a. Initial view: Bookmarks and Page.
 - 5 b. Magnification: Fit in Window.
 - 6 c. Page layout: Single page.
 - 7 d. Set the file to open to the cover page of the manual with bookmarks to the left,
 - 8 and the first bookmark linked to the cover page.
 - 9 e. All PDF documents shall be set with the option "Fast Web View" to open the first
 - 10 pages of the document for the viewer while the rest of the document continues to
 - 11 load.
- 12 14. File naming conventions
 - 13 a. File names shall use a "ten dot three" convention (XXXXXX-YY-Z.PDF) where
 - 14 XXXXX is the Specification Section number, YY is the Shop Drawing Root
 - 15 number and Z is an ID number used to designate the associated volume.

17 Example 1:

18 Two (2) pumps submitted as separate Shop Drawings under the same
19 Specification Section:

20 Pump 1 = 11061-01-1.pdf.

21 Pump 2 = 11061-02-1.pdf.

23 Example 2:

24 Control system submitted as one (1) Shop Drawing but separated into two (2)
25 O&M volumes:

26 Volume 1 = 13440-01-1.pdf.

27 Volume 2 = 13440-01-2.pdf.

- 29 15. As a minimum, include the following labeling on all CD-ROM discs and jewel cases:
 - 30 a. Project Name
 - 31 b. Equipment Name and Project Tag Number
 - 32 c. Project Specification Section
 - 33 d. Manufacturer Name
 - 34 e. Vendor Name
 - 35 f. Binding
 - 36 (1) Include labeled CD(s) in labeled jewel case(s).
 - 37 (2) Bind jewel cases in standard three-ring binder Jewel Case Page(s), inserted at
 - 38 the front of the Final paper copy submittal.
 - 39 (3) Jewel Case Page(s) to have means for securing Jewel Case(s) to prevent loss
 - 40 (e.g., flap and strap).

41 1.04 EQUIPMENT AND SYSTEMS

- 42 A. Submission of Operation and Maintenance Manuals for equipment and systems is
- 43 applicable but not necessarily limited to:
 - 44 1. Major equipment

- 1 2. Equipment powered by electrical, pneumatic or hydraulic systems
- 2 3. Specialized equipment and systems including instrumentation and control systems
- 3 and system components for HVAC process system control
- 4 4. Valves and water control gates
- 5 5. Equipment function, normal operating characteristics, limiting operations
- 6 6. Assembly, disassembly, installation, alignment, adjustment, and checking instructions
- 7 7. Operating instructions for start-up, normal operation, control, shutdown, and
- 8 emergency conditions
- 9 8. Lubrication and maintenance instructions
- 10 9. Troubleshooting guide
- 11 10. Parts lists
- 12 a. Comprehensive parts and parts price lists.
- 13 b. List of spare parts provided as specified in the associated Specification Section.
- 14 11. Outline, cross-section, and assembly Drawings; engineering data; and electrical
- 15 diagrams, including elementary diagrams, wiring diagrams, connection diagrams,
- 16 word description of wiring diagrams and interconnection diagrams.
- 17 12. Test data and performance curves.
- 18 13. As-constructed fabrication or layout Drawings and wiring diagrams.
- 19 14. Instrumentation or tag numbers assigned to the equipment by the Contract Documents
- 20 are to be used to identify equipment and system components.
- 21 15. Additional information as specified in the associated equipment or system
- 22 Specification Section.

23 1.05 COUNTY/PROFESSIONAL'S REVIEW ACTION

- 24 A. County/Professional will review and indicate one of the following review actions:
- 25 1. ACCEPTABLE
- 26 2. REVISE AND RESUBMIT
- 27 B. Acceptable paper copy submittals will be retained with the transmittal form returned with
- 28 a request for one (1) additional paper copy and two (2) electronic copies on CD-ROM.
- 29 C. Deficient submittals (paper copy and/or electronic copy) will be returned along with the
- 30 transmittal form which will be marked to indicate deficient areas.

31 **END OF SECTION**

SECTION 01740
WARRANTIES AND BONDS

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PART 1 - GENERAL

1.01 SCOPE OF WORK

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

1.02 RELATED WORK

- A. Refer to Conditions of Contract for the general requirements relating to warranties and bonds.
- B. General closeout requirements are included in Section 01700 "Project Closeout."
- C. Specific requirements for warranties for the Work and products and installations that are specified to be warranted are included in the individual Sections of Division 2 through 16.

1.03 DEFINITIONS

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

1.04 SUBMITTALS

- A. Submit written warranties to the County prior to requesting a Substantial Completion Inspection as outlined in Section 01700 "Project Closeout." If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the County.
- B. When a designated portion of the Work is completed and occupied or used by the County, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the County within 15-days of completion of that designated portion of the Work.

- 1 C. When a special warranty is required to be executed by the Contractor, or the Contractor
2 and a Subcontractor, supplier or manufacturer, prepare a written document that contains
3 appropriate terms and identification, ready for execution by the required parties. Submit
4 a draft to the County for approval prior to final execution.
- 5 D. Refer to individual Sections of Divisions 2 through 16 for specific content requirements,
6 and particular requirements for submittal of special warranties.
- 7 E. Prior to Substantial Completion Inspection, submit to the County two (2) copies of each
8 required warranty and bond properly executed by the Contractor, or by the Contractor,
9 Subcontractor, supplier, or manufacturer. Organize the warranty documents into an
10 orderly sequence based on the table of contents of the Project Manual.
- 11 1. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl
12 covered loose-leaf binders, thickness as necessary to accommodate contents and sized
13 to receive 8-1/2-inch by 11-inch three-hole punched paper.
- 14 2. Table of Contents will be neatly typed, in the sequence of the Table of Contents of
15 the Project Manual, with each item identified with the number and title of the
16 specification Section in which specified and the name of the product or work item.
- 17 3. Provide heavy paper dividers with celluloid covered tabs for each separate warranty.
18 Mark the tab to identify the product or installation. Provide a typed description of the
19 product or installation, including the name of the product and the name, address and
20 telephone number of the installer, supplier and manufacturer.
- 21 4. Identify each binder on the front and the spine with the typed or printed title
22 "WARRANTIES AND BONDS", the project title or name and the name, address and
23 telephone number of the Contractor.
- 24 5. When operating and maintenance manuals are required for warranted construction,
25 provide additional copies of each required warranty, as necessary, for inclusion in
26 each required manual.

27 1.05 WARRANTY REQUIREMENT

- 28 A. The Contractor will warrant all equipment in the Contractor's one-year warranty period
29 even though certificates of warranty may not be required. For all major pieces of
30 equipment, the Contractor shall submit a warranty from the equipment manufacturer.
31 "Major" equipment is defined as a device having a 5 HP or larger motor or which lists for
32 more than \$1,000.00.
- 33 B. In the event that an equipment manufacturer or supplier is unwilling to provide a one-
34 year warranty commencing at Substantial Completion, the Contractor will obtain from
35 the manufacturer a warranty of sufficient length commencing at the time of equipment
36 delivery to the job site, such that the warranty will extend to at least 1-year past
37 substantial completion.
- 38 C. If an individual specification section requires a particular warranty more stringent than
39 that required by this Section or the General Conditions, the more stringent requirements
40 will govern for the applicable portion of the Work.

- 1 D. Related Damages and Losses: When correcting warranted Work that has failed, remove
2 and replace other Work that has been damaged as a result of such failure or that must be
3 removed and replaced to provide access for correction of warranted Work.
- 4 E. Reinstatement of Warranty: When Work covered by a warranty has failed and been
5 corrected by replacement or rebuilding, reinstate the warranty by written endorsement.
6 The reinstated warranty will be equal to the original warranty with an equitable
7 adjustment for depreciation.
- 8 F. Replacement Cost: Upon determination that Work covered by a warranty has failed,
9 replace or rebuild the Work to an acceptable condition complying with requirements of
10 Contract Documents. The Contractor is responsible for the cost of replacing or
11 rebuilding defective Work regardless of whether the County has benefited from use of the
12 Work through a portion of its anticipated useful service life.
- 13 G. County's Recourse: Written warranties made to the County are in addition to implied
14 warranties, and will not limit the duties, obligations, rights and remedies otherwise
15 available under the law, nor will warranty periods be interpreted as limitations on time in
16 which the County can enforce such other duties, obligations, rights, or remedies.
- 17 H. Rejection of Warranties: The County reserves the right to reject warranties and to limit
18 selections to products with warranties not in conflict with requirements of the Contract
19 Documents.
- 20 I. The County reserves the right to refuse to accept Work for the project where a special
21 warranty, certification, or similar commitment is required on such work or part of the
22 Work, until evidence is presented that entities required to counter-sign such commitments
23 are willing to do so.
- 24 J. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product
25 warranties do not relieve the Contractor of the warranty on the Work that incorporates the
26 products, nor does it relieve suppliers, manufacturers, and Subcontractors required to
27 countersign special warranties with the Contractor.

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

29 **PART 3 - EXECUTION**

30 3.01 DELIVERABLES

- 31 A. Assemble warranties, bonds and service and maintenance contracts, executed by each of
32 the respective manufacturers, suppliers, and Subcontractors, and bind into a commercial
33 quality standard 3-ring binder; submit 5 copies of the warranties and bonds to the County
34 for review.
- 35 1. The warranties and bonds shall include:
36 a. Equipment or product description
37 b. Manufacturer's name, principal, address and telephone number

- 1 c. Contractor, name of responsible principal, address and telephone number
- 2 d. Local supplier's or representatives name and address
- 3 e. Scope of warranty or bond
- 4 f. Proper procedure in case of failure
- 5 g. Instances which might affect the validity of warranty or bond
- 6 h. Date of beginning of warranty, bond or service and maintenance contract
- 7 i. Duration of warranty, bond or service maintenance contract

8 B. Warranties

- 9 1. Furnish an extended warranty for sanitary sewer main liner certified by the
- 10 manufacturer for specified material properties for a particular job. The manufacturer
- 11 warrants the liner to be free from defects in raw materials for 1-year from the date of
- 12 acceptance. During the warranty period, any defects which affect the integrity or
- 13 strength of the pipe shall be repaired at the Contractor's expense in a manner
- 14 acceptable to the County.
- 15 2. Furnish an extended warranty for sanitary lateral liner certified by the manufacturer
- 16 for specified material properties for a particular job. The manufacturer warrants the
- 17 liner to be free from defects in raw materials for 1-year from the date of acceptance.
- 18 During the warranty period, any defects which affect the integrity or strength of the
- 19 pipe shall be repaired at the Contractor's expense in a manner acceptable to the
- 20 County.
- 21

22 **END OF SECTION**

1 **SECTION 02050**

2 **DEMOLITION OF EXISTING STRUCTURES**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

5 A. Scope of Work

- 6 1. This Section specifies the labor, materials, equipment, and incidentals required for the
7 demolition, relocation, and/or disposal of all structures, building materials,
8 equipment, and accessories to be removed as shown on the Drawings and as specified
9 herein.
- 10 2. There may be existing and active stormwater, wastewater, water, and other facilities
11 on site as indicated on the Drawings. It is essential that these facilities, when
12 encountered, remain intact and in service during the proposed demolition.
13 Consequently, the Contractor shall be responsible for the protection of these facilities
14 and shall diligently direct all his activities toward maintaining continuous operation
15 of the existing facilities and minimizing operational inconvenience.
- 16 3. Demolition generally includes:
- 17 a. Complete demolition and removal of manholes, valve vaults, wetwells, piping,
18 and mechanical and electrical equipment related to the Work as shown on the
19 Drawings and specified herein.
- 20 b. Complete demolition and removal of all above and below ground structures,
21 concrete slabs and foundations, vaults, and underground utilities (water,
22 wastewater, electrical, etc.) as shown on the Drawings and specified herein.
- 23 c. All material, equipment, rubble, debris, and other products of the demolition shall
24 become the property of the Contractor for his disposal off-site in accordance with
25 all applicable laws and ordinances at the Contractor's expense. The sale of
26 salvageable materials by the Contractor shall only be conducted off-site. The sale
27 of removed items on the site is prohibited by the County.
- 28 4. The Contractor shall examine the various Drawings, visit the site, determine the
29 extent of the Work, the extent of work affected therein, and all conditions under
30 which he is required to perform the various operations.
- 31 5. The Contractor shall fill and compact all voids left by the removal of pipe, structures,
32 etc. with materials described herein to a grade that will provide for positive drainage
33 of the disturbed area to drain run-off in direction consistent with the surrounding area.
34 The Contractor shall provide all fill materials to the site as needed. Compaction of
35 fill shall match the compaction of adjacent undisturbed material.

36 1.02 QUALITY ASSURANCE

- 37 A. Permits and Licenses: Contractor shall obtain all necessary permits and licenses for
38 performing the Work and shall furnish a copy of same to the County prior to
39 commencing the Work. The Contractor shall comply with the requirements of the
40 permits.

- 1 B. Notices: Contractor shall issue written notices of planned demolition to companies or
2 local authorities owning utility conduit, wires, or pipes running to or through the project
3 site. Copies of said notices shall be submitted to the County.
- 4 C. Utility Services: Contractor shall notify utility companies or local authorities furnishing
5 gas, water, electrical, telephone, or sewer service to remove any equipment in the
6 structures to be demolished and to remove, disconnect, cap, or plug their services to
7 facilitate demolition.
- 8 D. Contractor shall notify the Orange County Risk Management Department in writing prior
9 to beginning any demolition work.

10 1.03 SHOP DRAWINGS AND SUBMITTALS

- 11 A. Submittals shall be submitted to the County for review and acceptance prior to
12 construction in accordance with the General Conditions and specifications Section 01300
13 "Submittals."
- 14 B. Submit to the County for their approval, 2 copies of proposed methods and operations of
15 demolition or relocation of the structures specified below prior to the start of Work.
16 Include in the schedule the coordination of shut-off, capping, and continuation of utility
17 service as required.
- 18 C. Provide a detailed sequence of demolition and removal work to ensure the uninterrupted
19 progress of the County's operations.
- 20 D. Before commencing demolition work, all structure relocation, bypassing, capping, or
21 modifications necessary will be completed. Actual work will not begin until the County
22 has inspected and approved the prerequisite work and authorized commencement of the
23 demolition work.
- 24 E. The above procedure must be followed for each individual demolition operation.

25 1.04 SITE CONDITIONS

- 26 A. Prior to demolition, the Contractor shall obtain written verification from the utility
27 owner(s) that the existing utilities, including stormwater, wastewater, and/or water
28 facilities, are not operational and are ready for demolition.
- 29 B. The County assumes no responsibility for the actual condition of the structures to be
30 demolished or relocated.
- 31 C. Conditions existing at the time of inspection for bidding purposes will be maintained by
32 the County insofar as practicable. However, variations within each site may occur prior
33 to the start of demolition work.
- 34 D. No additional payment will be made for pumping or other difficulties encountered due to
35 water.

1 E. Certain information regarding the reputed presence, size, character and location of
2 existing underground structures, pipes and conduit has been shown on the Drawings.
3 There is no certainty of the accuracy of this information, and the location of underground
4 structures shown may be inaccurate and other obstructions than those shown may be
5 encountered. The Contractor hereby distinctly agrees that the County is not responsible
6 for the correctness or sufficiency of the information given; that in no event is this
7 information to be considered as a part of the Contract; that he shall have no claim for
8 delay or extra compensation on account of incorrectness of information regarding
9 obstructions either revealed or not revealed by the Drawings; and that he shall have no
10 claim for relief from any obligation or responsibility under this Contract in case the
11 location, size, or character of any pipe or other underground structure is not as indicated
12 on the Drawings, or in case any pipe or other underground structure is encountered that is
13 not shown on the Drawings.

14 1.05 RESTRICTIONS

15 A. No building, tank or structure, or any part thereof, shall be demolished until an
16 application has been filed by the Contractor with the Building Department Inspector and
17 a permit issued if a permit is required. The fee for this permit shall be the Contractor's
18 responsibility. Demolition shall be in accordance with applicable provisions of the
19 Building Code of the State of Florida.

20 B. No explosives shall be used at any time during the demolition. No burning of
21 combustible material will be allowed.

22 C. Contractor shall notify the Orange County Risk Management Department prior to
23 beginning any demolition work.

24 1.06 DISPOSAL OF MATERIAL

25 A. All salvageable or useable material or equipment to be retained by the County shall be
26 shown on Drawings, and shall be moved to a designated area by Contractor for pick up
27 by County. The Contractor shall promptly remove all other materials from the site as
28 indicated or shown on the Drawings.

29 B. All materials not retained by the County shall become the Contractor's property and shall
30 be removed off-site.

31 C. The on-site storage of removed items is prohibited by the County. Off-site sale of
32 salvageable material by the Contractor is acceptable.

33 1.07 TRAFFIC AND ACCESS

34 A. Conduct work to ensure minimum interference with on-site and off-site roads, streets,
35 sidewalks, and occupied or used facilities.

- 1 B. Special attention is directed towards maintaining safe and convenient access to the
2 existing facilities remaining in operation by plant personnel and plant associated vehicles,
3 including trucks and delivery vehicles.
- 4 C. Do not close or obstruct streets, sidewalks, or other occupied or used facilities without
5 permission from the County. Provide alternate routes around closed or obstructed traffic
6 in access ways.

7 1.08 PROTECTION

- 8 A. Conduct operations to minimize damage by falling debris or other causes to adjacent
9 buildings, structures, roadways, other facilities, and persons. Provide interior and
10 exterior shoring, bracing, or support to prevent movement or settlement or collapse of
11 structures to be demolished and adjacent facilities to remain.

12 1.09 DAMAGE

- 13 A. Promptly repair damage caused to adjacent facilities by demolition operations as directed
14 by the County at no cost to the County.

15 1.10 UTILITIES

- 16 A. Maintain existing utilities as directed by the County to remain in service and protect
17 against damage during demolition operations.
- 18 B. Do not interrupt existing utilities serving occupied or operational facilities, except when
19 authorized by County. Provide temporary services during interruptions to existing
20 utilities as acceptable to the County.
- 21 C. The Contractor shall cooperate with the County to shut off utilities serving structures of
22 the existing facilities as required by demolition operations.
- 23 D. The Contractor shall be solely responsible for making all necessary arrangements and for
24 performing any necessary work involved in connection with the interruption of all public
25 and private utilities or services.
- 26 E. All utilities being abandoned shall be terminated at the service mains in conformance
27 with the requirement of the utility companies or the municipality owning or controlling
28 them.

29 1.11 EXTERMINATION

- 30 A. If required, before starting demolition, the Contractor shall employ a certified rodent and
31 vermin exterminator and treat the facilities in accordance with governing health laws and
32 regulations. Any rodents, insects, or other vermin appearing before or during the
33 demolition shall be killed or otherwise prevented from leaving the immediate vicinity of
34 the demolition work.

1 1.12 POLLUTION CONTROL

2 A. For pollution control, use water sprinkling, temporary enclosures, and other suitable
3 methods as necessary to limit the amount of dust rising and scattering in the air to the
4 lowest level of air pollution practical for the conditions of work. The Contractor shall
5 comply with the governing regulations.

6 B. Clean adjacent structures and improvements of all dust and debris caused by demolition
7 operations as directed by the County. Return areas to conditions existing prior to the start
8 of Work.

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

10 **PART 3 - EXECUTION**

11 3.01 SEQUENCE OF WORK

12 A. The sequence of demolition and relocation of existing facilities shall be in accordance
13 with the approved critical path schedule as specified in paragraph 1.03 above.

14 3.02 REMOVAL OF EXISTING PROCESS EQUIPMENT, PIPING, AND APPURTENANCES

15 A. Equipment to be retained by the County will be designated for retention by the County
16 prior to bidding as specified in Paragraph 1.06 above. Subject to the constraints of
17 maintaining existing facilities in operation as shown on the Drawings, all other process
18 equipment, non-buried valving and piping, and appurtenances shall be removed from the
19 site.

20 3.03 DEMOLITION PROCEDURES

21 The Contractor shall adhere to the following demolition procedures as referenced on the
22 Drawings:

23 A. TO BE DEMOLISHED: Demolition shall be the breaking up, cutting, filling of any holes
24 resulting, final grading of the area, performing any other operations required, and the
25 removal from the site of all structures and equipment (structures, substructures, floor
26 slabs, equipment, tanks, pipes, fittings, electrical systems, light poles, wiring,
27 underground conduits and wiring, isolated slabs, and sidewalks) as indicated on the
28 Drawings. All pieces of concrete, metal, and any other demolished material shall be
29 removed to a depth of at least 5-feet below existing grade. Broken pieces of concrete
30 may be size reduced by an on-site crusher, but in any event must be removed from the
31 project site.

32 Before commencing structural demolition, remove all mechanical, electrical, piping, and
33 miscellaneous appurtenances. Completely remove the structure by thoroughly breaking
34 up concrete into pieces no more than 2-feet across the largest dimension.

- 1 B. TO BE REMOVED: Where indicated on the Drawings, the structures and equipment
2 shall be completely removed from the site with all associated connecting piping or
3 electrical service. The item shall be taken whole or in parts to be salvaged or disposed of
4 by the Contractor.
- 5 C. TO BE ABANDONED: Where indicated on the Drawings, the structures and equipment
6 shall be left in place, drained, and the contents properly disposed. The upper 4-feet of the
7 structure shall be cut and removed, including the cover slab and access port, frame, and
8 cover. All structures to be abandoned with bottom slabs shall be drilled (2 holes
9 minimum, 2.0-inch diameter each) or hole punched to prevent flotation and filled with
10 common fill.
- 11 D. PIPING TO BE REMOVED: Where indicated on the Drawings, pipe (and conduit) shall
12 be drained and the contents properly disposed. The pipe (or conduit) shall then be
13 completely removed from the site, including fittings, valves, and other in-line devices.
14 Connections to existing piping to remain shall be plugged by mechanical means (M.J.
15 plugs, tie-rods, or thrust blocks). Piping shall be removed in accordance with
16 Specification Section 02080 "Abandonment, Removal and Salvage or Disposal of
17 Existing Pipe."
- 18 E. PIPING TO BE ABANDONED: Where indicated on the Drawings, piping (or conduit)
19 shall be left in place. All such piping shall be drained and the contents properly disposed.
20 The pipe (or conduit) shall then be filled with grout (flowable fill) and each end of the
21 pipe (or conduit) shall be plugged using a concrete plug in a manner acceptable to the
22 County. Piping shall be abandoned in accordance with Specification Section 02080
23 "Abandonment, Removal and Salvage or Disposal of Existing Pipe."
- 24 F. TO BE PROTECTED: Where indicated on the Drawings, the utility service, fence,
25 structure, tree, or device so designated shall be temporarily protected during the
26 prosecution of the demolition work as specified in Division 1.
- 27 G. TO REMAIN: Where indicated on the Drawings, the designated facilities shall remain
28 intact and in service during the prosecution of the demolition work.

29 **3.04 DEWATERING OF EXISTING PROCESS UNITS AND DISPOSAL OF RESIDUE**

30 The Contractor shall notify the County prior to beginning the dewatering work on any
31 existing process units which contain wastewater, grit, or sludge. The Contractor, at his own
32 expense, shall remove the entire contents of each structure and dispose off site. The proper
33 transport and disposal of all residues shall remain the responsibility of the Contractor.
34

35 **END OF SECTION**

1 **SECTION 02080**

2 **ABANDONMENT, REMOVAL, AND SALVAGE OR DISPOSAL OF EXISTING PIPE**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

5 A. Scope of Work: This section specifies the furnishing of all labor, materials, equipment,
6 and incidentals required to abandon, remove, salvage, and/or dispose of existing pipelines
7 and appurtenances as shown on the Drawings and as specified herein.

8 1.02 QUALITY ASSURANCE

9 A. Permits and Licenses: Contractor shall obtain and pay respective fees for all necessary
10 permits and licenses for performing the Work and shall furnish a copy of same to the
11 County prior to commencing the Work. The Contractor shall comply with the
12 requirements of the permits. All removal or abandonment of asbestos pipe material shall
13 be performed by a licensed asbestos abatement Contractor or Subcontractor registered in
14 the State of Florida.

15 B. Notices: Contractor shall issue written notices of planned Work to companies or local
16 authorities owning utility conduit, wires, or pipes running to or through the project site.
17 Copies of said notices shall be submitted to the County.

18 C. Standards:

- 19 1. Florida Administrative Code, Chapter 62-204.800
20 2. National Emission Standards Hazardous Air Pollution (NESHAP), 40 CFR Part 61,
21 Subpart M, latest revision
22 3. Occupational Safety and Health Act, 29 CFR
23 4. The Environmental Protection Agency (EPA) Asbestos Abatement Worker Protection
24 Rule
25 5. Florida Statute 455.300
26 6. Asbestos pipe handling best management practices provided at the end of this section

27 D. Quality Control

- 28 1. It shall be the responsibility of the Contractor to provide supervision and inspections
29 to ensure that the existing piping is removed and disposed, salvaged, or abandoned as
30 designated in the Drawings and as specified herein.
31 2. Asbestos Pipe
32 a. All removal or abandonment of pipe material containing asbestos shall be
33 performed by a licensed asbestos abatement Contractor or Subcontractor.

- 1 b. The asbestos abatement Contractor or Subcontractor shall contact the Orange
2 County Environmental Protection Division (407-836-1400) prior to removal or
3 abandonment of any asbestos material and shall obtain all required permits and
4 licenses and issue all required notices as required by the Orange County
5 Environmental Protection Division. The Contractor shall be responsible for all
6 fees associated with permits, licenses, and notices to the governing regulatory
7 agencies.
8 c. The asbestos abatement Contractor shall perform Work in accordance with all
9 applicable standards referenced in paragraph 1.02.C of this section.
10 d. The asbestos abatement Contractor shall have experience performing asbestos
11 removal similar to this Project.

12 1.03 SHOP DRAWINGS AND SUBMITTALS

- 13 A. Shop Drawings
14 1. Submittals shall be submitted to the County for review and acceptance prior to
15 construction in accordance with the General Conditions and specifications Section
16 01300 "Submittals."
17 2. Shop Drawings shall be submitted to the County for review and acceptance prior to
18 construction in accordance with these specifications for the following:
19 a. Grout
20 b. Caps and plugs
21 c. Credentials of licensed asbestos abatement Contractor including current
22 certification.

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

24 **PART 3 - EXECUTION**

25 3.01 REMOVAL, ABANDONMENT, SALVAGE, AND DISPOSAL

- 26 A. General: Existing piping designated on the Drawings to be removed shall be exposed and
27 removed by the Contractor.
28 B. Removal and Disposal
29 1. Pipe designated to be removed shall be completely drained and the contents properly
30 disposed. The piping system including fittings and valves shall then be completely
31 removed from the site.
32 2. Existing services and/or connections not shown on the Drawings shall be removed in
33 accordance with this section at no additional cost. Existing live services encountered
34 shall be maintained.
35 3. Asbestos: Pipe material containing asbestos shall be removed and disposed by a
36 licensed asbestos abatement Contractor or Subcontractor.

- 1 4. Structures shall be removed in accordance with Section 02050 "Demolition of
2 Existing Structures."
- 3 C. Removal of material to be salvaged
- 4 1. Pipe designated on the Drawings to be removed and salvaged shall be completely
5 drained and the contents properly disposed. The pipe shall then be thoroughly
6 pressure washed, palletized on wooden skids to a dimension not exceeding the
7 recommendation of the manufacturer, and conveyed to the County at the location
8 designated by the County.
- 9 2. Items to be salvaged:
- 10 a. Air release valves
- 11 b. Sanitary manhole rings and covers
- 12 c. Isolation valves
- 13 d. Valve boxes
- 14 e. Fire hydrant and valve assemblies
- 15 D. Abandonment
- 16 1. Pipe designated on the Drawings to be abandoned (or retired in place) shall be left in
17 place, drained, and its contents properly disposed. Pipe requires end caps or plugs.
18 All air release valves and vaults, valve boxes, fire hydrants, manholes, and manhole
19 rings and covers shall be removed and disposed of or salvaged as specified above.
- 20 2. All pipe 4-inches or larger to be abandoned in place shall be completely filled with
21 grout and each end of the pipe shall be plugged in a manner acceptable to the County.
- 22 3. Grout: Where designated on the Drawings, pipe to be abandoned shall be filled with
23 grout in accordance with Section 03600 "Grouting."
- 24 4. Plugs: Pipe to be abandoned shall be capped or plugged with a mechanical joint
25 fitting that will prevent soil or other deposits from entering the pipe.
- 26 E. Asbestos Pipe Handling Best Management Practices
- 27 1. Projects will require worker documentation before entering the regulated Work area.
28 A copy of: their current training certificate (workers and their supervisor); current
29 medical condition showing the doctor approved their working with asbestos and
30 wearing a respirator; signed acknowledgment forms; and current record (6-months) of
31 each workers respirator fit test will be required from all workers.
- 32 2. Projects also require air monitoring. OSHA will accept historic data on air
33 monitoring within 12-months of the Project, provided the data is from a project of
34 like material and conditions with a crew of the same experience, supervision, and
35 training. Otherwise, monitoring is required throughout the Project. OSHA requires
36 two (2) types of personnel air monitoring, full shift and 30-minute excursion level
37 (when highest levels are anticipated).
- 38 3. Some provisions should be made for worker showering or otherwise washing
39 following work before removing respirators, etc. Even if direct exposure is not
40 anticipated, and at a minimum, a source of water to rinse the respirators, wash
41 workers faces and hands, and (in the event of unanticipated direct exposure) some
42 place to shower is required. The workers will also need a change room and some
43 place to keep their street clothes and personal possessions.

- 1 4. Proposals to remove asbestos pipe sections by cutting must address how the cutting
2 debris will be captured and kept from becoming airborne. Soil that could be
3 considered contaminated may also have to be removed.
- 4 5. Licensed asbestos abatement Contractors or Subcontractors should have a pollution
5 endorsement in their liability insurance in case of asbestos fiber release. A
6 contingency plan, in case the project does not run as smoothly as expected, should be
7 developed and include emergency phone numbers kept on site during the Project.
- 8 6. Daily logs of the asbestos removal work should be kept, and should include sign in
9 sheets for the workers and whatever air monitoring was done. Accident reports and
10 other reports or correspondence if something unusual happened should also be
11 included.
- 12 7. Waste receipts must be kept through all stages of transport from the site to, and
13 including, the acceptance at the dumpsite where the material will be abandoned.
14 Amount of material removed must be equal to the amount of material to be turned
15 into to the dump.
- 16 8. The primary Contractor will give "approval for tear down" at project completion,
17 indicating that all asbestos removal operations are complete and whether there is a
18 need for any air monitoring. Air monitoring, if not required by any governing agency
19 or approved permit as discussed previously, may also be required by the County if
20 documentation to the general public pertaining to contamination is deemed necessary.
21 This air monitoring is normally done by collecting area samples downwind of the
22 project at the barrier tape or just inside it. It requires a source of electricity to run the
23 pumps, which is often provided by a generator.
24

25

END OF SECTION

1 **SECTION 02100**

2 **TEMPORARY EROSION AND SEDIMENTATION CONTROL**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

5 A. Scope of Work

- 6 1. The Work specified in this Section consists of designing, providing, maintaining and
7 removing temporary erosion, sedimentation and turbidity controls as necessary.
- 8 2. Temporary erosion controls include, but are not limited to, grassing, mulching, setting,
9 watering and reseeding on-site surfaces and soil and borrow area surfaces and providing
10 interceptor ditches at ends of berms and at those locations which will ensure that erosion
11 during construction will be either eliminated or maintained within acceptable limits as
12 established by federal, state and local requirements and by the County.
- 13 3. Temporary sedimentation controls include, but are not limited to; silt fence, silt dams,
14 traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that
15 sedimentation pollution will be either eliminated or maintained within acceptable
16 limits as established by federal, state and local requirements and by the County.
- 17 4. Temporary turbidity controls include, but are not limited to, floating or staked
18 turbidity barriers which will ensure that turbidity pollution will be either eliminated or
19 maintained within acceptable limits as established by Federal, state, and local
20 requirements and by the County.
- 21 5. Contractor is responsible for providing effective temporary erosion, sediment, and turbidity
22 control measures during construction or until permanent controls become effective.

- 23 B. Related Work Described Elsewhere: South Florida Building Code and Standard Building Code,
24 FDOT Standard Specifications for road and bridge construction and FDOT Design Standards.

25 **PART 2 - PRODUCTS**

26 2.01 EROSION CONTROL

- 27 A. Netting Fence: fabricated of material acceptable to the County.
- 28 B. Sod is specified in Section 02578, "Solid Sodding."

29 2.02 SEDIMENTATION CONTROL

- 30 A. Bales: clean, seed-free cereal hay type.
- 31 B. Netting: fabricated of material acceptable to the County.
- 32 C. Filter stone: crushed stone conforming to Florida Department of Transportation
33 specifications.

- 1 D. Concrete block: hollow, non-load bearing type.
- 2 E. Concrete: exterior grade not less than 1-inch thick.
- 3 F. Rock Bags: conforming to FDOT Specifications.

4 2.03 TURBIDITY CONTROL

- 5 A. Conforming to FDOT Design Standards Index 103 - Turbidity Barriers.

6 **PART 3 - EXECUTION**

7 3.01 EROSION CONTROL

- 8 A. Minimum Procedures for Grassing Are:

- 9 1. Scarify slopes to a depth of not less than 6-inches and remove large clods, rock,
- 10 stumps and roots larger than 1/2-inch in diameter and debris.
- 11 2. Sow seed within 24-hours after the ground is scarified with either mechanical seed
- 12 drills or rotary hand seeders.
- 13 3. Apply mulch loosely and to a thickness of between 3/4-inch and 1-1/2-inches.
- 14 4. Apply netting over mulched areas on sloped surfaces.
- 15 5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and
- 16 growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and
- 17 seed eroded areas.

18 3.02 SEDIMENTATION CONTROL

- 19 A. Install and maintain silt fence, silt dams, traps, barriers and appurtenances as shown on
- 20 the approved descriptions and working Drawings. Hay bales which deteriorate and filter
- 21 stone which is dislodged shall be replaced.

22 3.03 TURBIDITY CONTROL

- 23 A. Install and maintain turbidity barriers daily and as described in FDOT Index #103.

24 3.04 PERFORMANCE

- 25 A. Should any of the temporary erosion and sediment control measures employed by the
- 26 Contractor fail to produce results which comply with the requirements of the State of
- 27 Florida, the Contractor shall immediately take whatever steps are necessary to correct the
- 28 deficiency at his own expense.

29 **END OF SECTION**

1 **SECTION 02140**

2 **DEWATERING**

3 **PART 1 - GENERAL**

4 1.01 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
7 with the requirements set forth, as shown on the Drawings, and/or geotechnical report.

8 1.02 QUALITY ASSURANCE

9 A. Qualifications: The Contractor shall engage a Geotechnical Engineer registered in the
10 State of Florida, to design the temporary dewatering system. The Contractor shall submit
11 conceptual plan for the dewatering system prior to commencing work. The dewatering
12 system installed shall be in conformity with the overall construction plan and certification
13 of this shall be provided by the Geotechnical Engineer. The dewatering system shall be
14 designed by a firm who regularly engages in the design of dewatering systems and who is
15 fully experienced, reputable 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
19 federal permits (including the Orange County, St. Johns River Water Management
20 District, and/or South Florida Management District discharge permits) required for the
21 withdrawal, treatment and disposal/discharge of water from the dewatering operation,
22 prior to start of work.

23 D. Comply with Florida Administrative Code, Chapter 62-621.300 (2).

24 1.03 SHOP DRAWINGS AND SUBMITTALS

25 A. Submittals shall be submitted to the County for review and acceptance prior to
26 construction in accordance with the General Conditions and specifications Section 01300
27 "Submittals."

28 B. In accordance with FAC 62-621.300(2), submit analytical test results from a certified
29 laboratory for the parameters listed in the FDEP "Generic Permit for the Discharge of
30 Produced Ground Water from Any Non-Contaminated Site Activity" to the FDEP and the
31 County. The submitted information shall show the location of the work, where the water
32 will be going to, as well as an estimate for the amount, rate and duration of discharge
33 being proposed.

- 1 C. Provide notification to all jurisdictional permitting agencies in accordance with the
2 requirements of the respective agency.
- 3 D. Provide a detailed plan and operation schedule for dewatering of excavations.
4 1. Provide descriptive literature of the dewatering system.
5 2. Provide a plan for erosion and sedimentation control during dewatering.
6 3. Provide copies of all permits/approvals for disposal/discharge of water during
7 dewatering.

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

9 **PART 3 - EXECUTION**

10 3.01 GENERAL

- 11 A. The Contractor shall have on-site and available the analytical test results performed in
12 accordance with the FDEP "Generic Permit for the Discharge of Produced Ground Water
13 from Any Non-Contaminated Site Activity" (FAC 62-621.300(2)).
- 14 B. The Contractor shall provide adequate equipment for the removal of storm or subsurface
15 waters which may accumulate within the excavation.
- 16 C. The Contractor's attention is directed to the water surface elevations discussed in the
17 report(s) on subsurface investigations. Water levels will normally vary from season to
18 season.
- 19 D. The Contractor shall be required to monitor the performance of the dewatering system
20 during the progress of the Work and make such modifications as may be required to
21 assure that the systems will perform satisfactorily. The dewatering system shall be
22 designed in such a manner as to preserve the undisturbed bearing capacity of the sub-
23 grade soils at the bottom of the trench or excavation.
- 24 E. Prior to excavation, the Contractor shall submit his proposed method of dewatering and
25 maintaining dry conditions to the County. Approval of the dewatering plan shall not
26 relieve the Contractor of the responsibility for the satisfactory performance of the system.
27 The Contractor shall be responsible for correcting any disturbance of natural bearing soils
28 or damage to structures caused by an inadequate dewatering system or by interruption of
29 the continuous operation of the system as specified.
- 30 F. If subsurface water is encountered, the Contractor shall utilize suitable equipment to
31 adequately dewater the excavation. A wellpoint system or other County acceptable
32 dewatering method shall be utilized if necessary to maintain the excavation in a dry
33 condition for preparation of the trench bottom and for pipe laying. Within and adjacent
34 to residential areas and other areas as required by the County, engines driving dewatering
35 pumps shall be equipped with residential type mufflers and the noise shall not exceed 55
36 decibels within 50-feet.

1 3.02 DEWATERING AND DISPOSAL

- 2 A. The Contractor shall construct and place all pipelines, structures, concrete work,
3 structural fill, backfill and bedding material in-the-dry. In addition, the Contractor shall
4 make the final 24-inches of excavation in-the-dry and not until the water level is a
5 minimum of 2-foot below proposed bottom of excavation. For purposes of this Contract,
6 in-the-dry is defined as $\pm 2\%$ of the optimum moisture content of the soil.
- 7 B. The Contractor shall, at all times during construction, provide and maintain proper
8 equipment and facilities to remove promptly and dispose of all water entering
9 excavations. Contractor shall keep excavations dry so as to obtain a satisfactory
10 undisturbed subgrade foundation condition until the fill, structure, or pipes have been
11 completed to such extent that they will not be floated or otherwise damaged by allowing
12 water levels to return to natural elevations.
- 13 C. Dewatering shall at all times be conducted in such a manner as to preserve the natural
14 undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
- 15 D. It is expected that dewatering will be required for pre-drainage of the soils prior to final
16 excavation for most of the in-ground structures or piping and for maintaining the lowered
17 groundwater level until construction has been completed so that the structure, pipeline or
18 fill will not be floated or otherwise damaged.
- 19 E. If wellpoints are used, Contractor shall adequately space wellpoints to maintain the
20 necessary dewatering. Provide suitable filter sand and/or other means to prevent
21 pumping of fine sands and silts. A continual check shall be maintained by the Contractor
22 to ensure that the subsurface soil is not being removed by the dewatering operations.
23 Pumping from wellpoints shall be continuous and standby pumps shall be provided.
- 24 F. The Contractor's proposed method of dewatering shall include groundwater observation
25 wells to determine the water level during construction. Observation wells shall be
26 installed along pipelines as required to verify depth to water level and at locations
27 approved by the County.
- 28 G. At all times, site grading shall promote drainage. Surface runoff shall be diverted from
29 excavations. Water entering the excavation from the surface shall be collected in shallow
30 ditches around the perimeter of the excavation, drained to sumps, and pumped or drained
31 by gravity to maintain an excavation bottom free from standing water.
- 32 H. Flotation shall be prevented by the Contractor by maintaining a positive and continuous
33 removal of water. The Contractor shall be fully responsible for all damages which may
34 result from failure to adequately keep excavations dewatered.
- 35 I. The Contractor shall dispose of water from the Work in a suitable manner without
36 damage to adjacent properties or facilities. No water shall be discharged without
37 appropriate treatment for adverse contaminants. No water shall be drained in work built
38 or under construction without prior consent from the County. Water shall be filtered to
39 remove sand and fine soil particles before disposal into any drainage system.

1 J. Dewatering of excavations shall be considered incidental to the construction of the Work
2 and all costs shall be included in the various Contract prices in the Bid Form, unless a
3 separate bid item has been established for dewatering.

4 3.03 GROUNDWATER TREATMENT (IF REQUIRED)

5 A. If concentrations of tested groundwater quality parameters exceed those allowable in the
6 FDEP Generic Permit for the Discharge of Produced Groundwater from any Non-
7 Contaminated Site Activity (62-621.300(2), F.A.C.), the Contractor shall treat the
8 effluent.

9 B. The Contractor shall immediately notify the County and discuss the parameters that
10 exceed allowable limits.

11 C. The Contractor shall meet with the FDEP to determine alternatives that are acceptable to
12 the FDEP.

13 D. The Contractor shall apply for and obtain any and all permits and/or treatment approvals
14 that FDEP requires including but not limited too:

- 15 1. Generic Permit for Discharges from Petroleum Contaminated Sites (62-621.300(1)).
16 Allows discharges from sites with automotive gasoline, aviation gasoline, jet fuel, or
17 diesel fuel contamination; or
- 18 2. Permit for all Other Contaminated Sites (62-04; 62-302; 62-620 & 62-660). The
19 coverage is available only through the individual NPDES permit issued by FDEP,
20 allows discharges from sites with general contaminant issues i.e. ground water and/or
21 soil contamination other than petroleum fuel contamination; or
- 22 3. Generic Permit for the Discharge of Produced Ground Water from Any Non-
23 Contaminated Site Activity (62-621.300(2), F.A.C.); or
- 24 4. Generic Permit for Stormwater Discharge from Large or Small Construction
25 Activities (62-621.300(4)(a), F.A.C.); or
- 26 5. An Individual Wastewater Permit (62-604.300(8) (a)

27 E. The Contractor shall implement the appropriate treatment that is acceptable to FDEP and
28 County to attain compliance for all excess limits encountered during dewatering
29 activities. Treatment may include, but is not limited to: Chemical, Biological,
30 Electrolysis or any combination of the three.

31 F. The Contractor shall make every effort to minimize the spread of contamination into
32 uncontaminated areas. Provide for the health and safety of all workers at the job site and
33 make provisions necessary for the health and safety of the public that may be exposed to
34 any potentially hazardous conditions. Ensure provision adhere to all applicable laws,
35 rules or regulations covering hazardous conditions and will be in a manner commensurate
36 with the level of severity of the conditions.

37 G. If necessary, provide contamination assessment and remediation personnel to handle site
38 assessment, determine the course of action necessary for site security and perform the
39 necessary steps under applicable laws, rules and regulations for additional assessment
40 and/or remediation work to resolve the contaminations issue.

- 1 H. Delineate the contamination area(s) and any staging or holding area required and develop
2 a work plan that will provide the schedule of projected completion dates for the final
3 resolution of the contamination issue.

- 4 I. Maintain jurisdiction over activities inside any delineated contamination areas and any
5 associated staging or holding areas. Be responsible for the health and safety of workers
6 within the delineated areas. Provide continuous access to representatives of regulatory or
7 enforcement agencies having jurisdiction.

8 3.04 REMOVAL

9 Immediately upon completion of the dewatering system, the Contractor shall remove all of
10 his equipment, materials, and supplies from the site of the Work, remove all surplus materials
11 and debris, fill in all holes or excavations, and grade the site to elevations of the surface
12 levels which existed before work started. The site shall be thoroughly cleaned and approved
13 by the County.

14 **END OF SECTION**

1

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1 **SECTION 02215**

2 **FINISH GRADING**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

5 A. Scope of Work: Provide finish grading to all areas within the limits of construction.

6 B. Grade sub-soil. Cut out areas to receive stabilizing base course materials for paving and
7 sidewalks. Place, finish grade, and compact topsoil.

8 1.02 PROTECTION

9 A. Prevent damage to existing fencing, trees, landscaping, natural features, benchmarks,
10 pavement, and utility lines. Correct damage at no cost to the County.

11 1.03 SHOP DRAWINGS AND SUBMITTALS

12 A. Submittals shall be submitted to the County for review and acceptance prior to construction
13 in accordance with the General Conditions and specifications Section 01300 "Submittals."

14 **PART 2 - PRODUCTS**

15 2.01 MATERIALS

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

18 B. Topsoil: Friable loam free from subsoil, roots, grass, excessive amount of weeds, stones,
19 and foreign matter; acidity range (pH) of 5.5 to 7.5; containing a minimum of 4% and a
20 maximum of 25% organic matter. The topsoil shall be suitable for the proposed plant
21 growth shown on the Drawings and specified. Use topsoil stockpiles on site if
22 conforming to these requirements. If there is not sufficient topsoil available at the project
23 site, the Contractor shall furnish additional topsoil as required to complete the Work at no
24 additional cost to the County.

25 **PART 3 - EXECUTION**

26 3.01 SUB SOIL PREPARATION

27 A. Rough grade sub-soil systematically to allow for a maximum amount of natural settlement
28 and compaction. Eliminate uneven areas and low spots. Remove debris, roots, branches,
29 stones, etc. Remove sub-soil that has been contaminated with petroleum products.

- 1 B. Cut out areas to subgrade elevation which are to receive stabilizing base for paving and
2 sidewalks.
- 3 C. Bring sub soil to required levels, profiles, and contours. Make changes in grade gradual.
4 Blend slopes into level areas.
- 5 D. Slope grade away from building a minimum of 2-inches in 10-feet unless indicated
6 otherwise on the Drawings.
- 7 E. Cultivate subgrade to a depth of 3-inches where topsoil is to be placed. Repeat
8 cultivation in areas where equipment used for hauling and spreading topsoil has
9 compacted sub-soil.

10 3.02 PLACING TOPSOIL

- 11 A. Place topsoil in areas where seeding, sodding, and planting is to be performed. Place to
12 the following minimum depths, up to finished grade elevations.
 - 13 1. 6-inches for seeded areas
 - 14 2. 4-1/2-inches for sodded areas
 - 15 3. 24-inches for shrub beds
 - 16 4. 18-inches for flower beds
- 17 B. Use topsoil in relatively dry state. Place during dry weather.
- 18 C. Fine grade topsoil eliminating rough and low areas to ensure positive drainage. Maintain
19 levels, profiles, and contours of subgrades.
- 20 D. Remove stones, roots, grass, weeds, debris, and other foreign material while spreading.
- 21 E. Manually spread topsoil around trees, plants, and buildings to prevent damage which may
22 be caused by grading equipment.
- 23 F. Lightly compact placed topsoil.

24 3.03 SURPLUS MATERIAL

- 25 A. Remove surplus sub soil and topsoil from site.
- 26 B. Leave stockpile areas and entire job site clean and raked, ready to receive landscaping.
27

28 **END OF SECTION**

1 1.02 QUALITY ASSURANCE

2 A. Testing laboratory employed by the County will make such tests as are deemed advisable.
3 The Contractor shall schedule his work to permit a reasonable time for testing before
4 placing succeeding lifts and shall keep the laboratory informed of his progress. Costs for
5 initial testing shall be paid by the County; however, tests which have to be repeated
6 because of the failure of the tested material to meet specification shall be paid for by the
7 Contractor and the cost of re-testing shall be deducted from payments due the Contractor.

8 B. Standards

- 9 1. AASHTO: American Association of State Highway and Transportation Officials
10 2. ANSI: American National Standards Institute
11 3. ASCE: American Society of Civil Engineers
12 4. ASTM: American Society for Testing and Materials
13 5. AWWA: American Water Works Association
14 6. OSHA 29 CFR Subpart P – Excavations and Trenches a) 1926.650, 1926.651,
15 1926.652
16 7. OSHA 29 CFR Subpart J - a) 1910.146 for Confined Space Entry

17 1.03 JOB CONDITIONS

18 A. Existing Utilities

- 19 1. The Contractor is responsible for subsurface verification of existing utilities prior to
20 construction. Locate existing utilities in the area of work in accordance with
21 Sunshine State One Call regulations, Chapter 556, "Underground Facility Damage
22 Prevention and Safety Act", FS.
23 2. Should uncharted or incorrectly charted piping or other utility be encountered during
24 excavation, notify the County. Keep all facilities in operation and repair damaged
25 utilities to the satisfaction of the County.
26 3. Damage and repair costs to such piping or utilities are the Contractor's responsibility.
27 4. If utilities are to remain in place, the Contractor shall provide adequate means of
28 protection.

29 B. Test borings and the sub-surface exploration data if previously done on the site will be
30 made available upon request and are for the Contractor's information only.

31 1.04 PROTECTION

32 A. Sheet piling and Bracing

- 33 1. Requirements of the Trench Safety Act shall be adhered to at all times.

- 1 2. Furnish, put in place, and maintain such sheeting and bracing as may be required to
2 support the sides of excavations, to prevent any movement which could in any way
3 diminish the width of the excavation below that necessary for proper construction, to
4 protect adjacent structures and power poles from undermining, and to protect workers
5 from hazardous conditions or other damage. Such support shall consist of braced
6 steel sheet piling, braced wood lagging and soldier beams or other acceptable
7 methods. If the County is of the opinion that at any point sufficient or proper
8 supports have not been provided, the County may order additional supports put in at
9 the expense of the Contractor, and compliance with such order shall not relieve or
10 release the Contractor from his responsibility for the sufficiency of such supports.
11 Care shall be taken to prevent voids outside of the sheeting, but if voids are formed,
12 they shall be immediately filled and compacted. Where soil cannot be properly
13 compacted to fill a void, lean concrete shall be used as backfill at no additional
14 expense to the County.
- 15 3. The Contractor shall construct the sheeting outside the neat lines of the foundation
16 unless indicated otherwise for the method of operation. Sheeting shall be plumb and
17 securely braced and tied in position. Sheeting and bracing shall be adequate to
18 withstand all pressure to which the structure or trench will be subjected. Any
19 movement or bulging which may occur shall be corrected by the Contractor at their
20 own expense so as to provide the necessary clearances and dimensions.
- 21 4. Where sheeting and bracing is required to support the sides of excavations for
22 structures, the Contractor shall engage a Professional Geotechnical Engineer,
23 registered in the State of Florida, to design the sheeting and bracing. The sheeting
24 and bracing installed shall be in conformity with the design, and the Professional
25 Engineer shall provide certification of this.
- 26 5. The installation of sheeting, particularly by driving or vibrating, may cause distress to
27 existing structures. The Contractor shall evaluate the potential for such distress and,
28 if necessary, take all precautions to prevent distress of existing structures because of
29 sheeting installation.
- 30 6. The Contractor shall leave in place to be embedded in the backfill all sheeting and
31 bracing not shown on the Drawings but which the County may direct him in writing
32 to leave in place at any time during the progress of the Work for the purpose of
33 preventing damage to structures, utilities, or property, whether public or private. The
34 County may direct that timber used for sheeting and bracing be cut off at any
35 specified elevation.
- 36 7. All sheeting and bracing not left in place shall be carefully removed in such manner
37 as not to endanger the construction or other structures, utilities, or property. All voids
38 left or caused by withdrawal of sheeting shall be immediately refilled with sand by
39 ramming with tools especially adapted to that purpose, or otherwise as may be
40 directed by the County.
- 41 8. The right of the County to order sheeting and bracing left in place shall not be
42 construed as creating any obligation on the County's part to issue such orders, and
43 their failure to exercise this right shall not relieve the Contractor from liability for
44 damages to persons or property occurring from or upon the Work occasioned by
45 negligence or otherwise, growing out of a failure on the part of the Contractor to
46 leave in place sufficient sheeting and bracing to prevent any caving or moving of the
47 ground.

- 1 9. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and
2 under no circumstances shall any wood sheeting be cut off at a level lower than 1-foot
3 above the top of any pipe.

4 B. Pumping and Drainage:

- 5 1. The Contractor shall at all times during construction provide and maintain proper
6 equipment and facilities to remove all water entering excavations, and shall keep such
7 excavations dry so as to obtain a satisfactory undisturbed subgrade foundation
8 condition until the fills, structures, or pipes to be built thereon have been completed to
9 such extent that they will not be floated or otherwise damaged by allowing the water
10 level to return to the natural level as stipulated in Section 02140 "Dewatering." The
11 Contractor shall engage a Professional Geotechnical Engineer registered in the State
12 of Florida to design the dewatering systems. The Contractor shall submit to the
13 County for a plan for dewatering systems prior to commencing work. The dewatering
14 system installed shall be in conformity with the overall construction plan, and the
15 Professional Engineer shall provide certification of this. The Professional Engineer
16 shall be required to monitor the performance of the dewatering systems during the
17 progress of the Work and require such modifications as may be required to assure that
18 the systems are performing satisfactorily.
- 19 2. Dewatering shall at all times be conducted in such a manner as to preserve the
20 undisturbed bearing capacity of the subgrade soils at the proposed bottom of
21 excavation and to preserve the integrity of adjacent structures. Dewatering by trench
22 pumping will not be permitted if migration of fine grained natural material from
23 bottom, sidewalls, or bedding material will occur.
- 24 3. Water entering the excavation from surface runoff shall be collected in shallow
25 ditches around the perimeter of the excavation, drained to sumps, and pumped from
26 the excavation to maintain a bottom free from standing water.
- 27 4. The Contractor shall take all additional precautions to prevent uplift of any structure
28 during construction.
- 29 5. Permission to use any storm sewers or drains for water disposal purposes shall be
30 obtained from the authority having jurisdiction. Any requirements and costs for such
31 use shall be the responsibility of the Contractor. However, the Contractor shall not
32 cause flooding by overloading or blocking up the flow in the drainage facilities, and
33 he shall leave the facilities unrestricted and as clean as originally found. Any damage
34 to facilities shall be repaired or restored as directed by the County or the authority
35 having jurisdiction, at no cost to the County.
- 36 6. The Contractor shall prevent flotation by maintaining a positive and continuous
37 operation of the dewatering system. The Contractor shall be fully responsible and
38 liable for all damages which may result from failure of this system.
- 39 7. Removal of dewatering equipment shall be accomplished after compaction/density
40 testing has been completed and the system is no longer required. The Contractor
41 shall remove the material and equipment constituting the system.
- 42 8. The Contractor shall take all necessary precautions to preclude the accidental
43 discharge of fuel, oil, or other contaminants in order to prevent adverse effects on
44 groundwater quality.

1 1.05 TESTING AND INSPECTION SERVICE

2 A. The County will provide a geotechnical testing and inspection service. The services
3 include testing soil materials and quality control testing during filling and backfilling
4 operations. Samples of soil materials shall be furnished to the testing service by the
5 Contractor. The County shall pay costs of initial geotechnical testing. The Contractor
6 shall pay for any subsequent testing required due to failure and laboratory stand-by
7 charges incurred.

8 B. The Contractor shall provide monthly density testing reports to the County during
9 backfilling activities. Density testing reports not submitted in a timely manner shall
10 result in rejection of the pipe installed and rejection of the density testing reports until
11 such time that density re-testing is coordinated and repeated at the Contractors expense.

12 C. Density testing scheduled subsequent to backfilling activities shall be coordinated with,
13 and witnessed by the County. Failure by the Contractor to coordinate or have the County
14 present shall result in rejection of the submitted density testing reports and re-testing at
15 the Contractor's expense.

16 D. Dewatering systems shall not be removed until compaction/density testing has been
17 completed.

18 **PART 2 - PRODUCTS**

19 2.01 MATERIALS

20 A. General:
21 1. All fill material shall be subject to the review and acceptance of the County.
22 2. All fill material shall be free of organic material, trash, or other objectionable
23 material. The Contractor shall remove excess or unsuitable material from the job site.

24 B. Common Fill Material: Common fill shall consist of mineral soil, substantially free of
25 clay, organic material, muck, loam, wood, trash, and other objectionable material which
26 may be compressible or which cannot be compacted properly. Common fill shall not
27 contain stones larger than 3-1/2-inches in any dimension in the top 12-inches or 6-inches
28 in any dimension in the balance of fill area. Common fill shall not contain asphalt,
29 broken concrete, masonry, rubble or other similar materials. It shall have physical
30 properties that allow it to be easily spread and compacted during filling. Additional
31 common fill shall be no more than 12 % by weight finer than the No. 200 mesh sieve,
32 unless finer material is approved for use in a specific location by the County. Select
33 Common Fill shall be as specified as above from common fill, except that the material
34 shall contain no stones larger than 1/2-inches in largest dimension, and shall be no more
35 than 5 % by weight finer than the No. 200 mesh sieve.

1 C. Structural Fill: Structural fill shall be reasonably well graded sand to gravelly sand
2 having the following gradation:
3

US Sieve Size	Percent Passing By Weight
No. 1	100
No. 4	75 - 100
No. 40	15 - 80
No. 100	0 - 30
No. 200	0 - 12

4 D. Class 1 Soils*: Manufactured angular, granular material, 1/4 to 1-1/2-inches (6 to 4 mm)
5 size, including materials having significance such as crushed stone or rock, broken coral,
6 crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below
7 separately.

8 Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay,
9 loam or organic matter, conforming to ASTM C33 stone size No. 89 and with particle
10 size limits as follows:
11

U.S. Sieve Size	% Passing By Weight
1/2	100
3/8	100
No. 4	20 - 25
No. 8	5 - 30
No. 16	0 - 10
No. 50	0 - 2

- 12 E. Class II Soils**:
- 13 1. GW: Well graded gravels and gravel-sand mixtures, little or no fines. Fifty percent or
14 more retained on No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
 - 15 2. GP: Poorly graded gravels and gravel-sand mixtures, little or no fines. Fifty percent
16 or more retained on No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
 - 17 3. SW: Well graded sands and gravelly sands, little or no fines. More than passes No.
18 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
 - 19 4. SP: Poorly graded sands and gravelly sands, little or no fines. More than 50 % passes
20 No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.

21 *Soils defined as Class I materials are not defined in ASTM D2487.

22 **In accordance with ASTM D2487, less than 5 % pass No. 200 sieve.
23

1 F. Coarse Sand: Sand shall consist of clean mineral aggregate with particle size limits as
2 follows:
3

U.S. Sieve Size	Percent Passing By Weight
3/8	100
No. 10	85 – 100
No. 40	20 – 40
No. 200	0 - 12

4 G. Other Material: All other material, not specifically described, but required for proper
5 completion of the Work shall be selected by the Contractor and acceptable by the County.

6 **PART 3 - EXECUTION**

7 3.01 PREPARATION

8 A. Clearing:

- 9 1. The construction areas shall be cleared of all obstructions and vegetation including
10 large roots and undergrowth within 10-feet of the lines of the excavation.
11 2. Strip and stockpile topsoil on the site at the location to be determined by the County.

12 3.02 EXCAVATION

13 A. General: Excavations for roadways, structures, and utilities must be carefully executed in
14 order to avoid interruption of utility service.

15 B. Excavating for Roadways/Structures/Utilities:

- 16 1. Excavation shall be made to such dimensions as will give suitable room for building
17 the foundations and the structures, for bracing and supporting, for pumping and
18 draining, and for all other work required.
19 a. Excavation for precast or prefabricated structures shall be carried to an elevation
20 2-feet lower than the proposed outside bottom of the structure to provide space for
21 the select backfill material. Prior to placing the select backfill, the excavation
22 shall be measured by the County to verify that the excavation has been carried to
23 the proper depth and is reasonably uniform over the area to be occupied by the
24 structure.
25 b. Excavation for structures constructed or cast in place in dewatered excavations
26 shall be carried down to the bottom of the structure where dewatering methods are
27 such that a dry excavation bottom is exposed and the naturally occurring material
28 at this elevation leveled and left ready to receive construction. Material disturbed
29 below the founding elevation in dewatered excavations shall be replaced with
30 Class B concrete.
31 c. Footings: Cast-in-place concrete footing sides shall be formed immediately after
32 excavation.
33 2. Immediately document the location, elevation, size, material type and function of all
34 new subsurface installations, and utilities encountered during the course of
35 construction.

- 1 3. Excavation equipment operators and other concerned parties shall be familiar with
2 subsurface obstructions as shown on the Drawings and should anticipate the
3 encounter of unknown obstructions during the course of the Work.
- 4 4. Encounters with subsurface obstructions shall be hand excavated.
- 5 5. Excavation and dewatering shall be accomplished by methods that preserve the
6 undisturbed state of subgrade soils. Subgrade soils which become soft, loose, "quick"
7 or otherwise unsatisfactory for support of structures as a result of inadequate
8 dewatering or other construction methods shall be removed and replaced by crushed
9 stone as required by the County at the Contractor's expense.
- 10 6. The bottom of excavations shall be rendered firm and dry before placing any piping
11 or structure.
- 12 7. All pavements shall be cut with saws or approved power tools prior to removal.
- 13 8. Excavated material shall be stockpiled in such a manner as to prevent nuisance
14 conditions. Surface drainage shall not be hindered. Excavated material not suitable
15 for backfill shall be removed from the site and disposed of by the Contractor.

16 3.03 DRAINAGE

- 17 A. The Contractor shall at all times during construction provide and maintain proper
18 equipment and facilities to remove promptly and dispose of properly all water entering
19 excavations, and keep such excavations dry so as to obtain a satisfactory undisturbed
20 subgrade foundation condition. The dewatering method used shall prevent disturbance of
21 earth below grade.
- 22 B. All water pumped or drained from the Work shall be disposed of in a suitable manner
23 without undue interference with other work, without damage to surrounding property,
24 and in accordance with pertinent rules and regulations.
- 25 C. No construction, including pipe laying, shall be allowed in water. No water shall be
26 allowed to contact masonry or concrete within 24-hours after being placed. The
27 Contractor shall constantly guard against damage due to water and take full responsibility
28 for all damage resulting from his failure to do so.
- 29 D. The Contractor will be required at his expense to excavate below grade and refill with
30 crushed stone (gradation 57 or 89) or other acceptable fill material if the County
31 determines that adequate dewatering has not been provided.

32 3.04 UNDERCUT

- 33 A. If the bottom of any excavation is below that shown on the Drawings or specified
34 because of Contractor error, convenience, or unsuitable subgrade due the Contractor's
35 excavation methods, he shall refill to normal grade with fill at his own cost. Fill material
36 and compaction method shall be approved by the County.

1 3.05 FILL AND COMPACTION

2 A. Compact and backfill excavations and construct embankment according to the following
3 schedule. (Modified Proctor standard shall be ASTM D-1557):
4

5 STRUCTURES AND ROADWORK
6

Area	Material	Compaction
Beneath Structures	Structural Fill	12-inch lifts, compacted to 98% maximum density as determined by AASHTO T-180. Fill Should not be placed over any in-place soils until those deposits have been compacted to 98% Modified Proctor.
Around Structures	Structural Fill	12-inch lifts, 95% of maximum density as determined by AASHTO T-180. Rubber Tire or vibratory plate compactors shall be used
Beneath Paved Surfaces	Common Fill	12-inch lifts, 98% by maximum density as determined by AASHTO T-180 or as required by the FDOT Standards.
Open Areas	Common Fill	12-inch lifts, 95% by maximum density as determined by AASHTO T-180.

7 B. Pipe shall be laid in open trenches unless otherwise indicated on the Drawings or
8 elsewhere in the Contract Documents.

9 C. Excavations shall be backfilled to the original grade or as indicated on the Drawings.
10 Deviation from this grade because of settling shall be corrected. The backfill operation
11 shall be performed to comply with all rules and regulations and in such a manner that it
12 does not create a nuisance or safety hazard.

13 D. Embankments shall be constructed true to lines, grades, and cross sections shown on the
14 plans or ordered by the County. Embankments shall be placed in successive layers of not
15 more than 8-inches in thickness, loose measure, for the full width of the embankment. As
16 far as practicable, traffic over the Work during the construction phase shall be distributed
17 so as to cover the maximum surface area of each layer.

18 E. If the Contractor requests approval to backfill material utilizing lifts and/or methods other
19 than those specified herein, such request shall be in writing to the County. Acceptance
20 will be considered only after the Contractor has performed tests, at the Contractor's
21 expense, to identify the material used and density achieved throughout the backfill area
22 utilizing the method of backfill requested. The County's acceptance shall be in writing.

23 F. One compaction test location shall be required for each 300 linear feet of pipe and for
24 every 100 square feet of backfill around structures as a minimum. The County may
25 determine that more compaction tests are required to certify the installation depending on
26 field conditions. The locations of the compaction tests within the trench shall be in
27 conformance with the following schedule:

- 28 1. At least one test at the spring line of the pipe.

- 1 2. At least one test for each 12-inch layer of backfill within the pipe bedding zone for
2 pipes 24-inches and larger.
- 3 3. One test at an elevation of 1-foot above the top of pipe.
- 4 4. One test for each 2-feet of backfill placed from 1-foot above the top of the pipe to
5 finished grade elevation.
- 6 5. Density testing is required for sanitary sewer manholes. Tests shall be staggered
7 around the manhole within 3-feet of the structure's outside diameter.
 - 8 a. First test shall be 1-foot above the structure base.
 - 9 b. Second test shall be 2-feet above the first test and subsequent tests every 2-feet up
10 the finished grade.
- 11 6. The Contractor shall provide additional compaction and testing prior to commencing
12 further construction if the County's testing reports and inspection indicate that the fill
13 has been placed below specified density.
- 14 7. The Contractor shall coordinate testing with the County approved testing laboratory
15 and shall provide monthly test results to the County in a timely manner during
16 construction activities. Density testing scheduled subsequent to backfilling activities
17 shall be coordinated with the County and witnessed by the County representative.
18 Failure by the Contractor to coordinate or have the County representative present
19 shall result in rejection of the submitted density testing reports and re-testing at the
20 Contractor's expense. Density testing reports not submitted in a timely manner shall
21 result in rejection of the pipe installed and rejection of the density testing reports until
22 such time that density re-testing is coordinated and repeated at the Contractor's
23 expense as deemed necessary by the County's representative.
- 24 8. Dewatering systems shall not be removed until compaction/density testing has been
25 completed.
- 26

27

END OF SECTION

- 1 C. The liquid limit shall not exceed 35 and the material shall be non-plastic.
- 2 D. Limerock material shall not contain cherty or other extremely hard pieces, lumps, balls,
3 or pockets of sand or clay size material in sufficient quantity as to be detrimental to the
4 proper bonding, finishing, or strength of the limerock base.
- 5 E. At least 97% (by weight) of the material shall pass a 3-1/2-inch sieve and the material
6 shall be graded uniformly to dust. The fine material shall consist entirely of dust of
7 fracture. All crushing or breaking-up which might be necessary in order to meet such size
8 requirements shall be done before the material is placed on the road.
- 9 F. Limerock shall have an average LBR of not less than 100.

10 **PART 3 - EXECUTION**

11 3.01 GENERAL

- 12 A. The limerock shall be transported to the point where it is to be used, over rock previously
13 placed if practicable, and dumped on the end of the preceding spread. Hauling over the
14 subgrade and dumping on the subgrade will be permitted only when, in the County's
15 opinion, these operations will not be detrimental to the base.

16 3.02 SPREADING LIMEROCK

- 17 A. The limerock shall be spread uniformly. All segregated areas of fine or coarse rock shall
18 be removed and replaced with properly graded rock.
- 19 B. When the specified compacted thickness of the base is greater than 6-inches, the base
20 shall be constructed in 2 courses. The thickness of the first course shall be approximately
21 one-half the total thickness of the finished base, or enough to bear the weight of the
22 construction equipment without disturbing the subgrade.
- 23 C. All operations for constructing limerock base for shoulder construction at any particular
24 location shall be done prior to placing the final course of pavement on the traveled
25 roadway. In the construction of limerock base on the shoulders, the Contractor shall
26 assure that the dumping of the limerock material shall be at such points and in such
27 manner, that no significant material is allowed on the adjacent pavement, to scar or
28 contaminate the pavement surface. Any limerock material which is deposited on the
29 surface course for any reason shall be immediately swept off.

30 3.03 COMPACTING AND FINISHING BASE

- 31 A. For single course base, after the spreading is completed the entire surface shall be
32 scarified and then shaped so as to produce the required grade and cross section after
33 compaction.

- 1 B. For double course base, the first course shall be cleaned of foreign material and bladed
2 and brought to a surface cross section approximately parallel to that of the finished base.
3 Prior to the spreading of any material for the upper course, the density tests for the lower
4 course shall be made and the County shall have determined that the required compaction
5 has been obtained. After the spreading of the material for the second course is
6 completed, its surface shall be finished and shaped so as to produce the required grade
7 and cross section after compaction, and free of scabs or laminations.
- 8 C. When the material does not have the proper moisture content to insure the required
9 density, wetting or drying will be required. When water is added it shall be uniformly
10 mixed in by disking to the full depth of the course which is being compacted. Wetting or
11 drying operations shall involve manipulation, as a unit, of the entire width and depth of
12 the course which is being compacted.
- 13 D. As soon as proper conditions of moisture are attained the material shall be compacted to a
14 density of not less than 98% of maximum density as determined by AASHTO T-180.
15 The minimum density which will be acceptable at any location outside the traveled
16 roadway (such as intersections, crossovers, turnouts, shoulders, etc.) shall be 98% of such
17 maximum.
- 18 E. At least 3 density determinations shall be made on each day's final compaction operations
19 on each course, and the density determinations shall be made at more frequent intervals if
20 deemed necessary by the County. During final compaction operations, if grading of any
21 areas is necessary to obtain the true grade and cross section, the compacting operations
22 for such areas shall be completed prior to making the density tests on the finished base.

23 3.04 CORRECTION OF DEFECTS

- 24 A. If at any time the subgrade material should become mixed with the base course material,
25 the Contractor shall without additional compensation dig out and remove the mixture,
26 reshape and compact the subgrade, and replace the materials removed with clean base
27 material.
- 28 B. If cracks or checks appear in the base, either before or after priming, which in the opinion
29 of the County would impair the structural efficiency of the base, the Contractor shall
30 remove the cracks or checks by re-scarifying, reshaping, adding base material where
31 necessary, and re-compacting.

32 3.05 TESTING SURFACE

- 33 A. The finished surface of the base course shall be checked with a template cut to the
34 required crown and a 15-foot straightedge placed parallel to the center line of the road.
35 Both templates shall be provided by the Contractor. All irregularities greater than 1/4-
36 inch shall be corrected by scarifying and removing or adding limerock as required, after
37 which the entire area shall be re-compacted.

1 3.06 PRIMING AND MAINTAINING

2 A. The prime coat shall be applied when the base meets the specified density requirements
3 and moisture content in the top half of the base does not exceed 90% of the optimum
4 moisture of the base material. At the time of priming, the base shall be firm, unyielding,
5 and in such condition that no undue distortion will occur.

6 B. The Contractor shall be responsible for assuring that the true crown and template are
7 maintained, with no rutting or other distortion, and the base meets all the requirements at
8 the same time the surface course is applied.

9 3.07 THICKNESS REQUIREMENTS

10 A. Thickness of the base shall be measured in intervals of not more than 200-feet.
11 Measurements shall be taken at various points on the cross section, through holes not less
12 than 3-inches in diameter.

13 B. Where the compacted base is deficient by more than 3/8-inches from the thickness called
14 for in the Drawings, the Contractor shall correct such areas by scarifying and adding
15 limerock. The base shall be scarified and limerock added for a distance of 100-feet in
16 each direction from the edge of the deficient area. The affected areas shall then be
17 brought to the required state of compaction and to the required thickness and cross
18 section.
19

20 **END OF SECTION**

1 1.04 SHOP DRAWINGS AND SUBMITTALS

- 2 A. Submittals shall be submitted to the County for review and acceptance prior to
3 construction in accordance with the General Conditions and specifications Section 01300
4 "Submittals."
5 1. Soil-cement design mix

6 **PART 2 - PRODUCTS**

7 2.01 GENERAL

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

10 2.02 MATERIALS

- 11 A. Cement shall be Portland cement, Type I, II, III, or Type 1-P per FDOT Specification
12 Section 921.
- 13 B. Use water that is free from substances deleterious to hardening of the soil-cement
14 mixture.
- 15 C. Curing Material shall be per FDOT Specification Section 916.
- 16 D. Emulsified asphalt shall be Grade SS, RS, or MS as approved by the County. Dilute as
17 recommended by the manufacturer.
- 18 E. Soils for base course construction shall be either limerock material per FDOT
19 Specification Section 911 or soils meeting the following requirements:
20
21

**Table 02572-1
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

22
23

**Table 02572-2
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%

1 2.03 PROPORTIONING OF MIX

- 2 A. Submit for approval a design mix for the soil proposed for use in soil-cement
3 construction prepared by a testing laboratory approved by the County. The design mix
4 submittal shall include the results of tests run to verify that the soil meets the
5 requirements; results of tests used to establish the cement content; and a final design
6 laboratory sample. Submit the design mix to the County for approval a minimum of 60-
7 calendar days prior to beginning of soil-cement construction for Brush Loss Design
8 Method or 15-calendar days prior to beginning of soil-cement construction for Strength
9 Design Method. Express the cement as a percentage of the dry unit weight of the soil.
10 For mixed-in-place construction, use a ratio of cement based on the maximum density of
11 the soil determined in accordance with AASHTO T-99 and rounded up to the nearest
12 pound per cubic yard.
- 13 B. When proportioning the soil-cement mixture in accordance with strength design,
14 determine the minimum cement content using FM 5-520. The design compressive
15 strength specified shall be achieved in 7-days. Ensure that the cement content is not less
16 than 5% by weight except as noted below.
- 17 C. When proportioning the soil-cement mixture in accordance with Brush Loss Design
18 criteria, determine the minimum cement content in accordance with AASHTO T-135.
19 Ensure that the cement content is not less than 5% by weight except as noted below.
20 Ensure that the soil-cement loss at the completion of 12 cycles of testing conforms to the
21 limits in the following table.
22

**Table 02572-3
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%

1 D. When proportioning of soil-cement mixture by the Brush Loss Design Criteria Method
2 and processing by Central-Plant-Mixing where the requirements noted below are met, the
3 County will not require strength testing of field specimens. Verify the properties of the
4 parent material during the processing, on a random frequency, to ensure that the final mix
5 has not changed from the original design. Provide the County a printout of each day's
6 production that shows proportioning of the mixture meets the approved Brush Loss
7 Design, including cement.

8 E. Do not apply the minimum 5% cement content specified above if obtaining the soil
9 material used in producing a soil-cement mixture from a commercial source (not to
10 exclude recycled materials) where soil properties are consistently uniform, and if
11 processing the mixture in a central mix plant that automatically weighs components and
12 automatically records the weight of each component on a printed ticket, tape, or other
13 digital record.

14 **PART 3 - EXECUTION**

15 3.01 GENERAL

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

21 3.02 SUBGRADE PREPARATION

22 A. Subgrade shall be completed before beginning base construction operations. Ensure that
23 the subgrade is firm enough to support the equipment used in the soil-cement base
24 operations without appreciable distortion or displacement. Remove any unsuitable
25 material and replace it with suitable material.

26 B. When constructing the base with central-plant-mixed soil-cement, grade and shape the
27 subgrade to the lines, grades, and typical cross-section shown in the plans. Ensure that
28 the subgrade is moist but not ponded at the time of placing the mixed base course
29 material.

30 3.03 BASE SOIL FOR MIXED-IN-PLACE PROCESSING

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

1 3.04 PROCESSING OF SOIL-CEMENT MIXTURE

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

13 3.05 MIXED-IN-PLACE METHOD

- 14 A. Where feasible, process the entire width of the base in a single operation. Uniformly
15 spread the design quantity of cement on the soil at the required rate of application, by
16 means of an approved method. Replace spread cement that becomes displaced before
17 starting mixing. Check the uniformity of spread rate by:
- 18 1. Weight of cement spread/square yards covered for a short trial section that is between
19 100 and 300-feet in length; or
20 2. Use of a square yard cloth/box
- 21 B. After applying the cement, begin mixing within 60-minutes. Initially mix the soil and
22 cement until the cement has sufficiently blended with the soil to prevent formation of
23 cement balls when applying additional water; then add water if necessary, and re-mix the
24 soil-cement mixture. Do not perform windrow mixing.
- 25 C. Process up to the full depth in 1 course, provided the distribution of cement and water
26 and the specified density are satisfactory to the County. If not, construct courses of such
27 thickness to obtain satisfactory results. Make provisions to achieve adequate bonding
28 between courses.
- 29 D. Immediately after mixing of the soil and cement, add any additional water that is
30 necessary. If the moisture content exceeds that specified, manipulate the soil-cement
31 mixture by re-mixing or grading as required to reduce the moisture content to within the
32 specified range. Avoid excessive concentrations of water. Continue mixing during and
33 after applying water until obtaining a uniform mixture of soil, cement, and water.
- 34 E. As an alternative to the above-described procedure, the Contractor may use an approved
35 machine that will blend the cement and the soil. Additional water may be added and
36 mixed as necessary.

1 3.06 CENTRAL-PLANT-MIXED METHOD

2 A. Mix the soil, cement, and water in a pugmill of either the batch or continuous-flow type.
3 Equip the plant with feeding and metering devices that will accurately proportion the soil,
4 cement, and water in the quantities specified. Mix soil and cement sufficiently to prevent
5 cement balls from forming when adding additional water. Continue mixing until
6 obtaining a uniform mixture of soil, cement, and water.

7 B. Haul the mixture to the roadway in trucks equipped with protective covers. Place the
8 mixture on the moistened subgrade in a uniform layer with suitable equipment. Do not
9 allow more than 60-minutes to elapse between placing of soil-cement in adjacent passes
10 of the spreader at any location, except at construction joints. Ensure that the layer of soil-
11 cement is uniform in thickness and surface contour and in such quantity that the
12 completed base will conform to the required grade and cross-section. Do not perform
13 windrow mixing.

14 3.07 CONSTRUCTION JOINTS

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

19 3.08 SHAPING AND FINISHING

20 A. Prior to final compaction, shape the surface of the soil-cement to the required lines,
21 grades, and cross-section. In all cases where adding soil-cement mixture to any portion
22 of the surface, lightly scarify the surface with a spring tooth harrow, spike drag, or other
23 approved device to uniformly loosen the surface prior to adding material and prior to the
24 initial set of the soil-cement mixture. Compact the resulting surface to the specified
25 density. Continue rolling until all rutting ceases and until the base conforms to the
26 density requirements.

27 B. Ensure that the surface material is moist but not ponded, and maintained at not less than
28 2% below its specified optimum moisture content, during finishing operations. Perform
29 surface compaction and finishing in such a manner as to produce a smooth dense surface,
30 free of compaction planes, construction cracks, ridges, and loose material.

31 C. If the time limits specified above are exceeded, either remove and replace the base or
32 leave the base undisturbed for a period of 7-days, after which, the County will examine it
33 to determine its suitability. If found unsuitable, remove and replace the base at no
34 additional cost to County.

1 3.09 COMPACTION

2 A. Begin compacting the soil-cement mixture immediately after mixing or placing. Do not
3 allow more than 30-minutes to elapse between the last pass of moist-mixing or spreading
4 and the start of compaction of the soil-cement mixture at a particular location.

5 B. Determine the optimum moisture content and the maximum density in the field by the
6 methods prescribed in AASHTO T-134 on representative samples of the soil-cement
7 mixture obtained immediately after the initial mixing. Determine the density for each
8 day's run or change of material.

9 C. Uniformly compact the loose material to meet the density requirements specified below.
10 During compaction operations, reshape the material to obtain required grade and cross-
11 section.

12 3.10 PROTECTION AGAINST DRYING

13 A. While finishing and correcting the surface, keep the surface of the base continuously
14 moist by sprinkling water as necessary until applying the emulsified asphalt curing
15 material. As soon as practicable, protect the base from drying for 7-days by applying the
16 emulsified asphalt at the rate of 0.20 to 0.25-gallons of the diluted mixture per square
17 yard. Provide complete coverage without excessive runoff. While applying the
18 bituminous material, ensure that the soil-cement surface is dense, free of all loose and
19 extraneous material, and contains sufficient moisture to prevent excessive penetration of
20 the bituminous materials.

21 B. If it is necessary to allow construction equipment or other traffic to use the completed
22 base before the bituminous material has cured sufficiently to prevent pickup or
23 displacement, sand the bituminous material, using approximately 10-lbs of clean sand per
24 square yard. Do not use cover material containing organic acids or other compounds
25 detrimental to the soil-cement base.

26 C. Maintain the curing material during the 7-day protection period.

27 3.11 OPENING TO TRAFFIC

28 A. Do not allow traffic on the base subsequent to completion of the finishing operations for
29 a minimum period of 72-hours. As an exception to this requirement, allow equipment
30 necessary for correction of surface irregularities, application of water, and application of
31 curing materials on the base, if the tire contact pressures of such equipment do not exceed
32 45-psi. Under special conditions (i.e. low speed limit, low traffic volume, urban
33 conditions), the County may waive the 72-hour period.

1 3.12 MAINTENANCE

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

14 3.13 DENSITY TESTING REQUIREMENTS

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

27 3.14 SURFACE FINISH ACCEPTANCE REQUIREMENTS

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

1 3.15 THICKNESS ACCEPTANCE REQUIREMENTS

2 A. Construction tolerances for thickness are as follows:

3

**Table 02572-4
Thickness Tolerances**

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

4 B. When any thickness measurement is outside the construction tolerance, the County will
5 take additional thickness measurements at 10-foot intervals parallel to the centerline in
6 each direction from the measurement which is outside the construction tolerance until a
7 measurement in each direction is within the construction tolerance.

8 C. The County will evaluate an area of base found to have a thickness outside the
9 construction tolerance and may require the Contractor to remove and replace it with
10 acceptable base of the thickness shown in the plans at no expense to the County.

11 3.16 STRENGTH TESTING OF FIELD SPECIMENS

12 A. Check the adequacy of cement content and uniformity of distribution of cement within
13 the base by sampling and testing the completed mix.

14 B. Take samples at the project site just prior to final compaction and perform a minimum of
15 2 Strength Test Values (STV) each day, with at least 1 STV per each 2,500 square yards
16 mixed.

17 C. Ensure that each STV is the average strength value of a minimum of 3 individual
18 specimens.

19 D. Take representative samples of the mixed soil-cement material for determining an STV
20 just prior to final compaction, recording the sample location, and ensuring that the
21 samples are large enough to mold 3 or more compressive strength test specimens as
22 prescribed in FM 5-520.

23 E. Mold test specimens at the field moisture content and cast the individual test specimens
24 as close to identical as possible

25 F. Rest the molds during compaction of strength test specimens on a 200-pound concrete
26 block that the Contractor provides.

27 G. Gently extrude these test specimens from the compaction mold, and carefully place them
28 in a moist curing environment (not in direct contact with water) such as a tightly closed
29 container 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
2 that the specimens have not gained sufficient strength to be moved without probable
3 damage, continue field curing until the County determines that each specimen can be
4 safely moved without probable damage occurring. When the County determines that the
5 specimens can be safely moved, transport them to the laboratory where they will be
6 cured, as described in the design procedure (FM 5-520), to 7-days of age. At 7-days of
7 age, test the individual specimen for determination of compressive stress and ensure that
8 the loading procedure and rates are the 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
10 material 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
12 and the judgment of the County is that the area of such deficiency should not be removed
13 and replaced, payment for the area retained will be at 50%.
- 14 K. When multiple deficiencies occur, the applicable percent payment schedule will be
15 applied to the LOT of base that is identified with each deficiency. The penalty for each
16 deficiency will be applied separately to the unit price.
17

18 **END OF SECTION**

1 **SECTION 02573**

2 **ASPHALT PAVEMENT REMOVAL AND REPLACEMENT**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

- 5 A. Scope of Work: Mill or remove existing asphalt pavement and base materials and install
6 asphalt paving on a prepared base or as an overlay to existing asphalt pavement sections.
7 Provide Maintenance of Traffic and coordinate and install temporary and permanent
8 replacement of traffic signalization and pavement striping and markings.

9 1.02 REFERENCES

- 10 A. Florida Department of Transportation (FDOT) Standard Specifications for Road and
11 Bridge Construction, 2000 and 2004 editions.

- 12 1. Section 300 – Prime and Tack Coats for Base Courses (2000 and 2004 Editions)
13 2. Section 320 – Hot Bituminous Mixtures – Plant, Methods, and Equipment (2000 and
14 2004 Editions)
15 3. Section 327 – Milling of Existing Asphalt Pavement (2000 and 2004 Editions)
16 4. Section 330 – Hot Bituminous Mixtures – General Construction Requirements (2000
17 and 2004 Editions)
18 5. Section 331 – Type S Asphalt Concrete (2000 Edition)
19 6. Section 334 – Superpave Asphalt Concrete (2004 Edition)
20 7. Section 901 – Coarse Aggregate (2000 and 2004 Editions)
21 8. Section 902 – Fine Aggregate (2000 and 2004 Editions)
22 9. Section 916 – Bituminous Materials (2000 and 2004 Editions)
23 10. Section 917 – Mineral Filler (2000 and 2004 Editions)

- 24 B. Florida Department of Transportation (FDOT) Design Standards, 2000 and 2004 editions.

25 1.03 QUALITY ASSURANCE

- 26 A. Asphalt pavements shall be plant-mixed hot bituminous mixtures. Plant operations shall
27 not begin unless all weather conditions are suitable for laying operations. A prime and
28 tack coat shall be first applied to newly constructed bases. A tack coat shall be applied
29 on existing pavements that are to be overlaid with an asphalt mix and between
30 successive layers of asphalt mix. Apply prime and tack coats when ambient or base
31 surface temperature is above 40°F, and when temperature has been above 35°F for 12-
32 hours immediately prior to application. Construct asphaltic concrete paving when
33 ambient temperature is above 45°F. Do not apply when base is wet, contains excess
34 moisture, or during rain. Establish and maintain required lines and elevations.

- 1 B. Do not spread the mixture when the wind is blowing to such an extent that proper and
2 adequate compaction cannot be maintained or when sand, dust, etc., are being deposited
3 on the surface being paved to the extent that the bond between layers will be diminished.

- 4 C. Field compaction density and thickness testing frequencies of the asphalt shall be tested
5 once every 300-linear feet of paving per 24-foot wide strip, staggered left, center, and
6 right of centerline. Where less than 300-linear feet of asphalt is placed in 1-day, provide
7 minimum of 1 test for each per day's construction at a location designated by the County.

- 8 D. Asphalt extraction gradation shall be tested from grab samples collected once every
9 1,800-square yards of asphalt delivered to the site, or a minimum of once per day. Obtain
10 the results in a timely manner (no later than the end of the day) so that adjustments can be
11 made if necessary.

- 12 E. On initial use of a Type S mix design at a particular plant, as a minimum, run an
13 additional extraction gradation analysis if more than 500-tons [450-metric tons] of
14 mixture are produced on the first day of production.

- 15 F. Tolerances for Quality Control Tests (Extraction Gradation Analysis) shall be in
16 accordance with FDOT Specification Section 331.

17 1.04 SHOP DRAWINGS AND SUBMITTALS

- 18 A. Submittals shall be submitted to the County for review and acceptance prior to
19 construction in accordance with the General Conditions and specifications Section 01300
20 "Submittals."
 - 21 1. Submit for each proposed design mix the Gradation analysis; Grade of asphalt cement
22 used; and Marshall Stability in pounds flow.
 - 23 2. Provide a single percentage of asphalt by weight of total mix intended to be
24 incorporated in the completed mixture, shown to the nearest 0.1%. For structural
25 mixes (S-1, S-3) establish the optimum asphalt content at a level corresponding to a
26 minimum of 4.5% air voids. Provide the laboratory density of the asphalt mixture for
27 all mixes except Open-Graded Friction Courses.
 - 28 3. Identify source and description of the materials to be used.
 - 29 4. Provide certification that the mix design conforms to specification requirements.
 - 30 5. Field compaction density and thickness testing.
 - 31 6. Field asphalt extraction gradation.

32 **PART 2 - PRODUCTS**

33 2.01 GENERAL

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

- 1 B. Type S Asphalt Concrete (Type S-1 or S-3) is required. The equivalent fine Type SP
 2 (Superpave) Asphalt Concrete mixture (Traffic Level C) meeting the requirements of
 3 FDOT Specification Section 334 may be selected as an alternate at no additional cost to
 4 the County. The equivalent mixes are as follows:
 5 1. Type S-1: Type SP-12.5
 6 2. Type S-3: Type SP-9.5
- 7 C. Asphalt plant and equipment shall meet the requirements in FDOT Specification Section
 8 320.

9 2.02 AGGREGATE

- 10 A. Coarse Aggregate, Stone, Slag, or Crushed Gravel shall meet the requirements in FDOT
 11 Specification Section 901.
- 12 B. Fine Aggregate shall meet the requirements in FDOT Specification Section 902.
- 13 C. Aggregate gradation shall meet the following:
 14
 15

**Table 02573-1
 Bituminous Concrete Mixtures
 (Gradation Design Range)**

Type	Total Aggregate Passing Sieves ¹							
	3/4-inch [19.0 mm]	1/2-inch [12.5 mm]	3/8-inch [9.5 mm]	No. 4 [4.75 mm]	No. 10 [2.0 mm]	No. 40 [425 μm]	No. 80 [180 μm]	No. 200 [75 μm]
S-1 ⁴	100	88-98	75-93	47-75	31-53	19-35	7-21	2-6
S-3 ⁴		100	88-98	60-90	40-70	20-45	10-30	2-6
ABC-1		100						0-12
ABC-2		100			55-90			0-12
ABC-3 ²	70-100			30-70	20-60	10-40		2-10
FC-2 ³		100	85-100	10-40	4-12			
FC-3 ⁴		100	88-98	60-90	40-70	20-45	10-30	2-6
1. In inches [mm] or sieves [μm]. 2. 100% passing 1-1/2-inch [37.5 mm] sieve. 3. The County may increase the design range for the No. 10 [200 mm] sieve for lightweight aggregates. 4. The County may retain up to 1% on the maximum sieve size.								

- 16
- 17 D. Use clean aggregate containing no deleterious substances. Do not use coarse or fine
 18 aggregate which contains more than 0.5% of phosphate.
- 19 E. In laboratory tests, and for the purpose of proportioning the paving mixture, consider all
 20 material passing the No. 10 [2.00-mm] sieve and retained on the No. 200 [75 μm] sieve
 21 as fine aggregate, and the material passing the No. 200 [75 μm] sieve as mineral filler.

1 F. Do not use any screenings in the combination of aggregates containing more than 15% of
 2 material passing the No. 200 [75 µm] sieve. When two screenings are blended to produce
 3 the screening component of the aggregate, one of such screenings may contain up to 18%
 4 of material passing the No. 200 [75 µm] sieve, as long as the combination of the two does
 5 not contain over 15% material passing the No. 200 [75 µm] sieve. Screenings may be
 6 washed to meet these requirements.

7 2.03 ASPHALT CEMENT

8 A. Superpave PG Asphalt Binder or Recycling Agent shall meet the requirements in FDOT
 9 Specification Section 916.

10 B. Mineral Filler shall meet the requirements in FDOT Specification Section 917.

11 C. Marshall design mix shall be in accordance with the following:
 12
 13

**Table 02573-2
 Marshall Design Properties For Bituminous Concrete Mixes**

Mix Type	Minimum Marshall Stability (lbs.)	Flow* (0.01 in)	Minimum VMA (%)	Air Voids (%)	Minimum Effective Asphalt Content (%)	VFA Voids Filled with Asphalt (%)
S-1	1,500	8-13	14.5	4-5	**	65-75
S-3	1,500	8-13	15.5	4-6	**	65-75
ABC-1	500	7-15	15	5-16	6.0	-
ABC-2	750	7-15	15	5-14	5.5	-
ABC-3	1,000	8-13	14	4-7	**	65-78
FC-2	-	-	-	-	-	-
FC-3	1,500	8-13	15.5	4-6	**	65-75

* The maximum Flow value during production shall not exceed one point more than shown in the Table.
 ** The ratio of the percentage by weight of total aggregate passing the No. 200 sieve to the effective asphalt content expressed as a percentage by weight of total mix shall be in the range of 0.6 to 1.2.

14

15 2.04 BITUMINOUS MIXTURE

16 A. Use a bituminous mixture composed of a combination of aggregate (coarse, fine or
 17 mixtures thereof), mineral filler, if required, and bituminous material. Ensure that no
 18 more than 20% by weight of the total aggregate used is silica sand or local materials as
 19 defined in FDOT Specification Section 902. Size, grade, and combine the several
 20 aggregate fractions in such proportions that the resulting mixture meets the grading and
 21 physical properties of the verified mix design.

1 **PART 3 - EXECUTION**

2 3.01 GENERAL

3 A. Set up, install and maintain temporary traffic control devices and detours as necessary in
4 accordance with Specification Section 1570 "Maintenance of Traffic."

5 B. Asphalt pavements, including all surface courses and base courses, where shown to be
6 open cut and removed on the Drawings or specified in the Project Manual, shall be
7 removed to a line back from each edge of the trench, other excavation, or to the limits
8 indicated on the Drawings. Pavements shall be cut straight, clean and square with a
9 power saw or other tools and equipment suitable for the Work.

10 C. Asphalt pavements, where shown to be milled on the Drawings or specified in the Project
11 Manual, shall be milled according to FDOT Specification Section 327.

12 D. Asphalt mixtures shall meet the general construction requirements specified in FDOT
13 Specification Section 330.

14 E. Spread the mixture only when the surface upon which it is to be laid has been previously
15 prepared, is intact, firm, and properly cured, and is dry. Do not spread mixture that
16 cannot be finished and compacted during daylight hours.

17 F. Deliver the asphalt cement from the asphalt plant at a temperature not to exceed 350°F
18 and equip the transport tanks with sampling and temperature sensing devices meeting the
19 requirements of FDOT. Maintain the asphalt cement in storage within a range of 230°F
20 to 350°F in advance of mixing operations. Maintain constant heating within these limits,
21 and do not allow wide fluctuations of temperature during a day's production.

22 G. Produce a homogeneous mixture, free from moisture and with no segregated materials,
23 that meets all specification requirements for the mixture, including compliance with the
24 Marshall Properties. Also apply these requirements to all mixes produced by the drum
25 mixer process and all mixes processed through a hot storage or surge bin, both before and
26 after storage.

27 3.02 PREPARATION OF APPLICATION SURFACES

28 A. Prior to the laying of the mixture, clean the surface of the base or pavement to be covered
29 of all loose and deleterious material by the use of power brooms or blowers,
30 supplemented by hand brooming where necessary.

31 B. Where an asphalt mix is to be placed on an existing pavement or old base that is irregular,
32 and wherever the plans indicate, bring the existing surface to proper grade and cross-
33 section by the application of patching or leveling courses.

34 C. Where an asphalt mix is to be placed over a newly constructed surface treatment, sweep
35 and dispose of all loose material from the paving area.

- 1 D. Paint all structures which will be in actual contact with the asphalt mixture, with the
2 exception of the vertical faces of existing pavements and curbs or curb and gutter, with a
3 uniform coating of asphalt cement to provide a closely bonded, watertight joint.
- 4 E. Apply a prime and tack coat on newly constructed bases and apply a tack coat, as
5 specified in FDOT Specification Section 300, on existing pavement structures that are to
6 be overlaid with an asphalt mix and between successive layers of all asphalt mixes.

7 3.03 PLACING MIXTURE

- 8 A. Lay all asphaltic concrete mixtures, including leveling courses, other than adjacent to
9 curb and gutter or other true edges, by the string line method to obtain an accurate,
10 uniform alignment of the pavement edge.
- 11 B. For each paving machine operated, use a separate crew, each crew operating as a full
12 unit. The Contractor's Certified Paving Technician in charge of the paving operations
13 may be responsible for more than one crew but must be physically accessible to the
14 County at all times when placing mix.
- 15 C. Check the depth of each layer at frequent intervals, and make adjustments when the
16 thickness exceeds the allowable tolerance. When making an adjustment, allow the
17 paving machine to travel a minimum distance of 32-feet to stabilize before the second
18 check is made to determine the effects of the adjustment.
- 19 D. In limited areas where the use of the spreader is impossible or impracticable, the
20 Contractor may spread and finish the mixture by hand.
- 21 E. Straightedge and back-patch after obtaining initial compaction and while the material is
22 still hot.
- 23 F. Upon arrival, dump the mixture in the approved mechanical spreader, and immediately
24 spread and strike-off the mixture to the full width required, and to such loose depth for
25 each course that, when the Work is completed, the required weight of mixture per square
26 yard [square meter], or the specified thickness, is secured. Carry an excess amount of
27 mixture ahead of the screed at all times. Hand-rake behind the machine as required.
- 28 G. Construct each course in layers of the thickness as shown on FDOT Design Standards
29 Index No. 513.
- 30 H. Before starting any rolling, check the surface; correct any irregularities; remove all
31 drippings, fat sandy accumulations from the screed, and fat spots from any source; and
32 replace them with satisfactory material. Do not skin patch. When correcting a
33 depression while the mixture is hot, scarify the surface and add fresh mixture.

1 3.04 APPLICATION OF LEVELING COURSES

2 A. Before spreading any leveling course, fill all depressions in the existing surface more
3 than 1-inch deep by spot patching with leveling course mixture, and then compact them
4 thoroughly.

5 B. Place all courses of leveling by the use of two (2) motor graders; equip one with a
6 spreader box. Use other types of leveling devices after they have been approved by the
7 County.

8 C. When the total asphalt mix provided for leveling exceeds 50-lb/yds² [27-kg/m²], place the
9 mix in two or more layers, with the average spread of any layer not to exceed 50-lb/yd²
10 [27-kg/m²]. When using Type S-3 Asphaltic Concrete for leveling, do not allow the
11 average spread of a layer to be less than 50-lb/yd² [27-kg/m²] or more than 75-lb/yd² [40-
12 kg/m²]. The Contractor may vary the rate of application throughout the Project as
13 directed by the County. When leveling in connection with base widening, the County
14 may require placing all the leveling mix prior to the widening operation.

15 3.05 COMPACTING MIXTURE

16 A. The coverage is the number of times the roller passes over a given area of pavement.
17 Regardless of the rolling procedure used, complete the final rolling before the surface
18 temperature of the pavement drops below 160°F.

19 B. Seal Rolling: Provide two (2) coverages with a tandem steel-wheeled roller (either
20 vibratory or static), weighing 5 to 12-tons, following as close behind the spreader as
21 possible without pick-up, undue displacement, or blistering of the material. Use
22 vibratory rollers in the static mode for layers of 1-inch or less in thickness.

23 C. Intermediate Rolling: Provide five (5) coverages with a self-propelled pneumatic-tired
24 roller, following as close behind the seal rolling operation as the mix will permit.

25 D. Final Rolling: Provide one (1) coverage with a tandem steel-wheeled roller (static mode
26 only), weighing 5 to 12-tons, after completing the seal rolling and intermediate rolling,
27 but before the surface pavement temperature drops below 160°F.

28 E. Operate the self-propelled, pneumatic-tired roller at a speed of 6 to 10-mph. For each
29 roller, do not exceed an area of coverage of 4,000 yd²/hour; if rolling Type S Asphaltic
30 Concrete, do not exceed an area of coverage of 3,000 yd²/hour.

31 F. Use a sufficient number of self-propelled pneumatic-tired rollers to ensure that the rolling
32 of the surface for the required number of passes does not delay any other phase of the
33 laying operation and does not result in excessive cooling of the mixture before
34 completing the rolling. In the event that the rolling falls behind, discontinue the laying
35 operation until the rolling operations are sufficiently caught up.

- 1 G. Use hand tamps or other satisfactory means to compact areas which are inaccessible to a
2 roller, such as areas adjacent to curbs, headers, gutters, manholes, etc.
- 3 H. Use self-propelled pneumatic-tired rollers to roll all patching and leveling courses.
4 Where placing the initial leveling course over broken concrete pavement, use a
5 pneumatic-tired roller that weighs at least 15-tons. For Type S-3 Asphaltic Concrete
6 leveling courses, use a steel-wheeled roller to supplement the traffic rollers. On other
7 leveling courses, use a steel-wheeled roller to supplement the traffic rollers on all passes
8 after the first pass.
- 9 I. Do not allow the rollers to deposit gasoline, oil, or grease onto the pavement. Remove
10 and replace any areas damaged by such deposits as directed by the County. While rolling
11 is in progress, test the surface continuously, and correct all discrepancies to comply with
12 the surface requirements. Remove and replace all drippings, fat or lean areas, and
13 defective construction of any description. Remedy depressions that develop before
14 completing the rolling by loosening the mixture and adding new mixture to bring the
15 depressions to a true surface. Should any depression remain after obtaining the final
16 compaction, remove the full depth of the mixture, and replace it with sufficient new
17 mixture to form a true and even surface. Correct all high spots, high joints, and
18 honeycombing as directed by the County. Remove and replace any mixture remaining
19 unbonded after rolling. Correct all defects prior to laying the subsequent course.
- 20 J. Use a self-propelled pneumatic-tired roller on the first structural layer placed on a milled
21 surface. Compact with a minimum of three passes.

22 3.06 JOINTS

- 23 A. Place the mixture as continuously as possible. Do not pass the roller over the unprotected
24 end of the freshly laid mixture except when discontinuing the laying operation long
25 enough to permit the mixture to become chilled. When thus interrupting the laying
26 operation, construct a transverse joint by cutting back on the previous run to expose the
27 full depth of the mat.
- 28 B. For all layers of pavement except the leveling course, place each layer so that
29 longitudinal construction joints are offset 6-inches to 12-inches laterally between
30 successive layers.
- 31 C. When laying fresh mixture against the exposed edges of joints (trimmed or formed as
32 provided above), place it in close contact with the exposed edge to produce an even, well-
33 compacted joint after rolling.

34 3.07 SURFACE REQUIREMENTS

- 35 A. Obtain a smooth surface on all pavement courses placed, and then straightedge all
36 intermediate and final courses with a 15-foot rolling straightedge. Furnish a 15-foot
37 [4.572-m] manual straightedge, and make it available at the job site at all times during the
38 paving operation for checking joints and surface irregularities.

- 1 B. Produce a finished surface of uniform texture and compaction with no pulled, torn, or
2 loosened portions and free of segregation, sand streaks, sand spots, or ripples.

3 3.08 ACCEPTANCE REQUIREMENTS

- 4 A. Upon completion of the final surface or friction course, the County will test the finished
5 surface with a 15-foot rolling straightedge. Correct all deficiencies in excess of 3/16-
6 inch.

- 7 B. If correction is made by removing and replacing the pavement, remove the full depth of
8 the course and extend at least 50-feet on either side of the defective area for the full width
9 of the paving lane.

- 10 C. If correction is made by overlaying, cover the length of the defective area and taper
11 uniformly to a featheredge thickness at a minimum distance of 50-feet on either side of
12 the defective area. Extend the overlay the full width of the roadway. Maintain the
13 specified cross slope. The County may adjust, as necessary, the mix used for the overlay
14 for this purpose.

- 15 D. The maximum deficiency from the specified thickness as follows:
16 1. For pavement of a specified thickness of 2-1/2-inches or more: 1/2-inch
17 2. For pavement of a specified thickness less than 2-1/2-inches: 1/4-inch

- 18 E. Where the deficiency in thickness is: (1) in excess of 3/8-inch for pavement of less than
19 2-1/2-inches in specified thickness, or (2) in excess of 3/4-inch for pavement of specified
20 thickness of 2-1/2-inches or more, correct the deficiency either by replacing the full
21 thickness for a length extending at least 50-feet from each end of the deficient area.

- 22 F. For any case of excess deficiency of the pavement, if approved by the County for each
23 particular location, correct the deficient thickness by adding new surface material, and
24 compact it to the same density as the adjacent surface. The County will determine the
25 area to be corrected and the thickness of new material added.

26 3.09 REPAIR AND RESTORATION

- 27 A. Replace asphalt pavement or roadway surfaces cut or damaged to equal or better
28 condition than the original, including stabilization, base course, surface course, curb and
29 gutter, and other appurtenances.

30 3.10 SIGNALIZATION, PAVEMENT STRIPING AND MARKING

- 31 A. The Contractor shall be responsible for coordinating, repairing or replacing all traffic
32 signalization devices and traffic loops damaged during the pavement milling, removal
33 and replacement process.

- 1 B. The Contractor shall be responsible for coordinating, inventorying, and replacing all
2 temporary and permanent pavement striping and markings damaged during the asphalt
3 pavement milling, removal, and replacement process.
- 4 C. Temporary pavement striping and markings shall be paint or reinforced retro-reflective
5 removal tape. Foil back tape is not acceptable. Permanent pavement striping and
6 markings shall be alkyd thermoplastic tape and raised reflective pavement markers.
7

8

END OF SECTION

1 **SECTION 02576**

2 **CONCRETE SIDEWALKS AND DRIVEWAYS**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

- 5 A. Scope of Work: Constructing new concrete sidewalks, driveways, and curb and gutters as
6 shown on the Drawings.

7 1.02 QUALITY ASSURANCE

- 8 A. Codes and Standards: Comply with applicable sections of F.D.O.T. Specifications and
9 local governing regulations.

- 10 B. The mixture, placement, and curing of all concrete work shall be in accordance with
11 F.D.O.T. Specifications.

12 1.03 SHOP DRAWINGS AND SUBMITTALS

- 13 A. Submittals shall be submitted to the County for review and acceptance prior to
14 construction in accordance with the General Conditions and specifications Section 01300
15 "Submittals."

- 16 B. Furnish manufacturer's product data, design mixes, test reports, and materials
17 certifications.

18 1.04 JOB CONDITIONS

- 19 A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other
20 construction activities, as specified under Section 01570 "Maintenance of Traffic."

- 21 B. Utilize flagman, barricades, warning signs, and warning lights as required.

22 1.05 GUARANTEE

- 23 A. All restored areas within the public right-of-way shall be guaranteed for 1-year after final
24 acceptance. In the event of cracked or broken concrete surfaces, the Contractor shall
25 make the necessary repairs to restore the concrete within 10-calendar days after
26 notification by the County. The cost of such repairs shall be paid by the Contractor.

1 **PART 2 - PRODUCTS**

2 2.01 GENERAL

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

5 2.02 CONCRETE MATERIALS

6 A. Forms: Steel or wood for each type of use of size and strength to resist movement during
7 concrete placement and to retain horizontal and vertical alignment until removal. Use
8 straight forms, free of distortion and defects.

9 1. Use flexible spring steel forms or laminated boards to form radius bends as required.

10 2. Coat forms with a non-staining form release agent that will not discolor or deface the
11 surface of the concrete.

12 B. Fibermesh Reinforcement: Fibermesh reinforcement fibers shall be 2-inches to 3-inches
13 collated polypropylene fibers. Fibers shall be in strict accordance with the manufacturer
14 recommendations and within the time as specified in ASTM C94, Type III 4.13 and
15 applicable building codes.

16 C. Concrete Materials: Comply with requirements of F.D.O.T. Section 347 for concrete
17 materials, admixtures, bonding materials, curing materials, and others as required.

18 D. Epoxy Resin Grout: Type N as specified in F.D.O.T. Section 926.

19 E. Aggregate, brick, or other material required to match existing driveway or walk shall be
20 as approved by the County.

21 2.03 CONCRETE MIX, DESIGN, AND TESTING

22 A. Comply with requirements of applicable F.D.O.T. Section 347 for concrete mix design,
23 sampling and testing, and quality control, and as herein specified.

24 B. Design the mix to produce standard weight concrete consisting of Portland cement,
25 aggregate, air entraining admixture, and water to produce the following properties.

26 1. Compressive Strength: Class B, 3,000 psi for walks and curbs.

27 2. Compressive Strength: Class A, 4,000 psi for driveways.

28 3. Air Content: 3% to 6% .

29 C. Concrete slump shall not exceed plus or minus 1-inch from approved design slump.

1 **PART 3 - EXECUTION**

2 3.01 CONCRETE SIDEWALK, DRIVEWAY, AND CURB AND GUTTER

3 A. Surface Preparation:

- 4 1. Remove loose material from the compacted sub base surface immediately before
5 placing concrete.
6 2. Proof-roll prepared sub base surface to check for unstable areas and the need for
7 additional compaction. Do not begin paving work until such conditions have been
8 corrected and are ready to receive paving.

9 B. Form Construction:

- 10 1. Set forms to the required grades and lines, rigidly braced and secured. Install
11 sufficient quantity of forms to allow continuous progress of the Work and so that
12 forms can remain in place at least 24-hours after concrete placement.
13 2. Check completed form work for grade alignment to the following tolerances:
14 a. Top of forms not more than 1/8-inch in 10-feet.
15 b. Vertical face on longitudinal axis, not more than 1/4-inch in 10-feet.
16 3. Clean forms for reuse immediately after use, and coat with form release agent as
17 often as required to ensure separation from concrete without damage.

18 C. Concrete Placement:

- 19 1. Do not place concrete until sub base and forms have been checked for line and grade.
20 Moisten if required to provide a uniform dampened condition at the time concrete is
21 placed. Do not place concrete around manholes or other structures until they are
22 completed to required finish elevation and alignment. Use special colors or aggregate
23 as required to match existing material.
24 2. Place concrete using methods which prevent segregation of the mix. Consolidate
25 concrete along the face of forms and adjacent to transverse joints with an internal
26 vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms.
27 Use only square-faced shovels for hand spreading and consolidation. Consolidate
28 with care to prevent dislocation of reinforcing, dowels, and joint devices. Do not use
29 vibrators to push or move concrete in forms or chute.
30 3. Deposit and spread concrete in a continuous operation between transverse joints, as
31 far as possible. If interrupted for more than 1/2-hour, place a construction joint.
32 4. An automatic machine may be used for sidewalk or curb and gutter placement at
33 Contractor's option. If machine placement is to be used, submit revised mix design
34 and laboratory test results which meet or exceed the minimum herein specified.
35 Machine placement must produce sidewalks and/or curbs and gutters to the required
36 cross-section, lines, grades, finish, and jointing as specified for formed concrete. If
37 results are not acceptable, remove and replace with formed concrete as specified.

- 1 5. Joints: Construct expansion, weakened-plane (contraction), and construction joints
2 true-to-line with face perpendicular to surface of the concrete, unless otherwise
3 indicated. Construct transverse joints at right angles to the centerline, unless
4 otherwise indicated. When joining existing structures place transverse joints to align
5 with previously placed joints, unless otherwise indicated.
6 a. Weakened-Plane Joints: Provide weakened-plane (contraction) joints sectioning
7 concrete into areas as shown on the Drawings. Construct weakened plane joints
8 for a depth equal to at least 1/4 concrete thickness, by sawing within 24-hours of
9 placement or formed during finishing operations. Place joints at intervals not to
10 exceed 10-feet if not otherwise indicated.
11 b. Construction Joints: Place construction joints at the end of all pours and at
12 locations where placement operations are stopped for a period of more than 1/2-
13 hour, except where such pours terminate at expansion joints. Construction joints
14 shall be as shown or, if not shown, use standard metal keyway-section form of
15 appropriate height.
16 c. Expansion Joints:
17 (1) Provide premolded joint filler for expansion joints abutting concrete curbs,
18 catch basin, manholes, inlets, structures, walks, and other fixed objects, unless
19 otherwise indicated.
20 (2) Locate expansion joints at 12-feet on center for concrete walks unless
21 otherwise indicated.
22 (3) Extend joint fillers full-width and depth of joint, and not less than 1/2-inch
23 below finished surface where joint sealer is indicated. If no joint sealer, place
24 top of joint filler flush with finished concrete surface.
25 (4) Furnish joint fillers in one-piece lengths for the full width being placed,
26 wherever possible. Where more than one length is required, lace or clip joint
27 filler sections together. Pieces shorter than 4-inches shall not be used unless
28 specifically shown as such.
29 (5) Protect the top edge of the joint filler during concrete placement with a metal
30 cap or other temporary material. Remove protection after concrete has been
31 placed on both sides of joint.
32 (6) Fillers and Sealants: Comply with the requirements of these specifications for
33 preparation of joints, materials installation, and performance, and as herein
34 specified.

35 D. Concrete Finishing:

- 36 1. After striking-off and consolidating concrete, smooth the surface by screening and
37 floating. Use hand methods only where mechanical floating is not possible. Adjust
38 the floating to compact the surface and produce a uniform texture.
39 2. After floating, test surface for trueness with a 20-foot straightedge. Variations
40 exceeding 1/3-inch for any two points within 10-feet shall not be acceptable.
41 Distribute concrete as required to remove surface irregularities, and refloat repaired
42 areas to provide a continuous smooth finish.
43 3. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging
44 tool, and round 10-1/2-inch radius, unless otherwise indicated. Eliminate any tool
45 marks on concrete surface.

- 1 4. After completion of floating and when excess moisture or surface sheen has
2 disappeared, broom finish sidewalks by drawing a fine-hair broom across concrete
3 surface, perpendicular to a line of pedestrian traffic. If the existing material has
4 another finish, match existing finish.
5 5. Do not remove forms for 24-hours after concrete has been placed. After form
6 removal, clean ends of joints and point up any minor honeycombed areas.

7 E. Curing:

8 Protect and cure finished concrete paving and walks, complying with applicable
9 requirements of F.D.O.T. Section 350. Use moist-curing methods for initial curing of
10 approved concrete curing compounds whenever possible.

11 F. Repairs and Protections:

- 12 1. Repair or replace broken or defective concrete, as directed by the County.
13 2. Drill test cores where directed by the County, when necessary to determine
14 magnitude of cracks or defective areas. Fill drilled core holes in satisfactory
15 pavement areas with Portland cement concrete bonded to pavement with epoxy resin
16 grout.
17 3. Protect concrete from damage until acceptance of work. When construction traffic is
18 permitted, maintain pavement as clean as possible by removing surface stains and
19 spillage of materials as they occur.
20 4. Sweep concrete pavement and wash free of stains and discolorations, dirt, and other
21 foreign material just prior to final inspection.

22 3.02 FIELD QUALITY CONTROL

23 A. General: Repair or remove and replace unacceptable concrete sidewalk, driveways, or
24 curb and gutter as directed by the County.

25 B. Surface Elevation: Actual surface elevations shall be within ± 0.05 feet of specified or
26 indicated elevations at any given point. Surface elevations between any 2 given points
27 shall be interpolated from a direct line between the 2 points. Surfaces exceeding actual
28 elevation tolerances of more than ± 0.05 feet at any 2 points within a distance of 15-feet
29 will not be acceptable.

30 **END OF SECTION**

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1 **SECTION 02578**

2 **SOLID SODDING**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

- 5 A. Scope of Work: Establishing a stand of grass by furnishing and placing grass sod.
6 Included are fertilizing, watering, and maintenance as required to assure a healthy stand
7 of grass. Solid sodding shall be placed on all slopes greater than 4:1, within 10-feet of all
8 proposed structures, and in all areas where existing grass or sod (regardless of it's
9 condition) is removed or disturbed by Contractor's operation unless otherwise specified
10 or shown on the Drawings.

11 1.02 SHOP DRAWINGS AND SUBMITTALS

- 12 A. Submittals shall be submitted to the County for review and acceptance prior to
13 construction in accordance with the General Conditions and specifications Section 01300
14 "Submittals."
15 1. A certification of sod quality by the producer shall be delivered to the County ten
16 days prior to use.

17 **PART 2 - PRODUCTS**

18 2.01 GENERAL

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

21 2.02 GRASS SOD

- 22 A. Grass sod for the road rights-of-way shall be of variety to match the existing adjacent
23 area and shall be well matted with grass roots. The sod shall be taken up in rectangles,
24 preferably 12-inch by 24-inch, shall be a minimum of 2-inches in thickness, and shall be
25 live, fresh, and uninjured at the time of planting.
- 26 B. Grass sod for restoration of new construction sites and/or areas disturbed by construction
27 on existing sites shall be St. Augustine well matted with grass roots. The sod shall be
28 taken up in rectangles, preferably 12-inch by 24-inch, shall be a minimum of 2-inches in
29 thickness, and shall be live, fresh, and uninjured at the time of planting.

1 C. It shall be reasonably free of weeds and other grasses and shall have a soil mat of
2 sufficient thickness adhering firmly to the roots to withstand all necessary handling. The
3 sod shall be planted as soon as possible after being dug and shall be shaded and kept
4 moist until it is planted.

5 2.03 FERTILIZER

6 A. Commercial fertilizers shall comply with the state fertilizer laws.

7 B. The numerical designations for fertilizer indicate the minimum percentages (respectively)
8 of (1) total nitrogen, (2) available phosphoric acid, and (3) water-soluble potash
9 contained in the fertilizer.

10 C. The chemical designation of the fertilizer shall be 6-6-6. At least 50% of the nitrogen
11 shall be derived from organic sources. At least 50 % of the phosphoric acid shall be from
12 normal super phosphate or an equivalent source, which will provide a minimum of two
13 units of sulfur. The amount of sulfur shall be indicated on the quantitative analysis card
14 attached to each bag or other container.

15 2.04 WATER FOR GRASSING

16 A. The water used in the sodding operations shall be by the Contractor as approved by the
17 County.

18 **PART 3 - EXECUTION**

19 3.01 PREPARATION OF GROUND

20 A. The area over which the sod is to be placed shall be scarified or loosened to a depth and
21 then raked smooth and free from debris. Where the soil is sufficiently loose and clean,
22 the County, at its discretion, may authorize the elimination of ground preparation.

23 3.02 APPLICATION OF FERTILIZER

24 A. Before applying fertilizer, the soil pH shall be brought to a range of 6.0 - 7.0.

25 B. The fertilizer shall be spread uniformly over the area to be sodded at the rate of 700-
26 pounds per acre, or 16-pounds per 1,000 square feet, by a spreading device capable of
27 uniformly distributing the material at the specified rate. Immediately after spreading, the
28 fertilizer shall be mixed with the soil to a depth of approximately 4-inches.

29 C. On steep slopes, where the use of a machine for spreading or mixing is not practicable,
30 the fertilizer shall be spread by hand and raked in and thoroughly mixed with the soil to a
31 depth of approximately 2-inches.

1 3.03 PLACING SOD

- 2 A. The sod shall be placed on the prepared surface, with edges in close contact and shall be
3 firmly and smoothly embedded by light tamping with appropriate tools.
- 4 B. Where sodding is used in drainage ditches, or on slopes of 4:1 or greater, the setting of
5 the pieces shall be staggered to avoid a continuous seam along the line of flow. Along
6 the edges of such staggered areas, the offsets of individual strips shall not exceed 6-
7 inches. In order to prevent erosion caused by vertical edges at the outer limits, the outer
8 pieces of sod shall be tamped so as to produce a featheredge effect.
- 9 C. On slopes greater than 2:1, the Contractor shall, if necessary, prevent the sod from sliding
10 by means of wooden pegs driven through the sod blocks into firm earth at suitable
11 intervals.
- 12 D. Sod which has been cut for more than 72-hours shall not be used unless specifically
13 authorized by the County after the inspection thereof. Sod which is not planted within
14 24-hours after cutting shall be stacked in an approved manner, maintained, and properly
15 moistened. Any pieces of sod that, after placing, show an appearance of extreme dryness
16 shall be removed and replaced by fresh, uninjured pieces.
- 17 E. Sodding shall not be performed when weather and soil conditions are, in the County's
18 opinion, unsuitable for proper results.

19 3.04 WATERING

- 20 A. The areas on which the sod is to be placed shall contain sufficient moisture, as
21 determined by the County, for optimum results. After being placed, the sod shall be kept
22 in a moist condition to the full depth of the rooting zone for at least 2-weeks. Thereafter,
23 the Contractor shall apply water as needed until the sod roots and starts to grow for a
24 minimum of 60-days (or until final acceptance, whichever is latest).

25 3.05 MAINTENANCE

- 26 A. The Contractor shall maintain, at his expense, the sodded areas in a satisfactory condition
27 until final acceptance of the Project. Such maintenance shall include repairing of any
28 damaged areas and replacing areas in which the establishment of the grass stand does not
29 appear to be developing satisfactorily.
- 30 B. Replanting or repair necessary due to the Contractor's negligence, carelessness, or failure
31 to provide routine maintenance shall be at the Contractor's expense.
32

33 **END OF SECTION**

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SECTION 02660
POTABLE WATER SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: Provide a complete system for water transmission/distribution pressure piping and appurtenant items.

1.02 QUALITY ASSURANCE

A. Design Requirements

1. Piping shall be laid with a minimum cover of 36-inches below finished grade for mains sized 12-inch and below and a minimum cover of 48-inches for mains sized 16-inch and greater. Pipe located within Local roadways (subdivisions) or within an easement, shall be laid with a minimum cover of 30-inches.
2. Pipelines shall be constructed of the materials indicated in this specification and on the Drawings.

B. Pipe Inspection:

1. The Contractor shall obtain a certificate of inspection from the pipe manufacturer stating that the pipe and fittings supplied for this Contract have been inspected at the plant and that they meet the requirements of these specifications.
2. The entire product of any plant may be rejected when, in the opinion of the County, the methods of manufacture fail to secure uniform results, or where the materials used are such as to produce inferior pipe or fittings.
3. All pipe and fittings shall be subjected to a visual inspection at the time of delivery and before being lowered into the trench. Joints or fittings that do not conform to these specifications will be rejected and must be removed immediately by the Contractor.
4. The County reserves the right to sample and test any pipe or fitting after delivery and to reject all pipe and fittings represented by any sample which fails to comply with the specified requirements.

C. Prevention of electrolysis is required in accordance with AWWA C105 and when crossing, or adjacent to, a power easement, gas easements, any location where induced currents may be present, in areas where aggressive soils exist, and where shown on Drawings. Electrolytic action through the contact of dissimilar metals shall be prevented by either:

1. The separation of one material from the other by means of an insulating or dielectric coupling (polyethylene wrap), or
2. The use of alternative materials, as directed by the County.

1 1.03 SHOP DRAWINGS AND SUBMITTALS

2 A. Submittals shall be submitted to the County for review and acceptance prior to
3 construction in accordance with the General Conditions and specifications Section 01300
4 "Submittals."

- 5 1. Mill test certificates or certified test reports on pipe
6 2. Details of restrained and flexible joints
7 3. Detailed laying schedule for pipe
8 4. Valves and valve boxes

9 1.04 JOB CONDITIONS

10 A. Water in Excavation

- 11 1. Dewatering shall be in accordance with. Section 02140 "Dewatering." Water shall
12 not be allowed in the trenches while the pipes are being laid and/or tested. The
13 Contractor shall not open more trench than the available pumping facilities are able to
14 dewater to the satisfaction of the County. The Contractor shall assume responsibility
15 for disposing of all water so as not to injure or interfere with the normal drainage of
16 the territory in which he is working.
17 2. In no case shall the pipelines being installed be used as drains. The ends of the pipe
18 shall be kept properly and adequately blocked during construction by the use of
19 approved stoppers and not by improvised equipment.
20 3. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other
21 obstructing matter into the pipelines. If on completion of the Work any such material
22 has entered the pipelines, it must be cleaned as directed by the County so that the
23 entire system will be left clean and unobstructed.

24 **PART 2 - PRODUCTS**

25 2.01 GENERAL

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

28 2.02 MATERIALS

29 A. Pipe, Fittings, Valves, and Ancillary Equipment shall be installed as shown on the
30 Drawings and as specified in Division 15.

31 B. Additional Work: Additional items of construction, necessary for the complete
32 installation of the systems, shall conform to specific details shown on the Drawings and
33 shall be constructed of first-class materials conforming to the applicable portions of these
34 specifications.

1 **PART 3 - EXECUTION**

2 3.01 PREPARATION

3 A. Bedding:

- 4 1. Pipe Cradle: Upon satisfactory installation of the pipe bedding material as specified in
5 Section 02220 "Excavating, Backfilling and Compacting", a continuous trough for the
6 pipe barrel and recesses for the pipe bells or couplings shall be excavated by hand
7 digging. When the pipe is laid in the prepared trench, true to line and grade, the pipe
8 barrel shall receive continuous, uniform support and no pressure will be exerted on
9 the pipe joints from the trench bottom.
- 10 2. Cleanliness: The interior of the pipes shall be thoroughly cleaned of all foreign matter
11 before being gently lowered into the trench and shall be kept clean during laying
12 operations by means of plugs or other methods approved by the County. During
13 suspension of work for any reason at any time, a suitable stopper shall be placed in the
14 end of the pipe last laid to prevent mud or other foreign material from entering the pipe.

15 3.02 INSTALLATION

16 A. Pipe Identification/Location

- 17 1. All PVC water mains shall be solid blue. All lettering shall appear legibly on the pipe
18 and shall run the entire length of the pipe. Lettering shall read as is acceptable for the
19 intended use.
- 20 2. All ductile iron water mains shall be color coded blue with tape. The tape (minimum 2-
21 inches) shall be permanently affixed to the top and each side of the pipe (3 locations
22 parallel to the axis of the pipe). For pipes less than 24-inches in diameter, a single tape
23 may be used along the top of the pipe.
- 24 3. All HDPE water mains shall be a solid blue or black with 4 co-extruded equally spaced
25 blue stripes of the same material as the pipe. Stripes painted on the pipe outside surface
26 shall not be acceptable.
- 27 4. If main is located over 30-feet from the edge of the pavement or in an easement, the
28 Contractor shall install 4-inch diameter schedule 80 PVC utility pipe line markers
29 over the pipe alignment at 1,000-foot intervals, at all valves, and at all locations where
30 fittings deflect the pipe alignment in the horizontal plane. Utility pipeline markers
31 shall include a decal and shall be colored blue for water service.
- 32 5. All mains (PVC, HDPE, and DI) shall be installed with a continuous, insulated 10-
33 gauge copper wire installed directly above the pipe for location purposes. Locate wire
34 shall terminate in a test station box and be capable of extending 12-inches above the top
35 of the box. Directionally drilled pipe shall be installed with 2 insulated 10-gauge
36 copper wires.

- 1 B. Pipe: The color stripe and pipe text shall be located on the top of the pipe when installed.
2 When installing PVC pipe, no additional joints will be installed until the preceding pipe
3 joint has been completed and the pipe carefully embedded and secured in place.
- 4 1. Gradient: Pipe shall be laid straight and depth of cover shall vary to provide uniform
5 gradient or slope to pipe, whether grading is completed or proposed at time of pipe
6 installation. When a grade or slope is shown on the Drawings, batter boards with
7 string line paralleling design grade, or other previously approved means, shall be used
8 by the Contractor to assure conformance to required grade.
 - 9 2. Pipe Joint Deflection
 - 10 a. Ductile Iron Pipe: Whenever it is desirable to deflect pipe, the amount of deflection
11 shall not exceed 75% of the maximum limits as shown in AWWA Standard C600
12 for ductile iron pipe.
 - 13 b. PVC Pipe: Joint deflection or pipe bending shall not be permitted. The maximum
14 allowable tolerance in the joint due to variances in installation is 0.75° (degrees)
15 (3-inches per joint per 20-foot stick of pipe). No bending tolerance in the pipe
16 barrel shall be acceptable. Alignment change shall be made only with sleeves and
17 fittings.
 - 18 3. Rejects: Any pipe found defective shall be immediately removed and replaced with
19 sound pipe at the Contractor's expense.
 - 20 4. Joint Compounds: No sulfur base joint compound shall be used.
 - 21 5. Thrust restraints shall be accomplished by the use of mechanical restraining devices
22 unless specifically identified otherwise on the Drawings or herein. Restraining
23 devices shall be specified in Sections 15062 "Ductile Iron Pipe and Fittings" and
24 15064 "Polyvinyl Chlorine (PVC) Pipe and Fittings", respectfully.

25 C. Installing Valves and Boxes

- 26 1. Valves: Valves shall be carefully inspected, fully opened, and then tightly closed and
27 the various nuts and bolts shall be tested for tightness. Any valve that does not
28 operate correctly shall be removed and replaced.
- 29 2. Valve Boxes: Valve boxes shall be carefully centered over the operating nuts of the
30 valves so as to permit a valve key to be fitted easily to the operating nut. In unpaved
31 areas, valve boxes shall be set to conform to the level of the finished surface and held
32 in position by a concrete collar placed under the support flange as shown on the
33 Drawings. The letter "V" shall be etched in the curb at each valve location. The
34 valve box shall not transmit surface loads to the pipe or valve but be supported by
35 bedding rock as shown on the Drawings. Extensions or risers for valve boxes shall be
36 an integral part of the box. No cut sections of D.I. or PVC pipe shall be used in
37 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
39 whose top does not conform to the finished ground surface shall be dug out and reset.
40 Before final acceptance of the Work all valve boxes shall be adjusted to finish grade.
- 41 3. Concrete Collar: Each valve installed in an unimproved area (outside of pavement,
42 driveways or sidewalks) shall require a 24-inch by 24-inch by 6-inch concrete pad or
43 collar as shown in the Drawings.

- 1 4. Identification Disc: Each 16-inch or larger valve (unless otherwise shown on the
2 Drawings) installed shall be identified by a 3-inch diameter bronze disc anchored in
3 the concrete pad or collar in unimproved areas and/or anchored on a 4-inch by 4-inch
4 by 18-inch long concrete post set flush with the pavement surface in improved areas.
5 The disc shall be stamped with the following information as shown on the Drawings:
6 a. Size of the valve
7 b. Type of valve
8 c. Service
9 d. Direction and number of turns to open

10 D. Concrete Encasement

- 11 1. Concrete encasement shall be constructed in accordance with details shown on the
12 Drawings and shall be constructed of Class C concrete. Encasement shall be
13 constructed where;
14 a. Indicated on the Drawings
15 b. The County orders the pipe encased
16 2. The points of beginning and ending of pipe encasement shall be not more than 6-
17 inches from a pipe joint to protect the pipe from cracking due to uneven settlement of
18 its foundation or the effects of superimposed live loads.

19 E. Flush Out Connections: Flush out connections shall be installed at the locations as
20 determined by the County and be full pipe size.

21 F. Service Connections: Service connections shall be installed at the locations determined
22 by the County and in the manner shown on the Drawings. No service line shall terminate
23 under a driveway.

24 G. Backfilling: Backfilling shall be in accordance with Section 02220 "Excavating,
25 Backfilling and Compacting" of these specifications.

26 3.03 CLEANING

27 A. General: At the conclusion of the Work, the Contractor shall thoroughly clean the new
28 pipelines by flushing with water or other means to remove all dirt, stones, or other
29 material which may have entered the line during the construction period. Flushing is
30 permitted for pipes less than or equal to 12-inch diameter.

31 B. Correction of Non-Conforming Work: All non-conforming work shall be repaired or
32 replaced by the Contractor at no additional expense to the County. Non-conforming
33 work shall be defined as failure to adhere to any specific or implied directive of this
34 Project Manual and/or the Drawings, including but not limited to pipe not laid straight,
35 true to the lines and grades as shown on the Drawings, damaged or unacceptable
36 materials, misalignment or diameter ring deflection in pipe due to bedding or backfilling,
37 visible or detectable leakage, or failure to pass any specified test or inspection.

1 3.04 FIELD QUALITY CONTROL

2 A. Flushing

- 3 1. All pipelines less than or equal to 12-inches shall be flushed to remove all sand and
4 other foreign matter. After initial slow-fill, pipe shall sit full for 24-hours to facilitate
5 cleaning and collection of debris from interior of pipe. Flushing shall be
6 accomplished through full pipe size connections at full pipe depth. The velocity of
7 the flushing water shall be at least 2.5-feet per second. Flushing shall be terminated
8 at the direction of the County. The Contractor shall dispose of the flushing water
9 without causing a nuisance or property damage. The Contractor shall arrange with
10 the County and pay for the source of flushing water.
- 11 2. In lieu of flushing, new water mains may be hydraulically or pneumatically cleaned
12 with a polypropylene swabbing device in accordance with "Orange County Utilities
13 Standards and Construction Specifications Manual."
- 14 a. The Contractor is responsible to provide temporary access and egress points.
15 b. Passage of the cleaning swabs through the system shall be constantly monitored,
16 controlled, and all poly swabs entered into the system shall be individually
17 marked and identified.
18 c. Cleaning of the system shall be done in conjunction with the initial filling of the
19 system for its hydrostatic test.
20 d. The Contractor is responsible for collection of debris, water, and the swab.
21 Considerations shall be made for protecting surrounding property and personnel.
22 e. Swabbing speed shall range between 2 and 5-feet per second.

23 B. Pressure and Leakage Tests of Pressure Piping

- 24 1. General: The Contractor shall perform hydrostatic pressure and leakage tests on all
25 pressure piping. Tests shall be made between valves and shall not exceed 2,000-feet.
26 Each side of all valves shall be pressure tested. Multiple sections of main may be
27 tested simultaneously providing there are non-pressurized sections in between each
28 pressure-tested section.
- 29 2. Standard: AWWA C600, Section 4, with the exceptions required herein and the
30 exception that the Contractor shall furnish all gauges, meters, pressure pumps, and
31 other equipment needed to test the lines.
- 32 3. Hydrostatic Pressure Test
- 33 a. Test Pressure: Pressure test at 50% above the normal working pressure, but not
34 less than 150-psi, unless otherwise noted on the Drawings.
35 b. Test Duration: Duration is 2-hours. If during the test, the integrity of the tested
36 line is in question, the County may require a 6-hour pressure test.
37 c. Air Release: Corporation cocks at least 3/4-inch in diameter, pipe riser, and angle
38 globe valves shall be provided at each dead-end to bleed air from the line.
- 39 4. Hydrostatic Leakage Test
- 40 a. General: Following the pressure test, the Contractor shall perform the leakage test.
41 The line shall be filled with water and all air removed for the test. The Contractor
42 shall provide a pump to maintain the test pressure for the entire test period.
43 b. Test Pressure: Maximum operating pressure as determined by the County but not
44 less than 150-psi unless otherwise noted.

- 1 c. Test duration: 2-hours.
- 2 d. Allowable leakage: $L = \frac{SD(P)0.5}{148,000}$
- 3
- 4 L = Allowable leakage (gallons per hour)
- 5 S = Length of pipe tested (feet)
- 6 D = Nominal diameter of pipe (inches)
- 7 P = Average test pressure maintained (psig)
- 8
- 9 e. Visible Leakage: All leaks evident at the surface shall be repaired and leakage
- 10 eliminated regardless of the measured total leakage.
- 11 f. Leakage Measurement: The amount of water required to maintain the test
- 12 pressure is the leakage.

13 C. Wire Continuity Check: The Contractor shall perform a continuity check of the 10-gauge
 14 locating wire for the entire length of the main by performing a continuity test at each
 15 valve test station box.

16 3.05 DISINFECTING POTABLE WATER PIPELINES

17 A. General: Before being placed in service, all potable water pipelines shall be disinfected
 18 by chlorination. Taps for chlorination and sampling shall be uncovered and backfilled by
 19 the Contractor as required. The disinfection procedure shall be approved by the County.

20 B. Standard: AWWA 651, "Standard Procedures for Disinfecting Water Mains."

21 C. Procedure

- 22 1. Flush all dirty or discolored water from the line and introduce chlorine in approved
- 23 dosages through a tap at one end while water is being withdrawn at the other end of
- 24 the line.
- 25 2. The chlorine solution shall remain in the pipeline for 24-hours.
- 26 3. Following the chlorination period, all treated water shall be flushed from the line and
- 27 replaced with water from the distribution system.
- 28 4. Bacteriological sampling and analysis shall be made in full accordance with AWWA
- 29 Manual C651 and the appropriate FDEP permit. If necessary, the Contractor will be
- 30 required to re-chlorinate.
- 31 5. Sampling and analysis shall be done by the County.

32 D. Approval: The line shall not be placed in service until the requirements of the State and
 33 County Public Health Department are met and the bacteriological test results are
 34 approved by the Department of Environmental Protection.

35 3.06 CONNECTION TO EXISTING SYSTEM

36 A. All connections to existing mains shall be made after complete disinfection of the proposed
 37 system and shall be made under the direction of the County. Valves separating the mains
 38 being installed from existing mains shall be operated by or under the direction of the County.

SECTION 02661
WASTEWATER FORCE MAINS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The work under this Section includes providing a complete system for wastewater transmission pressure piping and appurtenant items.

1.02 QUALITY ASSURANCE

A. Design Requirements

1. Piping shall be laid with a minimum cover of 36-inches below finished grade, unless otherwise indicated.
2. Pipelines shall be constructed of the materials indicated on the Drawings.
3. All force mains shall be installed with a continuous insulated 10-gauge copper wire. Wire shall terminate at the top of each valve and be capable of extending 18-inches above the top of the box.
4. All PVC force mains shall be solid green. All lettering shall appear legibly on the pipe and shall run the entire length of the pipe. Lettering shall read as is acceptable for the intended use.
5. Flanged ductile iron used in valve vaults or above ground piping at pump stations shall be Protecto 401 lined and coated per specification Section 09901, "Coatings and Linings." Flanged DIP shall be epoxy coated from the factory and shall not be coated with bitumastic or asphaltic exterior coatings.

- B. Pipe Inspection: The Contractor shall obtain from the pipe manufacturers a certificate of inspection to the effect that the pipe and fittings supplied for this contract have been inspected at the plant and that they meet the requirements of these specifications. All pipe and fittings shall be subjected to visual inspection at time of delivery and just before they are lowered into the trench to be laid. Joints or fittings that do not conform to these specifications will be rejected and must be removed immediately by the Contractor. The entire product of any plant may be rejected when, in the opinion of the County, the methods of manufacture fail to secure uniform results, or where the materials used produce inferior pipe or fittings.

- C. Prevention of Electrolysis: Where shown on Drawings or deemed necessary, electrolytic action through the contact of dissimilar metals shall be prevented by either;

1. The separation of one material from the other by means of an insulating or dielectric coupling (polyethylene wrap), or
2. The use of alternative materials, as directed by the County

1 1.03 SHOP DRAWINGS AND SUBMITTALS

2 A. Submittals shall be submitted to the County for review and acceptance prior to construction
3 in accordance with the General Conditions and specifications Section 01300 "Submittals."

- 4 1. Certified test reports on pipe
- 5 2. Details of restrained and flexible joints
- 6 3. Detailed laying schedule for pipe
- 7 4. Valves and valve boxes

8 B. Acceptance of Material: The County reserves the right to sample and test any pipe or
9 fitting after delivery and to reject all pipe and fittings represented by any sample which
10 fails to comply with the specified requirements.

11 1.04 JOB CONDITIONS

12 A. Water in Excavation: Water shall not be allowed in the trenches while the pipes are being
13 laid and/or tested. The Contractor shall not open more trenches than the available
14 pumping facilities are able to dewater to the satisfaction of the County. The Contractor
15 shall assume responsibility for disposing of all water so as not to injure or interfere with
16 the normal drainage of the territory in which he is working. In no case shall the pipelines
17 being installed be used as drains for such water, and the ends of the pipe shall be kept
18 properly and adequately blocked during construction by the use of acceptable stoppers
19 and not by improvised equipment. All necessary precautions shall be taken to prevent the
20 entrance of mud, sand, or other obstructing matter into the pipelines. If on completion of
21 the Work any such material has entered the pipelines, it must be cleaned as directed by
22 the County so that the entire system will be left clean and unobstructed.

23 **PART 2 - PRODUCTS**

24 2.01 GENERAL

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

27 2.02 MATERIALS

28 A. Pipe Fittings, Valves, and Ancillary Equipment shall be installed as shown on the
29 Drawings and as specified in Division 15.

30 B. Additional Work: Additional items of construction, necessary for the complete
31 installation of the systems, shall conform to specific details shown on the Drawings and
32 shall be constructed of first-class materials conforming to the applicable portions of these
33 specifications.

1 **PART 3 - EXECUTION**

2 3.01 PREPARATION

3 A. Bedding: Upon satisfactory installation of the pipe bedding material as specified in
4 Section 02220 "Excavating, Backfilling and Compacting", a continuous trough for the
5 pipe barrel and recesses for the pipe bells or couplings shall be excavated by hand
6 digging. The pipe shall be laid in the prepared trench, true to line and grade, the pipe
7 barrel shall receive continuous, uniform support and no pressure will be exerted on the
8 pipe joints from the trench bottom.

9 B. Cleanliness: The interior of the pipes shall be thoroughly cleaned of all foreign matter
10 before being gently lowered into the trench and shall be kept clean during laying
11 operations by means of plugs or other methods acceptable by the County. During
12 suspension of work for any reason at any time, a suitable stopper shall be placed in the
13 end of the pipe last laid to prevent mud or other foreign material from entering the pipe.

14 3.02 INSTALLATION

15 A. Pipe Identification/Location

- 16 1. All PVC wastewater mains shall be solid green in color. All lettering shall appear
17 legibly on the pipe and shall run the entire length of the pipe. Lettering shall read as
18 is acceptable for the intended use.
- 19 2. All HDPE wastewater mains shall be either a solid green or black with four co-
20 extruded equally spaced green stripes of the same material as the pipe. Stripes
21 painted on the pipe outside surface shall not be acceptable.
- 22 3. If main is located over 30-feet from the edge of the pavement or in an easement, the
23 Contractor shall install 4-inch diameter schedule 80 PVC utility pipe line markers
24 over the pipe alignment at 1,000-foot intervals, at all valves, and at all locations where
25 fittings deflect the pipe alignment in the horizontal plane. Utility pipeline markers
26 shall include a decal and shall be colored purple for reclaimed water service.
- 27 4. All mains (PVC and HDPE) shall be installed with a continuous, insulated 10-gauge
28 copper wire installed directly above the pipe for location purposes. Locate wire shall
29 terminate in a test station box and be capable of extending 12-inches above the top of
30 the box. Directionally drilled pipe shall be installed with two insulated 10-gauge
31 copper wires.

32 B. Pipe:

- 33 1. Gradient: Lines shall be laid straight, and depth of cover shall vary to provide
34 uniform gradient or slope to pipe, whether grading is completed or proposed at time
35 of pipe installation. When a grade or slope is shown on the Drawings, batter boards
36 with string line paralleling design grade, or other previously approved means, shall be
37 used by the Contractor to assure conformance to required grade.

- 1 2. Pipe Joint Deflection: No joint deflection or pipe bending is allowed in PVC pipe.
2 The maximum allowable tolerance in the joint due to variances in installation is 0.75°
3 (degrees), (3-inches per joint per 20-ft stick of pipe). No bending tolerance in the
4 pipe barrel shall be acceptable. Alignment changes shall be made with sleeves and
5 fittings as shown in Drawings. Deflection in fittings and sleeves shall not exceed
6 75% of the limits recommended by the fitting manufacturer.
- 7 3. Rejects: Any pipe found defective shall be immediately removed from the site and
8 replaced with sound pipe at the Contractor's expense.
- 9 4. Joint Compounds: No sulfur base joint compound shall be used.
- 10 5. Thrust restraints shall be accomplished by the use of mechanical restraining devices
11 unless specifically identified otherwise on the Drawings or herein. Restraining devices
12 are specified in Section 15064 "Polyvinyl Chlorine Pipe and Fittings", respectfully.

13 C. Installing Valves and Boxes

- 14 1. Valves: Valves shall be carefully inspected, opened wide and then tightly closed and
15 the various nuts and bolts shall be tested for tightness. Plug valves shall have the disc
16 shaft installed horizontally with the plug rotating upward to the top of the valve. Any
17 valve that does not operate correctly shall be removed and replaced.
- 18 2. Valve Boxes: Valve boxes and riser shall be centered over the operating nuts of the
19 valves with a centering ring or disc so as to permit a valve key to be fitted easily to
20 the operating nut. In unpaved areas, valve boxes shall be set to conform to the level
21 of the finished surface and held in position by a concrete collar placed under the
22 support flange as shown on the Drawings. The valve box shall not transmit surface
23 loads to the pipe or valve. Extensions or risers for valve boxes shall be an integral
24 part of the box. No cut sections of D.I. or PVC pipe shall be used in extending the
25 box to its proper height. Care shall be taken to prevent earth and other material from
26 entering the valve box. Any valve box which is out of alignment or whose top does
27 not conform to the finished ground surface shall be dug out and reset. Before final
28 acceptance of the Work all valve boxes shall be adjusted to finish grade.

29 D. Concrete Encasement

- 30 1. Concrete encasement shall be constructed in accordance with details shown on the
31 Drawings and shall be constructed of Class C concrete. Encasement shall be
32 constructed where
33 a. As indicated on the Drawings
34 b. As directed by the County
- 35 2. The points of beginning and ending of pipe encasement shall be not more than 6-
36 inches from a pipe joint to protect the pipe from cracking due to uneven settlement of
37 its foundation or the effects of superimposed live loads.
- 38 3. Concrete Collar: Each valve installed in an unimproved area (outside of pavement,
39 driveways or sidewalks) shall require a 24-inch x 24-inch x 6-inch concrete pad or
40 collar as shown in the Drawings.

- 41 E. Flush Out Connections: Flush out connections shall be installed at the locations as
42 determined by the County and be full pipe size to accommodate a full diameter flush for
43 pipes 12-inches and smaller or a swab for pipes greater than 12-inches.

1 F. Backfilling: Backfilling shall be in accordance with Section 02220 "Excavating,
2 Backfilling and Compacting" of these specifications.

3 3.03 CLEANING

4 A. General: At the conclusion of the Work the Contractor shall thoroughly clean the new
5 pipe lines by flushing with water or other means to remove all dirt, stones or other
6 material which may have entered the line during the construction period.

7 B. Flushing 12-inch pipes and less: Flushing to remove all sand and other foreign matter
8 from pipelines shall only be permitted for mains 12-inches and smaller. Flushing shall be
9 accomplished through full pipe size connections at full pipe depth. The velocity of the
10 flushing water shall be at least 4-feet per second. Flushing shall be terminated at the
11 direction of the County. The Contractor shall dispose of the flushing water without
12 causing a nuisance or property damage. The Contractor shall arrange and pay for the
13 source of flushing water with the County or others.

14 C. Swabbing in lieu of flushing: New mains may be hydraulically or pneumatically cleaned
15 with a polypropylene swabbing device to remove dirt, sand and debris from main. If
16 swabbing access and egress points are not provided in the design drawings, it will be the
17 responsibility of the Contractor to provide temporary access and egress points for the
18 cleaning, as required. Passage of cleaning poly swabs through the system shall be
19 constantly monitored, controlled and all poly swabs entered into the system shall be
20 individually marked and identified so that the exiting of the poly swabs from the system
21 can be confirmed. Cleaning of the system shall be done in conjunction with the initial
22 filling of the system for its hydrostatic test. After initial slow-fill, pipe shall sit full for 24
23 hours to facilitate cleaning and collection of debris from interior of pipe. The Contractor
24 shall insert flexible polyurethane foam swabs (2-pounds per cubic foot density) complete
25 with rear polyurethane drive seal, into the first section of pipe. The swabs shall remain
26 there until the pipeline construction is completed. The line to be cleaned shall only be
27 connected to the existing distribution system at a single connection point. Locate and
28 open all new in-line valves beyond the point of connection on the pipeline to be cleaned
29 during the swabbing operation. At the receiver or exit point for the poly swab, the
30 Contractor is responsible for creating a safe environment for collection of debris, water
31 and the swab. Considerations shall be made for protecting surrounding personnel and
32 property and safe retrieval of the swab. Only County personnel shall operate the supply
33 valve from the existing distribution system. Cleaning and flushing shall be accomplished
34 by propelling the swab down the pipeline to the exit point with potable water. Flushing
35 shall continue until the water is completely clear and swab is retrieved.

1 3.04 FIELD QUALITY CONTROL

2 A. Correction of Non-Conforming Work: All non-conforming work shall be repaired or
3 replaced by the Contractor at no additional expense to the County. Non-conforming
4 work shall be defined as failure to adhere to any specific or implied directive of this
5 Project Manual and/or the Drawings, including but not limited to pipe not laid true to the
6 lines and grades as shown on the Drawings, damaged or unacceptable materials,
7 misalignment or diameter ring deflection in pipe due to bedding or backfilling, visible or
8 detectable leakage and failure to pass any specified test or inspection.

9 B. Pressure and Leakage Tests of Pressure Piping

10 1. General: The Contractor shall perform hydrostatic pressure and leakage tests on all
11 pressure piping. Tests shall be conducted on segments between valves and no more than
12 2,000 linear feet is to be tested at one time unless otherwise acceptable by the County.

13 2. Standard: AWWA C600, Section 5 (DI pipe) and AWWA C605 Section 7 (PVC pipe)
14 with the exceptions required herein and the exception that the Contractor shall furnish
15 all gauges, meters, pressure pumps and other equipment needed to test the lines.

16 3. Hydrostatic Pressure Test

17 a. Test Pressure: Test pressure will be 50% above the normal working pressure, but
18 not less than 100-psi, unless otherwise noted on the Drawings.

19 b. Test Duration: Test shall be for a period of 2-hours. If during the test, the integrity
20 of the tested line is in question, the County may require a 6-hour pressure test.

21 c. Air Release: Corporation cocks at least 3/4-inch in diameter, pipe riser and angle
22 globe valves shall be provided at each dead-end to bleed air from the line.

23 4. Hydrostatic Leakage Test

24 a. General: Following the pressure test, the Contractor shall perform the leakage
25 test. The line shall be filled with water and all air removed for the test. The
26 Contractor shall provide a pump to maintain the test pressure for the entire test
27 period.

28 b. Test Pressure: Maximum operating pressure as determined by the County but not
29 less than 100-psi unless otherwise noted.

30 c. Test duration: 2-hours.

31 d. Allowable leakage: $L = \frac{SD(P)^{0.5}}{148,000}$

32 L = Allowable leakage (gallons per hour)

33 S = Length of pipe tested (feet)

34 D = Nominal diameter of pipe (inches)

35 P = Average test pressure maintained (psig)

36
37
38 e. Visible Leakage: All leaks evident at the surface shall be repaired and leakage
39 eliminated regardless of the measured total leakage.

40 f. Leakage Measurement: The amount of water required to maintain the test
41 pressure is the leakage.
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END OF SECTION

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1 **SECTION 02761**

2 **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
6 the internal television inspection(s) for new or existing wastewater systems.
- 7 B. Gravity Main and Sewer Lateral Cleaning: The intent of gravity main cleaning is to
8 remove debris that may be causing a reduction in flow capacity, potential sewer backups,
9 or that limits the ability to evaluate the structural condition of the pipe segment. On all
10 sewers, the Contractor shall perform sewer-cleaning work to an acceptable level as
11 necessary to perform a thorough television inspection of the sewer. An acceptable level
12 is defined as the removal of all debris throughout the pipe segment cleaned. If the pipe
13 condition is such that cleaning may cause a potential collapse, then the pipe shall be
14 televised without attempting to clean it pending approval by the County.
- 15 C. Water for Cleaning: The Contractor will be responsible for obtaining a transient water
16 meter and paying for water used during course of cleaning.
- 17 D. Recovering of Equipment: The Contractor will be responsible for recovering any
18 equipment that becomes lodged or lost in the pipeline. The Contractor will be responsible
19 for all costs associated with required evacuation, restoration of roads and easements, and
20 repairs to pipes and manholes as needed to restore the pipeline and appurtenances back to
21 their original conditions.

22 1.02 CLEANING EQUIPMENT

- 23 A. Hydraulically Propelled Equipment: The equipment used shall be of a movable dam type
24 and be constructed in such a way that a portion of the dam may be collapsed at any time
25 during the cleaning operation to protect against flooding of the sewer. The movable dam
26 shall be equal in diameter to the pipe being cleaned and shall provide a flexible scraper
27 around the outer periphery for grease removal. Special precautions to prevent flooding of
28 the sewers and public or private property shall be taken at all times.
- 29 B. High-Velocity Jet (Hydro-Cleaning) Equipment: All high-velocity sanitary sewer cleaning
30 equipment shall be constructed for ease and safety of operation. The equipment shall have
31 a selection of 2 or more high-velocity nozzles. The nozzles shall be capable of producing a
32 scouring action from 15° to 45° (degrees) in all size mains. Equipment shall also include a
33 high-velocity gun for washing and scouring manhole walls and floor. The gun shall be
34 capable of producing flows from a fine spray to a solid stream. The equipment shall carry
35 its own water tanks, auxiliary engines, pumps, and hydraulically driven hose reel.

1 C. Mechanically Powered Equipment: Bucket machines shall be in pairs with sufficient
2 power to perform the Work in an efficient manner. Machines shall be belt operated or
3 have an overload device. Machines with direct drive that could cause damage to the pipe
4 will not be used. A power rodding machine shall be either a sectional or continuous rod
5 type capable of holding a minimum of 750-feet of rod. The rod shall be heat-treated
6 steel. To ensure safe operation, the machine shall be fully enclosed and have an
7 automatic safety clutch or relief valve.

8 D. Vacuum machines may be used for removal of materials from manholes when other
9 cleaning equipment is used to dislodge and transport material to the access point.

10 E. Combination Cleaner: For cleaning small and large diameter sewer, the Contractor may
11 use a combination hydraulic high volume water and solids separation system. Water
12 volume of up to 250-gpm at or above 2,000-psi will move solids to the downstream
13 manhole in high flow conditions. The separation system will dewater solids to 95 %
14 (passing a paint filter test) and transfer them to a dump truck, if needed, for transport to a
15 water reclamation facility, approved landfill, or other location specified by the County or
16 designee. Wash water will be filtered to a point where it can be used in the pump for
17 continuous cleaning. No bypassing of sewer flows will be necessary. The unit shall be
18 capable of 24-hour operation and the unit shall not leave the manhole until a section is
19 fully cleaned.

20 1.03 SHOP DRAWINGS AND SUBMITTALS

21 A. Submittals shall be submitted to the County for review and acceptance prior to
22 construction in accordance with the General Conditions and specifications Section 01300
23 "Submittals."

24 B. A daily log shall be maintained to record the location of the manholes and sewer lines,
25 lengths of the lines cleaned, method of cleaning, line sizes, identify type of cleaning
26 (light, medium, or heavy), and type of debris moved. Observations are to be recorded on
27 a cleaning report form.

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

29 **PART 3 - EXECUTION**

30 3.01 GENERAL

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

33 B. The equipment shall remove dirt, grease, rocks, sand, other materials, and obstructions
34 from the sewer mains, laterals, and manholes.

1 C. A high-velocity sewer cleaner will be used for the majority of the cleaning work. Other
2 equipment, such as bucket machines, rod machines, hydraulic root cutters, vacuum trucks
3 and balling equipment shall be available.

4 3.02 CLEANING PRECAUTIONS

5 A. All necessary precautions shall be taken to protect the sewer from damage during all
6 cleaning and preparation operations. Precautions shall also be taken to ensure that no
7 damage is caused to public or private property adjacent to or served by the sewer or its
8 branches. The Contractor shall pay for and restore, at no additional costs to the County,
9 any damage caused to public or private property because of such cleaning and
10 preparation operations.

11 B. Satisfactory precautions shall be taken in the use of cleaning equipment. When
12 hydraulically propelled cleaning tools (which depend upon water pressure to provide
13 their cleaning force) or tools which retard the flow in the sewer line are used, precautions
14 shall be taken to ensure that the water pressure created does not damage or cause flooding
15 of public or private property being served by the sewer. No fire hydrant shall be
16 obstructed in case of a fire in the area served by the hydrant. All requirements shall be
17 met when accessing a fire hydrant including but not limited to meters, backflow
18 preventers, and properly trained personnel. It shall be the Contractor's responsibility to
19 meet all state and local requirements.

20 3.03 CLEANING

21 A. If cleaning of an entire sewer section cannot be successfully performed from one
22 manhole, the equipment shall be set up on the other manhole and cleaning attempted
23 again. If results of the cleaning are favorable, the Contractor will proceed with the TV
24 inspection. All sludge, dirt, sand, rocks, and other solid or semisolid materials resulting
25 from the cleaning operation shall be removed from the downstream manhole of the
26 section being cleaned. The Contractor shall not be responsible for removing mortar or
27 other material that is securely attached to the pipe walls or joints.

28 B. Materials shall be disposed of from the site at least once at the end of each workday. The
29 Contractor will be responsible for the disposal of materials removed from the sewer
30 system. All sewer-cleaning efforts shall require documentation of all quantities and types
31 of materials removed during cleaning.

32 C. The designated sewer manhole sections shall be cleaned using hydraulically propelled,
33 high-velocity jet, or mechanically powered equipment approved by the County. Cleaning
34 shall consist of normal hydraulic jet cleaning to facilitate the internal CCTV inspection.

- 35 1. Types of cleaning of sanitary sewers:
- 36 a. Light cleaning of sewers consists of a maximum of 1 pass of the jet nozzle. Light
37 cleaning of laterals will consist of flushing water into a cleanout.
 - 38 b. Medium cleaning of sewers consists of 2 to 4 passes of the jet nozzle. Medium
39 cleaning of laterals will consist of 1 to 4 passes with a jet nozzle.

- 1 c. Heavy cleaning consists of 5 or more passes of the jet nozzle such as removing
2 heavy grease, debris, and roots.
- 3 d. Descaling of Ductile Iron pipe: Multiple passes with mechanical equipment to
4 remove scale build up to restore pipe to original inside diameter.
- 5 2. Selection of the equipment used shall be based on the conditions of lines at the time
6 the Work commences. The equipment and methods selected shall be satisfactory to
7 the County. The equipment shall be capable of removing dirt, grease, rocks, sand,
8 debris, other materials, and obstructions from the sewer lines, laterals, and manholes.
- 9 3. If cleaning of an entire section cannot be successfully performed from one manhole,
10 the equipment shall be set up on the other manhole and cleaning again attempted.
11 The intent of preparatory cleaning is to provide sufficient cleaning to ensure camera
12 passage and the internal conditions of the pipeline can be fully assessed.
- 13 4. If the County establishes that a particular section of the pipeline cannot be adequately
14 cleaned due to broken, collapsed, or void areas, then the inspection will be attempted
15 up to the obstruction.

16 3.04 ROOT REMOVAL

- 17 A. Roots shall be removed in the designated sections and manholes where root intrusion is a
18 problem and where authorized by the County. Special attention should be used during
19 the cleaning operation to remove roots from the joints. Any roots that could prevent the
20 proper application of chemical sealants, or could prevent the proper seating and
21 application of cured-in-place liners shall be removed. Procedures may include the use of
22 mechanical equipment such as, rodding machines, bucket machines, winches using root
23 cutters, porcupines, and equipment such as high-velocity jet cleaners. Chemical root
24 treatment shall be used before or following the root removal operation, depending on the
25 manufacturer's recommendation. The Contractor shall capture and remove all roots from
26 the line.

27 3.05 CHEMICAL ROOT TREATMENT

- 28 A. To aid in the removal of roots, manhole sections that have root intrusion shall be treated
29 with an acceptable herbicide. The application of the herbicide to the roots shall be done
30 in accordance with the manufacturer's recommendations and specifications in such a
31 manner to preclude damage to surrounding vegetation. Any damaged vegetation, so
32 designated by the County, shall be replaced by the Contractor at no additional cost to the
33 County. All safety precautions as recommended by the manufacturer shall be adhered to
34 for handling and application of the herbicide.

1 3.06 MATERIAL REMOVAL AND DISPOSAL

- 2 A. All sludge, dirt, sand, rocks, grease, roots, and other solid or semisolid material resulting
3 from the cleaning operation shall be removed at the downstream manhole of the section
4 being cleaned. Contractor shall provide appropriate screening to stop passing of
5 materials into downstream sewers. All solid or semisolid materials dislodged during
6 cleaning operations shall be removed from the sewer by Contractor at the downstream
7 manhole of the sewer section being cleaned. The passing of dislodged materials
8 downstream of the sewer segment being cleaned shall not be permitted. In such an event,
9 as observed or detected by the County or any third party, Contractor shall be responsible
10 for cleaning the affected downstream sewers in their entirety, at no additional cost to the
11 County.
- 12 B. These materials shall become the property of the Contractor, shall be removed from the
13 site at the end of each workday, and shall be disposed of by the Contractor. Copies of
14 records of all disposals shall be furnished to the County, indicating disposal site, date,
15 amount, and a brief description of material disposed. Disposal manifests from the
16 licensed disposal facility shall be submitted with invoices.
- 17 C. The Contractor shall keep his haul route and work area(s) neat, clean, and reasonably free
18 of odor, and shall bear all responsibility for the cleanup of any spill.

19 3.07 ACCEPTANCE OF CLEANING OPERATION

- 20 A. Acceptance of sanitary sewer cleaning shall be made upon the successful completion of
21 the television inspection and shall be to the satisfaction of the County. If television
22 inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to re-
23 clean and re-inspect the sewer line at no additional cost until the cleaning is shown to be
24 satisfactory.
- 25 B. In addition, on all sanitary sewers which have sags or dips, to an extent that the television
26 camera lens becomes submerged during the television inspection, the Contractor shall use
27 a high pressure cleaner to draw the water out of the pipe, or other means, to allow the full
28 circumferential view of the pipe and identification of pipe defects, cracks, holes, and
29 location of service connections.
30

31 **END OF SECTION**

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- 1 2. **Installation Crew:** At least 1 person other than the Superintendent from the CIPP
2 installation crew shall have a minimum of 1-year of CIPP experience totaling at least
3 20,000 lineal feet of 8-inch or greater installed liner. The crewmember with listed
4 qualifications must be on the project site during all installation activities.
- 5 3. **Boiler Technician:** Contractor shall provide the name and information for the boiler
6 technician who will perform the actual Work. The boiler technician must have a
7 minimum of 2 projects totaling at least 10,000 lineal feet of CIPP lining in which a
8 similar position was held.
- 9 4. **Lateral Cutter Technician:** Contractor shall provide the name and information for
10 the technician who will perform the actual Work. The lateral cutter technician must
11 have a minimum of 2 projects totaling at least 10,000 lineal feet of CIPP lining in
12 which a similar position was held.
- 13 5. **Lead CCTV inspector** shall be NASSCO PACP certified to report liner defects.
- 14 6. The final decision to accept or reject the product, manufacturer, and/or installer lies
15 solely with the County. The named Manufacturer, Field Superintendent, CIPP Lead
16 Installer, Boiler Technician, and Lateral Cutter must be employed to perform the
17 Work, unless changes are specifically authorized by the County.

18 1.03 PERFORMANCE WORK STATEMENT

- 19 A. The Contractor shall submit, before any lining WORK is performed, to the County a
20 Performance Work Statement (PWS) which clearly defines the CIPP product delivery in
21 conformance with the requirements of these contract documents. The PWS shall contain
22 at a minimum the following:
 - 23 1. Contractor's certificate of compliance that clearly indicates that the CIPP will
24 conform to the project requirements as outlined in Specification Section 01010
25 Summary of Work and as delineated in these specifications.
 - 26 2. A detailed installation plan describing:
 - 27 a. All preparation work (cleaning operations, pre-CCTV inspections, by-pass
28 pumping, and traffic control)
 - 29 b. Installation procedure and method of curing
 - 30 c. Service reconnection
 - 31 d. Quality control and testing to be performed
 - 32 e. Post-CCTV inspection
 - 33 f. Warrantees
 - 34 g. Description of the proposed CIPP lining technology.
 - 35 3. A detailed plan for identifying all active service connections during mainline installation.
 - 36 4. The qualifications of the Contractor.
 - 37 a. Name, business address and telephone number
 - 38 b. Personnel names, experience, and certifications for Field Superintendent, CIPP
39 lead Installer, Lateral Cutter, Boiler Technician, and Lead CCTV NASSCO
40 PACP Certificated Inspector to be directly involved with this project. The
41 Contractor shall sign and date the information provided and "certify that to the
42 extent of his knowledge, the information is true and accurate, and that the
43 supervisory personnel will be directly involved with and used on this project".
44 Substitutions of personnel and/or methods will not be allowed without written
45 authorization of the County.

- 1 c. Specialty technicians shall be certified by the equipment manufacturer and/or its
2 authorized representative. Certifications shall be submitted to the
3 County/Professional.
- 4 5. Proposed manufacturer's technology data shall be submitted for all CIPP products
5 and all associated technologies to be furnished.
- 6 6. All tools and equipment required for a complete installation of the CIPP.
 - 7 a. Clearly describe all equipment including proposed back-up equipment to be
8 furnished for this project.
 - 9 b. Identify redundant tools and equipment to be kept on the job site in the event of
10 equipment breakdown.
 - 11 c. The Contractor shall outline the mitigation procedure to be implemented in the
12 event of key equipment failure during the installation process for the CIPP.
- 13 7. A detailed description of the Contractor's proposed procedures for the removal of any
14 existing blockages in the pipeline that may be encountered during the cleaning
15 process.
- 16 8. Detailed public notification plan for stage notification to residences affected by the
17 CIPP installation.
- 18 9. An odor control plan that will ensure that project specific odors will be minimized at
19 the project site and surrounding area.
- 20 10. Outline specific repair or replacement procedures for potential defects that may occur
21 in the installed CIPP. Repair or replacement procedures shall be as recommended by
22 the CIPP system manufacturer and shall be submitted prior to any Work.
 - 23 a. Repairable defects that may occur in the installed CIPP shall be specifically
24 defined by the Contractor based on the manufacturer's recommendations,
25 including a detailed step-by-step repair procedure, resulting in a finished product
26 meeting the requirements of the specifications.
 - 27 b. Un-repairable defects that may occur to the CIPP shall be clearly defined by the
28 Contractor based on the manufacturer's recommendations, including a
29 recommended procedure for the removal and replacement of the CIPP.

30 1.04 REFERENCES

- 31 A. Codes, Specifications, and Standards
 - 32 1. Codes, specifications, and standards referred to by number or title shall form a part of
33 this specification to the extent required by the references thereto. Latest revisions
34 shall apply, unless otherwise shown or specified.
 - 35 2. All American Society for Testing and Materials (ASTM) Standards noted below shall
36 be to the latest revised version.
 - 37 D543 – Standard and Practice for Evaluating the Resistance of Plastics to Chemical
38 Reagents
 - 39 D638 – Standard Test Method for Tensile Properties of Plastics
 - 40 D790 – Standard Test Methods for Flexural Properties of Un-reinforced and
41 Reinforced Plastics and Electrical Insulating Materials
 - 42 D792 – Standard Test Methods for Density and Specific Gravity of Plastics by
43 Displacement
 - 44 D2122 – Standard Test Method for Determining Dimensions of Thermoplastic Pipe
45 and Fittings

- 1 D2837 – Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
- 2 D2990 – Standard Test Methods for Tensile, Compressive, and Flexural Creep and
- 3 Creep-Rupture of Plastics
- 4 D3567 – Standard Practice for Determining Dimensions of Fiberglass (Glass-Fiber-
- 5 Reinforced Thermosetting Resin) Pipe and Fittings
- 6 D3681 – Standard Test Method for Chemical Resistance of “Fiberglass (Glass Fiber
- 7 Reinforced Thermosetting Resin) Pipe and Fittings
- 8 D5813 – Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe
- 9 F1216 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by
- 10 Inversion and Curing of a Resin-impregnated Tube
- 11 F1743 – Standard Practice for Rehabilitation of existing pipelines and conduits by
- 12 pulled-in-place installation of cured-in-place thermo setting resin pipe
- 13 F2019 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by
- 14 the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-
- 15 Place Thermosetting Resin Pipe (CIPP)
- 16 F2561 - Standard Practice for Rehabilitation of a Sewer Service lateral and Its
- 17 Connection to the Main Using a One Piece Main and Lateral Cured-in-Place
- 18 Liner

19 1.05 PRE-TREATMENT OF REGULATED CHEMICALS TO DISCHARGE INTO SEWER

- 20 A. CIPP liner systems using resins containing styrene or other regulated chemicals that will
- 21 be discharged into the wastewater system shall be required to reduce the concentration of
- 22 Styrene in the cure water prior to discharge to the sanitary sewer. The discharge limits are
- 23 as follows:
- 24

Total Gallons of Discharge Including Water Added for cool down	Discharge Limits to South WRF Service Area		Discharge Limits to Northwest WRF Service Area		Discharge Limits to Eastern WRF Service Area	
	Maximum Styrene Concentration Limit for Discharge to South WRF (PPM)	Maximum Total Pounds per Day of Styrene to be Discharged to South WRF (Pounds/Day)	Maximum Styrene Concentration Limit for Discharge to Northwest WRF (PPM)	Maximum Total Pounds per Day of Styrene to be Discharged to Northwest WRF (Pounds/Day)	Maximum Styrene Concentration Limit for Discharge to Eastern WRF (PPM)	Maximum Total Pounds per Day of Styrene to be Discharged to Eastern WRF (Pounds/Day)
< 500,000	7	29	1	4	3.5	14
< 250,000	14	29	2	4	7.0	14
< 100,000	35	29	5	4	17.5	14

- 25
- 26 1. A single day’s or line segment water discharge in excess of 500,000 gallons per day
- 27 shall require approval by the County’s Environmental Compliance Section for
- 28 separate concentration limit evaluation and approval.”

- 29 B. CIPP liner systems using resins containing styrene or other regulated chemicals that will
- 30 be discharged into the wastewater system shall require a pre-treatment plan to remove the
- 31 regulated chemicals to acceptable levels prior to discharge. The Contractor shall submit
- 32 the pre-treatment plan to the County for approval prior to discharge. The information
- 33 required shall include:

- 1 1. MSDS for all chemicals used in the process and that will be discharged into the
- 2 wastewater system
- 3 2. Representative analytical data that was performed in the past for the proposed
- 4 process, as collected from the wastewater stream
- 5 3. The addresses and mapped locations of the discharge
- 6 4. The total duration of discharge request
- 7 5. The anticipated discharge temperature. Discharges in excess of 140°F are not
- 8 permitted
- 9 6. The Contractor shall submit for approval a summary table of pre-treatment design
- 10 calculations in Excel containing the following information:
- 11 a. Dates of discharge of each section
- 12 b. Lining section numbers using the OCUD numbering system
- 13 c. Length and diameter of each section
- 14 d. Volume (in gallons) of inversion water of each section
- 15 e. Volume (in gallons) of cool down water of each section
- 16 f. Total volume (in gallons) of inversion and cooling water of each section
- 17 g. Regulated chemical (in pounds) in discharge volume of each section
- 18 h. Reduction chemical (in pounds) to meet post-treatment concentration limit
- 19 i. Reaction time period (in hours) to achieve post-treatment concentration limit
- 20 j. Cool down time period (in hours)
- 21 k. Regulated chemical post-treatment concentration limit (in PPM)
- 22 7. The Contractor shall provide pre-treatment and post-treatment sampling and
- 23 laboratory analysis of the process wastewater and submit the results to the County for
- 24 verification.

- 25 C. After curing, the Contractor shall obtain a post-treatment cure water sample at each site
- 26 and submit for laboratory analysis. ,
- 27 1. The following laboratory analysis is required:
- 28 a. One (1) sample to be collected from the treated water line segment and analyzed
- 29 for “Styrene” using EPA Method 8260.
- 30 b. One (1) “Trip Blank” sample, analyzed for “Styrene” using EPA Method 8260.
- 31 2. The Contractor shall submit the analytical report to the County for approval.
- 32 3. The Contractor shall be responsible for all costs related to laboratory analytical
- 33 testing of the water samples collected.
- 34 4. Sampling shall continue for each successive lining segment until the laboratory
- 35 results verify the Contractor’s competency in determining the amount of styrene
- 36 reduction tablets/material required for a given water volume. Competency will be
- 37 determined by meeting the stated discharge limits.
- 38 5. Once the sample results demonstrate that the discharge limits have been met the
- 39 Contractor shall follow similar styrene reduction procedures for subsequent lining
- 40 segments, but sampling will not be required.
- 41 6. Should samples from three locations not meet the discharge limits, the County may
- 42 require the Contractor to hold cure water in place until laboratory results confirm the
- 43 water is below the discharge limits.
- 44 7. The County reserves the right to obtain samples at any site on any line segment to
- 45 ensure compliance with the discharge limits.”

- 1 D. The service areas for each of the proposed lining subareas are as follows:
- 2 1. (Subarea Name) (Subarea Number) is/are located in the Eastern WRF service area.
- 3 2. (Subarea Name) (Subarea Number) is/are located in the South WRF service area
- 4 3. (Subarea Name) (Subarea Number) is/are located in the Northwest WRF service area.

5 1.06 RESPONSIBILITY FOR OVERFLOWS AND SPILLS

- 6 A. It shall be the responsibility of the Contractor to schedule and perform his work so as to
- 7 result in no overflows or spills of sewage or combined sewage from the system. If
- 8 sewage flows are such that they interfere with the Contractor's ability to perform work,
- 9 the Contractor shall be responsible for scheduling his work during low flow periods or
- 10 provide bypass pumping. Bypass pumping shall be provided only with the specific
- 11 written approval of the County.

- 12 B. In the event of overflows caused by the Contractor's work activities, the Contractor shall
- 13 immediately take appropriate action to contain and stop the overflow, clean up the
- 14 spillage, disinfect the area affected by the spill, and notify the County in a timely manner.

- 15 C. Contractor will indemnify and hold harmless the County for any fines or third-party
- 16 claims for personal or property damage arising out of a spill or overflow that is fully or
- 17 partially the responsibility of the Contractor. Should fines subsequently be imposed as a
- 18 result of any overflow for which the Contractor is fully or partially responsible, the
- 19 Contractor shall pay all such fines and all of the County's legal, engineering, and
- 20 administrative costs in defending such fines and claims associated with the overflow.

- 21 D. If the Contractor is required to hold cure water due to unacceptable styrene testing
- 22 results, the Contractor shall be required to provide bypass pumping or other means to
- 23 insure wastewater service is not disrupted during the hold period.

24 1.07 SHOP DRAWINGS AND SUBMITTALS

- 25 A. Submittals shall be submitted to the County for review and acceptance prior to
- 26 construction in accordance with the General Conditions and specifications Section 01300
- 27 "Submittals." Submittals shall include the following:
- 28 1. Performance Work Statement shall be provided with a table of contents and tabbed
- 29 sections.
- 30 2. Product:
- 31 a. A list of projects from the Manufacturer that total a minimum of 500,000 linear
- 32 feet of liner installed in the United States. An Excel spread sheet shall be
- 33 included listing as a minimum the name of projects, linear footage of main,
- 34 completion date, contract amount, name of owner, address, contact person, and
- 35 phone number.
- 36 b. Fabric tube – manufacturer and description of product components
- 37 c. Flexible membrane (coating) material and recommended repair (patching)
- 38 procedure if applicable
- 39 d. Raw resin data – manufacturer and description of product components

- 1 e. Manufacturer's shipping, storage and handling recommendations for all
2 components of the CIPP system
- 3 f. All MSDS sheets for all materials to be furnished
- 4 g. Tube wet-out and cure method including:
- 5 (1) A complete description of the proposed wet-out procedure for the proposed
6 technology
- 7 (2) The manufacturer's recommended cure method for each diameter and
8 thickness of CIPP liner to be installed including the curing medium and the
9 method of application
- 10 3. Quality Control Plan
- 11 a. Defined responsibilities of the Contractor's personnel for assuring that all quality
12 requirements are met. These will be assigned by the Contractor to specific
13 personnel.
- 14 b. Proposed procedures for quality control, product sampling and testing shall be
15 defined and submitted as part of the Plan.
- 16 c. Proposed methods for product performance controls, including the method of and
17 frequency of product sampling and testing both in raw material form and cured
18 product form.
- 19 d. Inspection forms and guidelines for quality control inspections shall be prepared
20 in accordance with the standards specified within this specification.
- 21 e. The manufacturer shall furnish a check list containing key elements of the CIPP
22 installation criteria that is important for the County to ensure that quality control
23 and testing requirements are performed in accordance with these specifications.
- 24 4. Engineering design calculations shall be submitted in a timely fashion prior to
25 construction, in accordance with the Appendix of ASTM F-1216, for each length of
26 liner to be installed including the thickness of each proposed CIPP. It will not be
27 acceptable for the Contractor to submit a design for the most severe line condition
28 and apply that design to all of the line sections. All calculations shall include data
29 that conforms to the requirements of these specifications.
- 30 a. These calculations shall be performed and certified by a Professional Engineer
31 registered in the State of Florida.
- 32 b. The manufacturer shall certify as to the compliance of its materials to the values
33 used in the calculations.
- 34 5. The liner manufacturer shall submit a tabulation of time versus temperature. This
35 tabulation shall show the lengths of time that exposed portions of the liner will endure
36 without self-initiated cure or other deterioration beginning. This tabulation shall be at
37 5°F (degrees Fahrenheit) increments ranging from 70°F to 100°F. The manufacturer
38 shall also submit his analysis of the progressive effects of such "pre-cure" on the
39 insertion and cured properties of the liner
- 40 6. Certified copies of test reports of factory tests required by the applicable standards
41 and this Section.
- 42 7. Manufacturer's installation instructions and procedures.
- 43 8. CIPP Installation Record (Shot Record) to include shot number and corresponding
44 manhole to manhole pipe reaches for each scheduled installation, design thickness,
45 actual thickness delivered to the site, pipe diameter, relength, total length of shot,
46 and number of laterals.

- 1 9. Wastewater pre-treatment plan including data, measurements, assumptions,
2 calculations and procedures for the pre-treatment of CIPP process wastewater
3 containing regulated chemicals.
- 4 10. Manufacturer's detailed procedures for repairing liners that have been installed
5 incorrectly or that have failed during installation.
- 6 11. Contractor's procedures and materials for service renewal including time and duration
7 of sewer service unavailability and a complete description of the methods he intends
8 to use to reconnect the existing laterals.
- 9 12. Sampling procedures and locations for obtaining representative samples of the
10 finished liner.
- 11 13. Sampling tests for compliance by an independent laboratory shall be made according
12 to the applicable ASTM specification and the manufacturer's quality control program.
- 13 B. A final certificate of compliance with this specification shall be provided by the
14 manufacturer for all lining material furnished.

15 1.08 WARRANTY

- 16 A. The materials used for the project shall be certified by the manufacturer for the specified
17 purpose. The Contractor shall warrant the liner material and installation for a period of
18 one (1) year. During the Contractor warranty period, any defect which may materially
19 affect the integrity, strength, function and/or operation of the pipe, shall be repaired at the
20 Contractor's expense in accordance with procedures in these specifications and as
21 recommended by the manufacturer.
- 22 B. On any work completed by the Contractor that is defective and/or has been repaired, the
23 Contractor shall warrant this work for an additional one (1) year.

24 1.09 DELIVERY, STORAGE, AND HANDLING

- 25 A. The Contractor shall be responsible for the delivery, storage, and handling of products.
26 No products shall be shipped to the job site without the approval of the County.
- 27 B. Keep products safe from damage. Promptly remove damaged products from the job site.
28 Replace damaged products with undamaged products.
- 29 C. The wet-out facility shall write the Shot number, total wet-out length, thickness, pipe
30 width, and resin type on each bag delivered to the project.

31 **PART 2 - PRODUCTS**

32 2.01 GENERAL

- 33 A. The materials used shall be designed, manufactured, and intended for sanitary sewer pipe
34 relining and the specific application in which they are used. The materials shall have a
35 proven history of performance in sewer relining and rehabilitation.

- 1 B. Pipe lining products pre-approved by the County include: Insituform Technologies
2 (CIPP Liner), National Liner (CIPP Liner), LMK Enterprises (Performance Liner),
3 Stevens Technologies (CIPP Liner 2 part 100% epoxy), Inner Cure Technologies
4 (Reichold/Dion CIPP Liner), Lanzo Lining Services (Lanzo CIPP Lining System), and
5 Premier Pipe (Premier Pipe CIPP Lining System), Layne Inliner (CIPP Liner), and Miller
6 Pipeline (CIPP Liner). All products must meet the specification herein and will require
7 approval prior to installation.
- 8 C. All materials, shipped to the project site, shall be accompanied by test reports certifying
9 that the material conforms to the ASTM listed herein. Materials shall be shipped, stored,
10 and handled in a manner consistent with written recommendations of the CIPP system
11 manufacturer to avoid damage. Damage includes, but is not limited to, gouging,
12 abrasion, flattening, cutting, puncturing, or ultra-violet (UV) degradation. On site storage
13 locations, shall be approved by the County. All damaged materials shall be promptly
14 removed from the project site at the Contractor's expense and disposed of in accordance
15 with all current applicable agency regulations.
- 16 D. The finished pipe liner in place shall be fabricated from materials which when complete
17 are chemically resistant to and will withstand internal exposure to domestic sewage
18 having a pH range of 5 to 11 and temperatures up to 150°F.
- 19 E. Take all necessary field measurements of the existing pipe (including diameter, ovality
20 and length) prior to manufacturing liners.
- 21 F. The minimum length shall be that deemed necessary by the Contractor to effectively span
22 the distance from the inlet to the outlet of the respective manholes unless otherwise
23 specified. The Contractor shall verify the lengths in the field before manufacturing.

24 2.02 STRUCTURAL REQUIREMENTS

- 25 A. Each CIPP shall be designed to withstand internal and/or external loads as dictated by the
26 site and pipe conditions. The CIPP design shall assume no bonding to the original pipe
27 wall.
- 28 B. The Contractor must have performed long-term testing for flexural creep of the CIPP
29 pipe material installed by his company. Such testing results are to be used to determine
30 the long-term, time dependent flexural modulus to be utilized in the product design. The
31 long-term modulus shall not exceed 50 percent of the short-term value for the resin
32 system and shall be verifiable through testing. The materials utilized for the contracted
33 project shall be of a quality equal to or better than the materials used in the long-term test
34 with respect to the initial flexural modulus used in the CIPP design.
- 35 C. The Contractor shall submit, prior to installation of the lining materials, certification of
36 the compliance with these specifications and/or the requirements of the CIPP system.
37 Certified material test results shall be included that confirm that all materials conform to
38 these specifications. Materials not complying with these requirements will be rejected.

D. The design thickness of the CIPP shall be arrived at using standard engineering methodology as found in ASTM F1216 and the physical properties. In no case shall the finished thickness of the cured liner be less than 4.5 millimeters. The required cured structural CIPP wall thickness shall be based, as a minimum, on the physical properties described in TABLE 02771 - 1 Minimum Physical Properties and per the design of the Professional Engineer and in accordance with the design equations in ASTM F 1216 Appendix X1 and the following design parameters:

Design Considerations	Criteria
Tube Design	ASTM F 1216 Appendix X1
Hydrostatic Buckling	ASTM F 2561 Section 6.1 and 6.1.1
Design Safety Factor	2.0
Retention Factor for Long Term Flexural Modulus to be used in Design	50 % of the short-term value of the resin system
Ovality	2 %
Groundwater Depth*	100% depth from pipe invert to surface
Soil Depth*	As indicated on the plans
Lining enhancement factor (K)	7
Soil Modulus**	1,000 psi
Soil Density**	120 pcf
Live Load**	One (1) H20 passing truck
Design Condition	Fully deteriorated
Minimum Long-Term Life	50 years

*Denotes multiple line segments may require a table of values

**Denotes information required for fully deteriorated design conditions

TABLE 02771-1
Minimum Physical Properties

Property	Standard	Cured Composite per ASTM F1216 (PSI)
Flexural Strength (short term)	ASTM D790	4,500
Flexural Modulus of Elasticity (short term)	ASTM D790	250,000

E. When multiple layers are present, the layers of the finished CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or such that the knife blade moves freely between the layers. If separation of the layers occurs during testing of the field samples, new samples will be cut from the work. The composite of the materials will, upon installation inside the host pipe, exceed the minimum test standards specified by the American Society for Testing Methods. Any reoccurrence may be cause for rejection of the work.

1 2.03 CURED-IN-PLACE LINER

2 A. Fabric

- 3 1. The Contractor shall determine the minimum tube length necessary to effectively
4 span the designated run between manholes. The Contractor shall verify the lengths in
5 the field prior to ordering and prior to impregnation of the tube with resin, to ensure
6 that the tube will have sufficient length to extend the entire length of the run. The
7 Contractor shall also measure the inside diameter of the existing pipelines in the field
8 prior to ordering liner so that the liner can be installed in a tight-fitted condition.
- 9 2. The sewn tube shall consist of one or more layers of absorbent non-woven felt fabric
10 and meet the requirements of ASTM F-1216, ASTM F1743, or ASTM D5813. The
11 tube shall be constructed to withstand installation pressures, have sufficient strength
12 to bridge missing pipe, and stretch to fit irregular pipe sections.
- 13 3. The wet out tube shall have a relatively uniform thickness that when compressed at
14 installation pressures will equal or exceed the calculated minimum design CIPP wall
15 thickness.
- 16 4. The flexible tube shall be fabricated to a size that when installed will neatly fit
17 (minimum 99.75%) the internal circumference of the existing sanitary sewer lines
18 (including services). Allowance shall be made for circumferential stretching during
19 insertion so that the final cured product is snug against the wall of the host pipe.
- 20 5. The outside layer of the tube shall be coated with an impermeable, flexible membrane
21 that will contain the resin and allow the resin impregnation (wet out) procedure to be
22 monitored.
- 23 6. The tube shall contain no intermediate or encapsulated elastomeric layers. No
24 material shall be included in the tube that may cause delamination in the cured CIPP.
25 No dry or unsaturated layers shall be evident.
- 26 7. The wall color of the interior pipe surface of CIPP after installation shall be a
27 relatively light reflective color so that a clear detailed examination with closed circuit
28 television inspection equipment may be made.
- 29 8. Seams in the tube shall be stronger than the non-seamed felt material.
- 30 9. The tube shall be marked for a distance at regular intervals along its entire length, not
31 to exceed five feet. Such markings shall include the Manufacturers name or
32 identifying symbol.
- 33 10. Unless otherwise specified, the Contractor will use a polyester filter felt tube and a
34 resin and catalyst system compatible with the inversion process and having the
35 minimum physical properties for the cured pipe identified in Table 02771 - 1
36 Minimum Physical Properties.

37 B. Resin

- 38 1. The resin system shall be a corrosion resistant polyester or vinyl ester resin and
39 catalyst system or epoxy and hardener system that when properly cured within the
40 tube composite, meets the minimum requirements of ASTM F1216, ASTM F1743 or
41 F2019, the physical properties given herein these specifications Section 02771 and
42 those, which are to be utilized in the design of the CIPP for this project.
- 43 2. The resin used shall not contain non-strength enhancing fillers.
- 44 3. The Contractor shall submit the resin characteristics, including filler identification, to
45 the County for approval prior to lining activities.

- 1 4. The resin shall produce a CIPP that will comply with the structural and chemical
2 resistance requirements of the specification.

3 **PART 3 - EXECUTION**

4 3.01 PREPARATION

5 A. Prior to any lining of a pipe so designated.

- 6 1. It shall be the responsibility of the Contractor to remove all internal debris and clean
7 the existing sewer line and/or lateral in accordance with the recommendations of the
8 liner manufacturer prior to installation of the liner and in accordance with Section
9 02761 "Cleaning Sanitary Sewer Systems." Both mainline and lateral line shall be
10 cleaned.
- 11 a. Preparation of the interior surface shall be accomplished by a thorough high-
12 pressure water-jet cleaning. The pipe shall be left free of all loose sand, rock, or
13 other deleterious materials. Any roots in the pipe shall be either removed or cut
14 off flush with the interior.
- 15 b. If conditions such as broken pipe and major blockages are found that will prevent
16 proper cleaning or where additional damage would result if cleaning is attempted
17 or continued, the Contractor shall notify the County immediately. The County
18 will determine what course of action will be taken to complete the project.
- 19 c. Precautions shall be taken by the Contractor to ensure that no damage or flooding
20 of public or private property is caused by the cleaning operation.
- 21 d. The County shall inspect the prepared pipe for cleanliness and smoothness before
22 the Contractor is authorized to proceed with pipe lining operations.
- 23 2. Certified PACP personnel trained in locating breaks, obstacles and service
24 connections by closed circuit television shall perform inspection of existing sewer
25 lines. The interior of the line shall be carefully inspected in accordance with Section
26 02762 "Televising Sanitary Sewer Systems" to determine the location of laterals in
27 any condition that may prevent proper installation of the liner pipe into the lines.
28 Such conditions shall be noted so they can be corrected. A digital data video and a
29 suitable log shall be prepared by the Contractor during the Work and provided to the
30 County a minimum of two weeks prior to liner installation.
- 31 3. The Contractor shall provide for the flow of sewage around the section or sections of
32 pipe designated for lining as specified in Section 01516 "Collection System Bypass."
- 33 a. Flow control shall be exercised as required to ensure that no flowing sewage
34 comes into contact with sections of the sewer under repair.
- 35 b. A sewer line plug shall be inserted into the sewer upstream from the section to be
36 repaired. The plug shall be so designed that all or any portion of the sewage
37 flows can be released. During the review, testing and installation portion of the
38 operation, flows shall be shut off in order to properly install the cured-in-place
39 pipe lining. The upstream manholes shall be constantly monitored for degree of
40 surcharging. After the installation is complete, flows shall be restored to normal
41 level.
- 42 c. Wherever lines are blocked off and the possibility of backing up the sewage and
43 causing harm to public and private property is foreseen, it shall be the
44 Contractor's responsibility to bypass flow from manhole to manhole.

- 1 d. Bypassing shall be accomplished using sewer plugs with pump connections, by
2 pumping down surcharged manholes, or by other methods acceptable to the
3 County. All bypassed flow must be discharged to a sanitary sewer. Bypassed
4 flow shall not be allowed to enter any storm line, drainage ditch or street gutter.
5 e. During a bypass operation, the pump shall be manned continuously; the
6 Contractor shall maintain the pump and bypass equipment; and shall be
7 responsible for any damages to public or private property due to the malfunction
8 of same.
- 9 4. The Contractor shall clear the line of obstructions such as solids, dropped joints,
10 protruding service connections or collapsed pipe that will prevent the insertion of the
11 liner pipe. If inspection reveals an obstruction that cannot be removed by
12 conventional sewer cleaning equipment, then the County shall be notified
13 immediately.
- 14 5. Do not install liner if ground water temperatures and/or ambient temperatures are
15 excessive for the product installation procedures.
- 16 6. Notification of Public or Customers: Customers shall be notified by the Contractor
17 with door hangers at least 3 days prior to the shutdown of any lateral services. The
18 door hanger shall be approved by the County and advise the customers of when the
19 Work will begin, expected date of completion, the type of work, and contact person
20 for any questions and the door hanger. When it is necessary to shut down a private
21 sewer lateral while work is in progress and before the laterals are reconnected, the
22 customers shall be notified by the Contractor. No sewer or water service is to remain
23 shut down for more than a period of 8-hours unless the Contractor provides substitute
24 services for the residents. Commercial sewer services shall be maintained at all times
25 that the business is open. No sewage from the services or main line shall be
26 discharged on the ground or in waterways.
- 27 7. Contractor shall coordinate pump stations, force main and sanitary sewer operation,
28 bypass and shutdown control with the County
- 29 8. Traffic Control: The Contractor shall provide all traffic control measures required for
30 the safety of the public, workers and equipment during the Work and in accordance
31 with FDOT and the County.
- 32 9. The Contractor shall provide critical backup equipment to insure that the lining
33 operation progresses without interruption. Required backup equipment shall include
34 at a minimum 1 additional lateral cutter system and 1 additional CCTV camera
35 system.

36 3.02 INSTALLATION OF LINER

- 37 A. The CIPP liner shall be installed and cured in the host pipe per the manufacturer's
38 specifications as described and submitted in the Performance Work Statement. CIPP
39 installation shall be in accordance with the applicable ASTM Standards with the
40 following modification:
- 41 1. Prior to installation and as recommended by the manufacturer remote temperature
42 gauges or sensors shall be placed inside the host pipe to monitor the temperatures
43 during the cure cycle. Liner and/or host pipe interface temperature shall be monitored
44 and logged during curing of the liner.

- 1 2. The heat source shall be fitted with suitable monitors to gauge the temperature of the
2 incoming and outgoing heat source. Another such gauge shall be placed between the
3 impregnated reconstruction tube and the pipe invert at the remote manhole to
4 determine the temperatures during cure. The resin manufacturer shall recommend
5 temperature in the line during the cure period.
- 6 3. The wet-out tube shall be positioned in the pipeline using the method specified by the
7 manufacturer. Care should be exercised not to damage the tube as a result of
8 installation. The tube shall be inverted through an existing manhole or approved
9 access point and fully extend to the next designated manhole or termination point.
10 Sufficient excess resin will be provided to insure excretion into cracked pipe and/or
11 joints of the host pipe after curing.
- 12 4. After inversion is completed, the Contractor shall supply suitable heat source and
13 recirculation equipment. The equipment shall be capable of delivering the heat
14 source throughout the section uniformly to raise the temperature above the
15 temperature required to affect a cure of the resin. This temperature shall be
16 determined by the resin/catalyst system employed. Temperatures shall be monitored
17 and recorded throughout the installation process to ensure that each phase of the
18 process is achieved at the manufacturer's recommended temperature levels. Copies of
19 these records shall be given to the County at the completion of each installation.
- 20 5. Curing shall be accomplished by utilizing the appropriate medium in accordance with
21 the manufacturer's recommended cure schedule. The curing source input and output
22 temperatures shall be monitored and logged during the cure cycles if applicable. The
23 manufacturer's recommended cure method and schedule shall be used for each line
24 segment installed, and the liner wall thickness and the existing ground conditions
25 with regard to temperature, moisture level, and thermal conductivity of soil, per
26 ASTM Standards as applicable, shall be taken into account by the Contractor.
- 27 6. For heat cured liners, if any temperature sensor or multiple sensors do not reach the
28 temperature as specified by the manufacturer to achieve proper curing or cooling, the
29 installer can make necessary adjustments to comply with the manufacturer's
30 recommendations. The system computer should have an output report that
31 specifically identifies each installed sensor station in the length of pipe, indicates the
32 maximum temperature achieved and the sustained temperature time. Each sensor
33 should record both the maximum temperature and the minimum cool down
34 temperature and comply with manufacturer's recommendations.
- 35 7. For UV cured liners, all light train sensor readings, recorded by the tamper proof
36 computer, shall provide output documenting the cure along the entire length of the
37 installed liner. The cure procedure shall be in accordance with the manufacturer's
38 recommendation as included in the performance work statement.
- 39 8. Temperatures and curing data shall be monitored and recorded by the Contractor
40 throughout the installation process to ensure that each phase of the process is achieved
41 as approved in accordance with the CIPP system manufacturer's recommendations.
- 42 9. The Contractor shall immediately notify the County of any delays taking place during
43 the insertion operation. Such delays shall possibly require sampling and testing by an
44 independent laboratory of portions of the cured liner at the County's discretion. The
45 cost of such test shall be borne by the Contractor and no extra compensation will be
46 allowed. Any failure of sample tests or a lack of immediate notification of delay shall
47 be automatic cause for rejection of that part of the Work at the County's discretion.

- 1 10. Initial cure shall be deemed to be completed when inspection of the exposed portions
2 of cured pipe appear to be hard and sound and the remote temperature sensor
3 indicates that the temperature is of a magnitude to realize an exotherm. The cure
4 period shall be of a duration recommended by the resin manufacturer, as modified for
5 the cured-in-place inversion process, during which time the recirculation of the heat
6 source and cycling of the heat exchanger to maintain the temperature continues.
7 Contractor shall retain a resin-impregnated sample (wick) to provide verification of
8 the curing process taking place in the host pipe.
- 9 11. The Contractor shall cool the hardened pipe to a temperature below 100°F before
10 relieving the static head in the inversion standpipe. Cool-down may be accomplished
11 by the introduction of cool water into the inversion standpipe to replace water being
12 drained and disposed per the approved pre-treatment plan. Care shall be taken in the
13 release of the static head so that a vacuum will not be developed that could damage
14 the newly installed pipe.
- 15 12. Seal the area where the line enters or leaves each manhole. Finish the inside of the
16 manhole with a quick set cement grout to raise the invert to the grade of the liner
17 pipe. Also use this grout to dress up around the end of the liner. This space may be
18 sealed with a mechanical seal, chemical seal, or combination of both. The Contractor
19 shall seal the liner at all manhole reconnections with an approved product, compatible
20 with the liner, to completely seal any annular space present.
- 21 13. If the pipe liner fails to make a tight seal due to broken or misaligned pipe at the
22 manhole wall or other reason, the Contractor shall apply a seal at that point.
- 23 14. The temperature of water discharged to the sewer system from processing liners shall
24 not exceed 100°F maximum or the level allowed by State or Local standards. When
25 draining water, care shall be exercised not to create a vacuum in the line.
- 26 15. After the liner has been installed, all active, existing services shall be temporarily
27 reinstated. This shall be done without excavation in pavement areas, and in the case
28 of non-man-entry pipes, from the interior of the pipeline by means of a 360° (degree)
29 television camera and a cutting device that re-establishes the service connection.
30 When a remote cutting device is used and a cleanout is available, then a mini-camera
31 down the service may also be used to assist the operator in cutting or trimming. All
32 coupons shall be recovered at the downstream manhole and removed.
- 33 16. The cost for maintaining sanitary sewer service for the property owners shall be
34 included in the prices bid and no additional compensation will be allowed.

35 3.03 POST INSTALLATION

36 A. Service Lateral Renewal

- 37 1. The number of service connections on some sewer segments may exceed the number
38 of buildings actually served. It is the Contractor's responsibility to determine through
39 dye testing, or other acceptable methods, the services that are live and require
40 reinstatement prior to commencing lining of the sewer main.
- 41 2. Inactive services to vacant parcels shall be renewed, unless otherwise directed by the
42 County.

- 1 3. The exact location and number of service connections or side sewers shall be verified
2 during the initial television inspection. It shall be the Contractor's responsibility to
3 accurately field locate all existing service connections or side sewers and establish
4 means for access for flow control. The Contractor shall reconnect all service
5 connections or side sewers to the liner pipe as indicated in accordance with the
6 Contract Documents.
 - 7 4. The Contractor shall be responsible for restoring/correcting, without any delay, all
8 missed or faulty reconnections, as well as any damage caused to property owners for
9 not reconnecting the services soon enough or for not giving notice to the property
10 owners.
 - 11 5. Any lateral not initially reinstated by the Contractor that proves to be active shall be
12 reinstated by the Contractor at no additional cost to the County and the Contractor
13 shall be responsible for any resulting property damage of floods.
 - 14 6. All existing service connections shall be reconnected by a remote controlled cutting
15 device directed internally by a television camera or by internal manual cutting. Cuts
16 shall be made by experienced operators so that no blind attempts or holes are made in
17 the liner pipe. Locations shall be verified carefully to match earlier tapes for accurate
18 lateral location, especially where dimples are not well defined. The County reserves
19 the right to require service connection by excavation at the Contractor's expense at
20 any location if the quality or workmanship of the cut is not satisfactory.
 - 21 7. A 2-pass process of utilizing a cutter to open the lateral followed by wire brush (or
22 similar) attachment to complete the cutting flush with the lateral walls should be
23 utilized, or approved alternate. It shall be properly aligned, invert to invert, to the
24 existing connection with no obstructions to the flow. Resin slugs shall be removed as
25 necessary from reinstated service connections. Any mis-cuts shall be repaired at no
26 cost to the County and shall be performed utilizing an additional thinner liner to
27 prevent water from entering behind the liner to the full satisfaction of the County. All
28 coupons cut from the liner for reopening of lateral connections shall be retrieved from
29 the sewer, accounted for by the Contractor, and turned over to the County.
 - 30 8. Service connections shall be reinstated to at least 95% of the original area as it enters
31 the host pipe.
 - 32 9. All service connections and side sewers to be reconnected to the main sewer, shall be
33 cleaned up to a length of 1-foot from the inside face of the existing wall of the main
34 pipe. All deposits within the first foot of the service connection or side sewer in the
35 service connections shall be removed and laterals reinstated.
 - 36 10. Contractor shall provide a sound, smooth transition from laterals/side sewers to the
37 main sewer. Contractor shall submit for approval a detailed repair plan for the
38 permanent repair of any gaps between the installed liner and the face of the
39 lateral/side sewer connections.
 - 40 11. For PVC laterals or laterals that have been previously lined with cured-in-place pipe
41 the Contractor shall take care during the reinstatement to avoid damage to the lateral
42 pipe.
- 43 B. Each pipe lined shall be post-CCTV inspected in accordance with Section 02762
44 "Televising Sanitary Sewer Systems" as soon as practical after processing to assure
45 complete curing.

- 1 1. The Contractor shall not reactivate any section of lined sewer pipe until authorized to
2 do so by the County. Segments not fully conforming to these Specifications must be
3 immediately brought to the County's attention with a proposed method of correction.
- 4 2. Immediately prior to conducting the post-lining CCTV, the Contractor shall
5 thoroughly clean the newly installed liner removing all debris and build-up that may
6 have accumulated, at no additional cost to the County.
- 7 3. The post-CCTV inspection documentation shall be submitted within 5 working days
8 of the liner installation. The County may at its discretion suspend any further
9 installation of CIPP until the post-installation documentation is submitted.
10 a. As a result of this suspension, no additional working days will be added to the
11 contract, nor will any adjustment be made for increase in cost

12 C. Defects

- 13 1. The liner shall be continuous and free of all visual and material defects except those
14 resulting from pre-lined conditions (such conditions shall be brought to the attention
15 of the County prior to lining).
- 16 2. There shall be no damage, deflection, holes, delaminating, uncured resin or other
17 visual defects in the liner.
- 18 3. The liner surface shall be smooth and free of waviness throughout the pipe.
- 19 4. No visible leakage through the liner or at manhole or service lateral connections will
20 be allowed.
- 21 5. Any defects located during the inspection shall be corrected by the Contractor to
22 conform to the requirements of the specifications and to the satisfaction of the
23 County.
- 24 6. Defects in the installed CIPP shall be identified and defined as specified in Section
25 02762 Televising Sanitary Sewer Systems.
- 26 7. Repairable defects that may occur in the installed CIPP shall be specifically defined
27 by the Contractor based on manufacturer's recommendations, including a detailed
28 step-by-step repair procedure, resulting in a finished product meeting the
29 requirements of these contract specifications.
- 30 8. Un-repairable defects that may occur to the CIPP shall be clearly defined by the
31 Contractor based on the manufacturer's recommendations, including a recommended
32 procedure for the removal and replacement of the CIPP.

33 D. Manhole Connections

- 34 1. Where liners of any type are installed in 2 or more continuous manhole segments, the
35 liner invert through the intermediate manholes shall be left intact. Final finishing of
36 the installation in those intermediate manholes shall require removal of the top of the
37 exposed liner and neat trimming of the liner edge where it touches the lip of the
38 manhole bench.
- 39 2. Reinstate openings for all manhole drop assemblies after relining mainline sewer
40 a. Outside drop assemblies shall be lined with a cured-in-place liner compatible with
41 the mainline liner, for the full length of the drop assembly and bend.
42 b. Inside drop assemblies are not required to be relined.
- 43 3. A seal consisting of a resin mixture or hydrophilic seal compatible with the installed
44 CIPP shall be applied at manhole/wall interface in accordance with the CIPP system
45 manufacturer's recommendations.

1 E. Portions of any piece of liner material removed during installation shall be available for
2 inspection and retention by the County.

3 3.04 TESTING

4 A. The physical properties of the installed CIPP shall be verified through field sampling and
5 laboratory testing. All testing shall be furnished by the Contractor. All materials testing
6 shall be performed at the Contractor's expense, by an independent third party laboratory
7 selected by the County as recommended by the CIPP manufacturer. All tests shall be in
8 accordance with applicable ASTM test methods to confirm compliance with the
9 requirements in these documents.

10 B. The Contractor shall pay for all testing included in this section

11 C. The Contractor shall provide samples for testing from the actual installed CIPP liner.
12 The Contractor shall determine sampling location and procedures to ensure representative
13 samples are obtained from the finished liner, subject to the approval by the County. The
14 contractor shall provide removable sizing sleeves, when possible, to collect liner samples,
15 which accurately replicate the host pipe diameter.

- 16 1. A minimum of 1 sample shall be taken of the first segment installed or as directed by
17 the County.
18 2. A minimum of 2 samples shall be taken for each 2,500 lineal feet of liner material
19 installed or for each manufacturing lot, if less, or as directed by the County.
20 3. A minimum of 6 samples per project shall be taken for each type of liner furnished or
21 as directed by the County.
22 4. A sample shall be cut from a section of cured liner that has been inverted or pulled
23 through a like diameter pipe which has been held in place by a suitable heat sink such
24 as sand bags.
25 5. All curing, cutting, and identification of samples shall be witnessed by the County.

26 D. Tests of the samples shall be conducted in accordance with ASTM standards

- 27 1. Short term flexural properties: The initial tangent flexural modulus of elasticity and
28 flexural strength shall be measured in accordance with test methods in ASTM D790.
29 2. Fiber reinforced flexural properties: specimens should be sampled in accordance with
30 ASTM F1743, section 8.1.2 and flexural properties shall be determined in accordance
31 with ASTM F1743, section 8.1.3 along the longitudinal and circumferential axis of
32 the install CIPP.
33 3. Fiber reinforced tensile properties: Where the CIPP is reinforced with oriented
34 continuous or discontinuous fibers to enhance the physical properties of the CIPP,
35 specimens shall be sampled in accordance with ASTM F1743, section 8.1.2 and
36 tensile properties shall be determined in accordance with ASTM D3039 and tested
37 along the longitudinal axis and circumferential axis of the installed CIPP.

1 4. CIPP wall thickness shall be determined in a manner consistent with ASTM D5813,
2 section 8.1.2. Thickness measurements shall be made in accordance with the practice
3 in ASTM D3567 for ASTM D5813, section 8.1. Deduct from the measured values
4 the thickness of any plastic coating or CIPP layer not included in the structural design
5 of the CIPP. The average thickness shall be calculated using all measured values and
6 shall meet or exceed the minimum design thickness. The minimum wall thickness at
7 any point shall not be less than 87.5% of the approved specified thickness.

8 E. The installed CIPP thickness shall be measured for each liner shipment to the job site. If
9 the CIPP thickness does not meet that specified in the contract and submitted as the
10 approved design by the Contractor, then the liner shall be repaired or removed. The
11 samples shall be made by core drilling 2-inch diameter test plugs at random locations
12 selected by the County. As an alternative the Contractor may use industry proven, non-
13 destructive methods for confirming the thickness of the installed CIPP if it can be shown
14 the calibrated thickness is the same as core test plugs.

15 3.05 ACCEPTANCE

16 A. Liner

- 17 1. It is the intent of these specifications that the completed liner with all appurtenances
18 shall be essentially equivalent in final quality and appearance to new sewer
19 installation.
- 20 2. The finished liner shall be continuous over the entire segment between manholes and
21 homogenous throughout.
- 22 3. The finished liner shall be fully rounded and as free as commercially practicable from
23 visible defects, including but not limited to damage, deflection, holes, delamination,
24 ridges, cracks, uncured resin, foreign inclusions or other objectionable defects.
- 25 4. Where a defect in the liner requires removal of a section of the liner in the County's
26 opinion, the Contractor shall make all repairs as required by the County and shall
27 install a segmental liner, compatible with the liner, to accomplish a continuous
28 finished liner.
- 29 5. The pipe shall be neatly and smoothly cut off at each manhole. The manhole trough
30 shall be raised to the invert of the liner to preclude snagging and shoaling of debris.

31 B. Defects: Any defect which will or could affect the structural integrity, strength of the
32 lining, flow impairment, or leaks shall be repaired as outlined below or in accordance
33 with the approved repair or replacement procedures as recommended by the CIPP system
34 manufacturer. The repair or replacement of the defects will be at the Contractor's
35 expense.

36 1. Leaks

- 37 a. There shall be no visible infiltration through the liner, around the liner at manhole
38 connections, at lined service connections or in lined services. Contractor shall
39 repair any visible leaks and the repair method shall be approved by the County.

40 2. Wrinkles/Fins

- 41 a. Wrinkles outside the flow line of the pipeline:

42 (1) Wrinkles/fins in height up to a maximum of 5% of the inside diameter of the
43 host pipe are acceptable

- 1 (2) Wrinkles/fins over 5%, particularly those of a longitudinal configuration, may
2 be acceptable and should be evaluated, by the project engineer for acceptance,
3 on a case-by-case basis.
- 4 b. Wrinkles in the flow line:
 - 5 (1) Wrinkles/fins projecting more than 5% into the flow that are generally
6 longitudinal in their orientation may be deemed acceptable by the County on a
7 case-by-case basis by considering any potential operation and maintenance
8 issues that would result from their being left in place.
 - 9 (2) Wrinkles/fins in the lower third or flow line of the finished CIPP (based upon
10 the depth of flow) that are generally circumferential in their orientation should
11 not exceed 0.5-inches, whichever is smaller. Acceptability of larger
12 wrinkles/fins meeting this characterization shall be, on a case-by-case basis by
13 the County with consideration given to potential operations and maintenance
14 issues that would result from their being left in place.
- 15 c. Repair when wrinkles/fins are removed:
 - 16 (1) Wrinkles should be fully cured, tight and the resin should be homogeneous
17 across the full width of the wrinkle.
 - 18 (2) In most cases, when wrinkles/fins are removed from the installed CIPP, the
19 resin in the liner pipe is fully cured and homogeneous and no further repair is
20 required. If a repair is required the manufacturer should be contacted for the
21 correct repair procedure.
- 22 3. Blisters should be probed and punctured to determine the existence of water behind
23 the blister.
 - 24 a. No action required unless the pipe is leaking at the blisters.
- 25 4. Lifts in Liner
 - 26 a. Soft lifts should be re-processed by the Contractor to fully cure the CIPP.
 - 27 b. Hard lift shall be removed and a new short liner as required being equivalent to
28 the original installed CIPP.
- 29 5. A bulge in the invert caused by residual debris left in the pipe that impedes the flow
30 characteristics of the pipeline should be cut out.
 - 31 a. Cut out the section of the bulge and replace with a new short liner equivalent to
32 the original product or as recommended by the manufacturer.
- 33 6. Pinholes: the area where the liner has pinholes should be patched with a short-liner
34 repair or the liner removed and replaced as recommended by the manufacturer.
- 35 7. Soft spot in liner needs to be reheated and hardened or cut out and replaced or as
36 recommended by the manufacturer.
- 37 8. Dry tube or white spots are not acceptable and shall be removed and a patch repair
38 shall be performed or as recommended by the manufacturer.
- 39 9. Liner surface peeled off
 - 40 a. Cut out a representative sample of the CIPP
 - 41 b. Test physical properties and remaining CIPP thickness to verify that the contract
42 design requirements are met.
 - 43 c. Replace liner or as recommended by the manufacturer
- 44 10. Hole in the liner is not acceptable
 - 45 a. Small holes can be repaired with epoxy
 - 46 b. Short liner installed over larger holes or as recommended by the manufacturer
- 47 11. Cracks in liner are unacceptable and shall be repaired

- 1 12. Loose liner seam tape shall be removed to prevent potential hang-up of debris.
- 2 13. Annular space between host pipe and liner at manhole
- 3 a. If leaking between the host pipe and the CIPP, inject a hydrophilic type grout to
- 4 stop the leakage.
- 5 b. If the pipe is located in groundwater, inject a hydrophilic type grout to stop
- 6 possible future leakage.
- 7 c. If the pipe is not in groundwater, a cementitious grout can be used to fill the
- 8 space.
- 9 14. Liner delamination
- 10 a. Cut out the section of delaminated liner and replace with a new short liner
- 11 equivalent to the original product or as recommended by the manufacturer.
- 12 15. CIPP discoloration
- 13 a. Obtain a sample for testing the CIPP physical properties. Follow manufacturer's
- 14 recommendations for repair.
- 15 b. Remove and replace the CIPP physical if the physical properties do not meet the
- 16 contract minimum requirements.
- 17 c. No action required if the tested samples meet the physical properties.
- 18 16. Improper repair of CIPP: duct tape is not an acceptable repair for any situation.
- 19 17. The CIPP should fit tight inside the host pipe.
- 20 a. If the CIPP does not fit tightly against the original pipe at its termination point(s),
- 21 the full circumference of the CIPP exiting the existing host pipe should be sealed
- 22 by filling with a resin mixture compatible with the CIPP.
- 23 18. Overcut connection not allowed
- 24 a. Opening cut to match bottom of service pipe to eliminate debris build-up
- 25 b. If an overcut is made, grout the interface between the connection and the mainline
- 26 c. Install a connection hat
- 27 d. Install a short liner, then re-cut the service connection opening
- 28 19. Leakage between CIPP and host pipe at service connection
- 29 a. Leakage shall be stopped
- 30 b. Grout the interface between the connection and the mainline
- 31 c. Install a connection hat
- 32 20. Connection hat issue
- 33 a. Coating from mainliner not removed before installing the hat
- 34 b. Loose material shall be removed
- 35 c. Remove and replace the connection hat as recommended by the manufacturer
- 36 21. Undercut service connection
- 37 a. Finish cut with brush to create a smooth opening
- 38 22. Resin slug in service connection
- 39 a. If not blocking the flow from the service connection and slug does not impede
- 40 more than 20% of the connection opening, no action required
- 41 b. If blocking the flow, remove slug or dig up and replace the connection
- 42 C. Service Connections
- 43 1. The CIPP lateral lining shall not inhibit the CCTV post video inspection of the
- 44 mainline or service lateral pipes.
- 45 2. Reinstatement of all lateral connections shall be done neatly and smoothly.

1 3.06 CLEAN-UP AND RESTORATION

2 A. The Contractor shall not allow the site of the Work to become littered with trash and
3 waste material, but shall maintain the site in a neat and orderly condition throughout the
4 construction period.

5 B. On or before completion, the Contractor shall clean and remove from the site of the Work
6 all surplus and discarded materials, temporary structures, stumps and portions of trees,
7 and debris of any kind. He shall leave the site of work in a neat and orderly condition,
8 similar or equal to that prior to construction.

9 C. All private and public property along or adjacent to the Work disturbed by construction
10 operations shall be restored to a condition similar or equal to that existing prior to
11 construction.

12 D. Before final acceptance by the County, the Contractor shall replace and/or restore any
13 water, sewer, drain, and gas lines and appurtenances; electrical, telephone, telegraph
14 conduits and wires, both underground and aboveground, and appurtenances; traffic
15 signals, fire and police alarm systems and appurtenances; sidewalks, curbs, gutter,
16 drainage ditches and pavements and all other public utility facilities and appurtenances
17 along or adjacent to the Work that may have been disturbed by construction operations.

18 E. Conditions permitting, property cleanup and restoration shall begin and be prosecuted to
19 completion on a timely basis as set forth herein.

20 3.07 PROGRESSIVE CIPP INSTALLATION RECORD (SHOT RECORD)

21 A. The Contractor shall provide a progressive CIPP Installation Record (Shot Record) with
22 monthly application for partial payments. The progressive shot record shall indicate
23 quantities actually installed and deviations to the parameters included in the shot record
24 (i.e. shot number and corresponding manhole to manhole pipe reaches for each scheduled
25 installation, design thickness, actual thickness delivered to the site, pipe diameter, reach
26 length, total length of shot, and number of laterals).

27 B. Monthly partial payments will not be approved without prior approval of the progressive
28 CIPP Installation record (Shot Record) including verification and acceptance of all
29 quantities by the County.

30 3.08 WARRANTY INSPECTION

31 A. The County shall conduct the warranty television inspection within 1-year following
32 completion of the project. If it is found that any of the CIPP has developed abnormalities
33 since the completion of the project, the abnormalities shall be repaired and/or replaced
34 by the Contractor promptly as per these specifications and as recommended by the
35 manufacturer.

36 **END OF SECTION**

1 **SECTION 02775**

2 **WASTEWATER MANHOLE REHABILITATION**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

5 A. Scope of Work: Sanitary sewer manhole rehabilitation including:

- 6 1. Rehabilitation and leak proofing of manholes by lining with spray applied or
7 centrifugally cast light-weight structural reinforced concrete, spray applied epoxy
8 resin systems, or equal as determined by County.
9 2. The repair and sealing of the manhole base, bench, invert, walls, corbel/cone, and
10 chimney of brick, block, or precast manholes, including the removal of any unsound
11 material.
12 3. The inspection and testing of the various types of work to insure compliance.

13 1.02 REFERENCES

14 A. Codes, Specifications, and Standards (Not Used)

15 B. Testing and Materials Standards

- 16 1. American Society of Testing and Materials (ASTM)

17 C. Related Sections

- 18 1. Section 01516 "Collection System Bypass"
19 2. Section 02774 "Wastewater Gravity Collection Systems"
20 3. Section 09901 "Coatings and Linings"
21 4. Section 09910 "Prefabricated Fiberglass Liners"

22 1.03 DEFINITIONS (NOT USED)

23 1.04 RESPONSIBILITY FOR OVERFLOWS AND SPILLS

24 A. It shall be the responsibility of the Contractor to schedule and perform his work so as to
25 result in no overflows or spills of sewage from the system. If sewage flows are such that
26 they interfere with the Contractor's ability to perform work, the Contractor shall be
27 responsible for scheduling his work during low flow periods or provide bypass pumping.
28 Bypass pumping shall be provided only with the specific written approval of the County.

29 B. In the event of overflows caused by the Contractor's work activities, the Contractor shall
30 immediately take appropriate action to contain and stop the overflow, clean up the
31 spillage, disinfect the area affected by the spill, and notify County in a timely manner.

1 C. Contractor will indemnify and hold harmless the County for any fines or third-party
2 claims for personal or property damage arising out of a spill or overflow that is fully or
3 partially the responsibility of the Contractor. Should fines subsequently be imposed as a
4 result of any overflow for which the Contractor is fully or partially responsible, the
5 Contractor shall pay all such fines and all of the County's legal, engineering, and
6 administrative costs in defending such fines and claims associated with the overflow.

7 1.05 SHOP DRAWINGS AND SUBMITTALS

8 A. Shop Drawings shall be submitted to the County for review and acceptance prior to
9 starting construction in accordance with the General Conditions and 01300 "Submittals"
10 for the following:
11 1. Manhole Liner

12 B. Submittals shall be submitted to the County for review and acceptance at least 14-days
13 prior to starting manhole rehabilitation in accordance with the General Conditions and
14 Division 1 for the following:
15 1. Manufacturers' Certificate of Compliance certifying compliance with the applicable
16 Specifications and Standards. The certifications shall list all materials furnished
17 under this Section.
18 2. Certified copies of factory tests required by the applicable Standards, the
19 Manufacturer, and this Section.
20 3. Manufacturer's handling, storage, and installation instructions and procedures.
21 4. Recommended lining thickness design to withstand groundwater pressure as specified
22 in Part 3 of this Section.

23 **PART 2 - PRODUCTS**

24 2.01 GENERAL

25 A. Materials
26 1. All materials furnished for this work shall be in accordance with the "List of
27 Materials and Approved Manufacturers" as appended to these Specifications.
28 2. The materials used shall be designed, manufactured, and intended for sewer manhole
29 rehabilitation and the specific application in which they are used. The materials shall
30 have a proven history of performance in sewer manhole rehabilitation. The materials
31 shall be delivered to the job site in original unopened packages clearly labeled with
32 the manufacturer's identification and printed instructions. All materials shall be
33 stored and handled in accordance with recommendations of the manufacturer. All
34 materials shall be mixed and applied in accordance with the manufacturer's written
35 instructions.
36 3. The Contractor shall warrant and hold harmless the County against all claims for
37 patent infringement and any loss thereof.
38 4. Handle and store all materials and dispose of all wastes in accordance with applicable
39 regulations.

- 1 5. Each lining system shall be designed for application over wet surfaces (but not active
2 running water) without degradation of the final product and/or the bond between the
3 product and the manhole surfaces.
- 4 B. The following shall be used for stopping active leaks in concrete and masonry manholes:
- 5 1. A premixed fast-setting, volume-stable waterproof cement plug consisting of
6 hydraulic cement, graded silica aggregates, special plasticizing, and accelerating
7 agents. It shall not contain chlorides, gypsum's, plasters, iron particles, aluminum
8 powder, or gas-forming agents, or promote the corrosion of steel it may come in
9 contact with. Set time shall be approximately 1-minute. Ten (10) minute
10 compressive strength shall be approximately 500-psi.
- 11 2. A silicate-based liquid accelerator field mixed with neat Portland cement. The set
12 time shall be approximately 1-minute.
- 13 3. The elastomeric polyurethane resin-soaked method, using dry twisted jute oakum, or
14 resin-rod with polyurethane resin (water activated).
- 15 C. The following shall be used for patching, repointing, filling, and repairing non-leaking
16 holes, cracks, and spalls in concrete and masonry manholes:
- 17 1. A premixed non-shrink cement-based patching material consisting of hydraulic
18 cement, graded silica aggregates, special plasticizing and accelerating agents, which
19 has been formulated for vertical or overhead use. It shall not contain chlorides,
20 gypsums, plasters, iron particles, aluminum powder, or gas-forming agents or
21 promote the corrosion of steel with which it may come into contact. Set time (ASTM
22 C-191) shall be less than 30-minutes. One-hour compressive strength (ASTM C-109)
23 shall be a minimum of 200-psi and the ultimate compressive strengths (ASTM C-882-
24 Modified) shall be a minimum of 1,700-psi.
- 25 D. Spray applied or centrifugally cast structural reinforced cement manhole lining
- 26 1. The material applied to the surface of the manhole shall be a cementitious blend of
27 calcium aluminate cement and manufactured calcium aluminate aggregates for
28 constructing a liner that is impervious to the flow of water, is resistant to sulfide
29 attack, and restores structural integrity to existing manhole walls.
- 30 2. A monolithic liner shall be formed which covers all interior manhole surfaces and
31 shall have the following minimum requirements at 28-days:
- 32 Compressive Strength (ASTM C-579B) 3,000-psi
- 33 Tensile Strength (ASTM C-496) 300-psi
- 34 Flexural Strength (ASTM C-293) (Modified) 600-psi
- 35 Shrinkage (ASTM C-596) 0% at 90% R.H.
- 36 Bond (ASTM C-321) 130-psi
- 37 Density, when applied 105± pcf
- 38 E. Spray applied epoxy resin system manhole lining.
- 39 1. The material sprayed onto the surface of the manhole shall be an epoxy resin system
40 formulated for application within a sanitary sewer environment. The resin will
41 exhibit suitable corrosion resistance and enhance the structural integrity of the
42 existing manhole.

1 F. Multi-component stress skin panel liner system.

- 2 1. The material applied onto the surface of the manhole shall be a multi-component stress
3 skin panel liner system designed to withstand the effects of hydrogen sulfide without any
4 deterioration to the liner. The liner shall be a solvent free, two-component polymeric,
5 moisture/chemical barrier specifically developed for the wastewater environment.
6 2. The cured epoxy resin system shall conform to the following minimum Structural
7 Standards:
8

Table 02775-1
Minimum Structural Standards

Cured Product	Test Method	Results
Tensile Stress	ASTM D-638	7,000-psi
Flexural Stress	ASTM D-790	13,000-psi
Flexural Modulus	ASTM D-790	500,000-psi
Compressive Strength	ASTM D-695	13,000-psi

9 **PART 3 - EXECUTION**

10 3.01 REHABILITATION OF MANHOLE STRUCTURE

11 A. General Procedures

- 12 1. Safety: The Contractor shall perform all work in strict accordance with all applicable
13 OSHA, state, local, and manufacturer's safety standards. Each method of manhole
14 rehabilitation in this Section requires some degree of manhole entry by workers.
15 Particular attention is drawn to those safety requirements regarding confined space
16 entry and respiratory protection from airborne particulate materials during cleaning,
17 product mixing, and application.
18 2. Cleaning: All concrete and masonry surfaces to be rehabilitated shall be clean. All
19 grease, oil, laitance, coatings, loose bricks, mortar, unsound brick or concrete, and other
20 foreign materials shall be completely removed. Water blasting utilizing a 210°F steam
21 unit and proper nozzles shall be the primary method of cleaning; however, other
22 methods such as wet or dry sandblasting, acid wash, concrete cleaners, degreasers, or
23 mechanical means may be required to properly clean the surface. All surfaces on
24 which these methods are used shall be thoroughly rinsed, scrubbed, and neutralized to
25 remove cleaning agents and their reactant products. Debris resulting from cleaning
26 shall be removed from the manhole and not discharged downstream.
27 3. Stopping Infiltration: After surface preparation and prior to the application of mortars
28 and coatings, infiltration shall be stopped either by plugging with a waterstop
29 compound or chemical grout sealing.
30 4. Patching: All large holes or voids around joints, or pipes and all spalled areas and all
31 holes caused by missing or cracked brick shall be patched. All missing mortar shall
32 be repointed using a non-shrink patching mortar. All cracked or disintegrated
33 material shall be removed from the area to be patched or repointed, exposing a sound
34 sub base. All cracks not subject to movement and greater than 1/16-inch in width
35 shall be routed out to a minimum width and depth of 1/2-inch and patched with non-
36 shrink patching mortar.

- 1 5. Flow Control: The Contractor shall be responsible for plugging or diverting the flow
2 of sewage as needed for repair and lining of manhole inverts and benches.
- 3 6. Remove all loose grout and rubble from existing channel. Rebuild channel if required
4 by reshaping and repairing slope of shelves or benches. Work shall include aligning
5 inflow and outflow ports in such a manner as to prevent the deposition of solids at the
6 transition point. All inverts shall follow the grades of the pipe entering the manhole.
7 Changes in direction of the sewer and entering branch or branches shall have a true
8 curve with the largest possible radius and shall be shaped to allow easy entrance of
9 maintenance equipment including buckets or T.V. camera.
- 10 7. Each lining system shall be installed in accordance with the manufacturer's
11 recommendation to withstand groundwater pressures. For manholes greater than 12-
12 feet in depth, the lining shall withstand the pressures associated with a groundwater
13 depth equal to the manhole depth. Linings for all other manholes shall withstand the
14 pressures associated with groundwater depth of 12-feet. Measure groundwater depth
15 from manhole bench to top of ground surface.
- 16 8. Application of products shall be by factory certified applicators.

17 3.02 SPRAY APPLIED LIGHT-WEIGHT STRUCTURAL REINFORCED CEMENT

- 18 A. The surface prior to spraying shall be damp without noticeable free water droplets or
19 running water. Materials shall be spray-applied to a minimum uniform thickness to
20 insure that all cracks, crevices, and voids are filled and a somewhat smooth surface
21 remains after light troweling. The light troweling is performed to compact the material
22 into voids and to set the bond.
- 23 B. The first application shall have begun to take an initial set (disappearance of surface
24 sheen, which could be 15-minutes to 1-hour depending upon ambient conditions) before
25 the second application to assure a minimum total finished thickness of 1/2-inch. The
26 final finished thickness may need to be greater than 1/2-inch as recommended by the
27 manufacturer to withstand groundwater pressures. A depth gauge shall be used during
28 application, at various locations, to verify the required thickness. The surface then shall
29 be trowelled to smooth finish with care taken not to over trowel so as to bring additional
30 water to the surface and weaken it. Manufacturer's recommendations shall be followed
31 whenever more than 24-hours have elapsed between applications.
- 32 C. The bench covers used to catch debris shall be removed and the bench and invert sprayed
33 such that a gradual slope is produced from the walls to the invert with the thickness at the
34 edge of the invert being no less than 1/2-inch. The wall-bench intersection shall be
35 rounded to a uniform radius the full circumference of the intersection.
- 36 D. No application shall be made to frozen surfaces or if freezing is expected to occur within
37 the manhole for 24-hours after application. If ambient temperatures are in excess of
38 95°F, precautions shall be taken to keep the mix temperature at time of application below
39 90°F, using ice if necessary.
- 40 E. The final application shall have a minimum of 4-hours cure time before being subjected
41 to active flow.

1 3.03 CENTRIFUGALLY CAST STRUCTURAL REINFORCED CEMENT

2 A. Application procedures shall conform to the recommendations of the manufacturer.

3 B. The rotating casting applicator shall be positioned to evenly apply the material and be
4 withdrawn at a rate to assure a final minimum thickness of 1-inch. The final finished
5 thickness may need to be greater than 1-inch as recommended by the manufacturer to
6 withstand groundwater pressures. A depth gauge shall be used during application, at
7 various locations to verify the required thickness.

8 C. The bench covers used to catch debris shall be removed and the bench and invert sprayed
9 or hand applied so that a gradual slope is produced from the walls to the invert with the
10 thickness at the edge of the invert being no less than 1/2-inch. The wall-bench
11 intersection shall be rounded to a uniform radius the full circumference of the
12 intersection.

13 D. No application shall be made to frozen surfaces or if freezing is expected to occur within
14 the manhole for 24-hours after application. If ambient temperatures are in excess of
15 95°F, precautions shall be taken to keep the mix temperature at time of application below
16 90°F.

17 E. The final application shall have a minimum of 1-hour cure time as recommended by the
18 manufacturer before being subjected to active flow.

19 3.04 SPRAYED APPLIED EPOXY RESIN SYSTEM

20 A. Application procedures shall conform to the recommendations of the manufacturer.

21 B. The epoxy resin shall be sprayed onto the surfaces of the manhole walls, benches, and
22 inverts to produce a smooth coating and yield the required structural integrity and
23 corrosion resistance. A depth gauge shall be used during application at various locations
24 to verify the required thickness.

25 C. The epoxy resin shall be applied to a minimum thickness of 0.125-inches (125-mils) at
26 the top of the manhole and gradually thickened in accordance with manufacturer's
27 recommendations to withstand groundwater pressures. The application shall have a
28 minimum cure time as recommended by the manufacturer before being subjected to
29 active flow.

30 D. The sloped surface of the manhole bench shall be made non-skid by broadcasting
31 aluminum oxide or sand into the surface prior to gelatin/set.

32 3.05 MULTI-COMPONENT LINER SYSTEM

33 A. Application procedures shall conform to the recommendations of the manufacturer.

- 1 B. The liner system shall be sprayed onto the surfaces of the manhole walls, benches, and
- 2 inverts to produce a smooth surface. The spray equipment shall be specifically designed
- 3 to accurately ratio and apply the liner system.
- 4 C. Final installation shall be a minimum of 500-mils.
- 5 D. The application shall have a minimum cure time as recommended by the manufacturer
- 6 before being subjected to active flow.

7 3.06 SANITARY SEWER LATERAL CONNECTIONS TO MANHOLES

- 8 A. Sanitary sewer lateral connections to rehabilitated manholes shall be reinstated to provide
- 9 a seamless, leak free, and unobstructed flow connection between the new manhole lining
- 10 or coating system and the lateral connection per 3.01A.
- 11 B. Sanitary sewer laterals requiring rehabilitation shall be renewed per Section 02772
- 12 "Cured-In-Place Pipe (CIPP) For Lateral Renewal."

13 3.07 MANHOLE REHABILITATION ACCEPTANCE

- 14 A. Test all rehabilitated manholes using the vacuum test method as per ASTM C 1244
- 15 "Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure
- 16 (Vacuum) Test", following the manufacturer's recommendations for proper and safe
- 17 procedures. Vacuum testing of manholes and structures shall be performed after curing
- 18 of linings. Any visible leakage in the manhole or structure before, during, or after the test
- 19 shall be repaired regardless of the test results.
- 20 B. All pipes for vacuum testing entering the manhole shall be installed at the top access
- 21 point of the manhole. A vacuum of 10-inches of mercury (5.0-psi) shall be drawn on the
- 22 manhole, and the time shall be measured for the vacuum to drop to 9-inches of mercury
- 23 (4.5-psi). Manholes will be considered to have failed the air test if the time to drop 1-
- 24 inch of mercury is less than what is shown in the following table:

Table 02775-2
Vacuum Test Timetable

Vacuum Test Timetable				
Manhole Diameter – Inches				
Depth – feet	48-inches	60-inches	72-inches	96-inches
4	30 sec.	30 sec.	30 sec.	30 sec.
8	30 sec.	30 sec.	32 sec.	38 sec.
12	30 sec.	39 sec.	48 sec.	57 sec.
16	40 sec.	52 sec.	64 sec.	76 sec.
20	50 sec.	65 sec.	80 sec.	95 sec.
24	60 sec.	78 sec.	96 sec.	114 sec.
+ Each 2'	+5 sec.	+6.5 sec.	+8.0 sec.	+9.5 sec.

- 1 C. Manhole depths shall be rounded to the nearest foot. Intermediate values shall be
2 interpolated. For depths above 24-feet, add the values listed in the last line of the table
3 for each 2-feet of additional depth.
- 4 D. If the manhole or structure fails the vacuum test, the Contractor shall perform additional
5 repairs and repeat the test procedures until satisfactory results are obtained.
- 6 E. After the manhole rehabilitation work has been completed, the manhole shall be
7 inspected by the Contractor in the presence of the County and the work shall be accepted
8 if found satisfactory to the County. No evidence of visible leaks shall be allowed. Non-
9 uniformity, sagging, lamination, holidays or other defects will be cause for rejection of
10 the coating. All surfaces shall be tested for the presence of holidays and pinholes via
11 spark testing at 100-volts per millimeter. The Contractor shall provide the testing
12 equipment and perform the testing in the presence of the County. Any holidays or
13 pinholes found during the testing shall be repaired and the surface re-tested until the
14 surfaces are completely free of holidays and pinholes.

15 3.08 CLEANUP

- 16 A. After the installation work has been completed and the testing is acceptable, the
17 Contractor shall clean up the entire project area. The Contractor shall dispose of all
18 excess material and debris. The work area shall be left in a condition equal to or better
19 than the prior condition.

20 3.09 WARRANTY

- 21 A. The Contractor shall guarantee his work for a warranty period of 1-year from the date of
22 acceptance.
- 23 B. If at anytime during the warranty period any leakage, cracking, loss of bond, or other
24 discontinuity is identified, the Contractor shall remove and replace the manhole liner with
25 new material at no cost to the County. No field repair shall be approved.
- 26 C. Furnish an extended warranty for manhole rehabilitation materials from the Contractor
27 and liner manufacturer for a total of 5-years from date of final completion.
28

29 **END OF SECTION**

1 2.02 MATERIALS

2 A. Fabric: The fabric shall be aluminum coated steel chain link, 72-inches high, No. 9-gauge
3 wire woven in a 2-inch mesh. The fabric shall conform to the requirements of ASTM
4 Designation A491. The aluminum coating shall be a minimum of 0.40-ounces per square
5 foot of wire surface for No. 9-gauge fabric. The fabric shall have a minimum tensile
6 strength of 75,000-psi. The weight of the coating shall be determined by the strip test as
7 defined in ASTM Designation A428. The fabric shall be coated with an ultra violet
8 stable black PVC coating which meets ASTM standards F688 Class I.

9 B. Post and Other Appurtenances: All posts and other appurtenances used in the
10 construction of this fence shall be hot dipped galvanized with a minimum of 1.8-ounces
11 per square foot of surface. Pipe sections shall conform to the requirements of ASTM
12 Designation A120. All posts, rails, and fittings shall be coated with an ultra violet stable
13 black PVC coating which meets ASTM standards F688 Class I.

14 C. Sizes of Posts, Gate Frames, and Rails:
15
16

COMPONENT	DIMENSIONS	
	Nominal Diameter	NPS Pipe Schedule
1. End, corner & pull posts	3-inch	40
2. Gateposts (one leaf width 8-feet or less)	3-inch	40
3. Intermediate posts	2-3/8-inch	40
4. Gate Frames	1-5/8-inch	40
5. Braces	1-5/8-inch	40
6. Top Rails	1-5/8-inch	20

17
18 D. Gates
19 1. Swing Gates: Gates shall be complete with latches, stops, keepers, and hinges. Gate
20 frames shall be constructed of round tubular members continuously welded at all
21 corners or assembled with fittings. Welds shall be painted with aluminum or zinc
22 based paint prior to application of PVC coating. Gate filler shall be of the same
23 fabric as specified for the fence and shall be attached securely to the gate frame with
24 No. 9 tie wires at intervals not exceeding 12-inches. Hinges shall be of adequate
25 strength for the gate and with large bearing surfaces for clamping in position. The
26 hinges shall not twist or turn under the action of the gate. The gates shall be easily
27 operable by one person. Latches, stops, and keepers for all gates, along with 1-inch
28 stainless steel chain and padlock, shall be provided.
29 2. Sliding Gates: Sliding gates shall be complete with latches, stops, keepers, rollers,
30 and roller tracks. Gate shall ride on a double wheel carrier. Gateposts shall be 3-inch
31 Sch. 40 and frame shall be 1-5/8-inch Sch. 40. Slide pipe tracks shall be 1-5/8-inch
32 Sch. 40. Safety post (outside of gatepost) shall be 3-inch Sch. 40. Fabric shall match
33 fence.

- 1 3. Gate padlocks shall be the County standard, case brass, shackle-case hardened steel,
2 1-inch links with 12-inch chain, 606 finish and keyed alike when more than one.

- 3 E. Top Rail: The top rail shall be provided with couplings approximately every 20-feet.
4 Couplings are to be the outside sleeve type, at least 6-inches long.

- 5 F. Concrete: Concrete shall have a minimum compressive strength of 2,500-psi at 28-days.

- 6 G. Hardware: Miscellaneous hardware shall be of steel, malleable iron or ductile iron of
7 standard design and conform to the requirements of the Chain Link Fence Manufacturer's
8 Institute. All parts shall be galvanized except ties and clips may be aluminum.

- 9 H. Power Gate Operators: The operators for sliding gates shall be Robot Industries, Inc.
10 Model LSG-100, Venco Model SJH, or acceptable equal units designed for use on
11 cantilever sliding gates. Operator motors shall be 1 horsepower and shall be wound for
12 208 volt, 3 phase, and 60 Hz power supply. Units shall provide gate speed of not less
13 than 75-feet per minute. Units shall be arranged for ground level mounting on 6-inch
14 concrete pads. A quick disconnect for manual operation with a padlock control shall be
15 provided. The cover for the operator shall be of galvanized steel, and the units shall be
16 provided with electric overload protection.

17 **PART 3 - EXECUTION**

18 3.01 ARRANGEMENT

- 19 A. Posts: Posts shall be uniformly spaced, not to exceed 10-feet on centers. Intermediate
20 posts shall have waterproof tops, which have integrally cast openings through which the
21 top rails shall pass. Terminal posts shall consist of end, corner, and pull posts.

- 22 B. Braces: Braces shall be provided at each gate, corner, pull, and end post.

- 23 C. Top Rails: The top rails shall pass through the line post tops and form a continuous brace
24 from end to end of each stretch of fence. The top rail shall be securely fastened to the
25 terminal posts by heavy pressed steel brace bands and malleable end connections.

- 26 D. Bottom Tension Wire: The bottom tension wire shall be No. 7-gauge aluminum coated
27 spring coil or crimped wire. Minimum weight of aluminum coating shall be 0.40-ounces
28 per square foot of wire surface. The tension wire shall be stretched taut between terminal
29 posts and securely fastened to each intermediate post 2-inches above the finish grade line.
30 Tension wire shall be attached to the fence fabric with aluminum hog rings every 24-
31 inches.

- 32 E. Stretcher Bars: Stretcher bars shall be no less than 3/16-inch by 3/4-inch in cross section
33 and shall have minimum length 2-inches longer than the fabric height. Stretcher bars
34 shall be used for attaching the fabric to all terminal posts by threading through the fabric
35 and being attached to the posts with No. 9-gauge tension bands, or other positive
36 mechanical means, spaced at 24-inch centers. One (1) stretcher bar shall be provided for
37 each gate and end post and 2 for each corner and pull post.

1 F. Ties and Clips: Fabric shall be fastened to all intermediate posts with 9-gauge tie wires,
2 spacing not to exceed 12-inches apart. Fabric shall be tied to top rail with 9-gauge tie
3 wires, spacing not to exceed 24-inches on centers.

4 3.02 INSTALLATION

5 A. Post Setting: Line and terminal posts shall be set in holes 12-inches in diameter, 42-
6 inches deep with 36-inch post embedment. After the post has been set and plumbed, the
7 hole shall be filled with concrete. The exposed surface of the concrete shall be crowned
8 to shed water.

9 B. Terminal and Gateposts: Terminal and gateposts shall be set as specified above and shall
10 be braced to the nearest post with a galvanized horizontal brace used as a compression
11 member and a galvanized 3/8-inch steel truss rod and turnbuckle used as a tension
12 member.

13 C. Fabric: Fabric shall not be stretched until concrete footings have cured a minimum of 3-
14 days. Chain link fabric shall be placed on the side designated by the County and shall be
15 stretched taut approximately 2-inches above finish grade and securely fastened to all
16 posts. Rolls of wire fabric shall be joined by weaving a single strand into the ends of the
17 rolls to form a continuous mesh.
18

19 **END OF SECTION**

1 2.02 MATERIALS

2 A. Form Lumber: Use form lumber when in contact with exposed concrete, conforming to
3 the following or acceptable equivalent.

4 B. Lumber: Douglas Fir/Larch No. 2 grade, seasoned, surfaced on four sides.

5 C. Plywood: "Plyform", Class I or II, bearing the label of the Douglas Plywood Association.
6 (Minimum 3/4-inch thickness).

7 D. Form Ties: Use form ties which do not leave an open hole through the concrete and
8 which permit neat and solid patching at every hole. Use embedded rods with integral
9 waterstops and cones to provide a 1-inch breakback. Wire ties and wood spreaders will
10 not be permitted.

11 E. Form Coatings: Form release coating shall be a paraffin base oil or mineral oil coating
12 which effectively prevents absorption of moisture; prevents bonding with concrete; is
13 non-staining to concrete; and leaves the concrete with a paintable surface.

14 F. Chamfer Strips: Chamfer strips shall be polyvinyl strips or acceptable equal, designed to
15 be nailed in the forms to provide a 3/4-inch chamfer (unless indicated otherwise) at
16 exposed edges of concrete members.

17 **PART 3 - EXECUTION**

18 3.01 INSTALLATION

19 A. Construction of Formwork: Forms shall be sufficiently strong to withstand the pressure
20 resulting from the placement and vibration of concrete and shall be sufficiently rigid to
21 maintain specified tolerances. Forms shall be sufficiently tight to prevent loss of mortar,
22 and shall be adequately braced against lateral, upward or downward movement.

23 B. Coating of Forms: Apply form coating to board forms prior to placing reinforcing. Keep
24 form coatings off steel reinforcing, items to be embedded, and previously placed concrete.

25 C. Form Erection:

26 1. Provide a means of holding adjacent edges, ends of panels, and ends of sections
27 tightly together and in accurate alignment so as to prevent the formation of ridges,
28 fins, offsets, or similar surface defects of the finished concrete. Insure that forms may
29 be removed without damage to the surface of the finished concrete.

30 2. Provide a positive means of adjustment of shores and struts. Insure that all settlement
31 is taken up during concrete placing.

32 3. Temporary openings shall be provided in wall forms to limit the free fall of concrete to a
33 maximum of 6-feet unless an elephant trunk is used. Such openings shall be located to
34 facilitate placing and consolidation and shall be spaced no more than 8-feet apart.
35 Temporary openings shall also be provided in the bottom of the wall, column forms, and
36 elsewhere as necessary to facilitate cleaning and observation immediately prior to
37 placing.

- 1 4. Do not embed any form-tying device or part thereof other than metal in concrete.
- 2 5. Form surfaces of concrete members except where placement of the concrete is against
- 3 the ground. The dimensions of concrete members shown on the Drawings apply to
- 4 formed surfaces, except where otherwise indicated.

5 D. Form Reuse: Reuse only forms which maintain a uniform surface texture on exposed
 6 concrete surfaces. Apply light sanding between uses to obtain such a uniform texture.
 7 Plug unused tie rod holes with corks, shave flush, and sand the concrete surface side of
 8 the plug.

9 E. Removal of Forms

- 10 1. Forms and shoring for elevated structural slabs, girders, and/or beams shall remain in
- 11 place until the concrete has reached a compressive strength equal to the specified 28-
- 12 day compressive strength as determined by test cylinders. Do not remove supports
- 13 and re-shore. The following table indicates the minimum allowable time after the last
- 14 concrete is placed before forms, shoring, and/or bracing may be removed.

Structural Item	Minimum Allowable Time
Bottom side of slabs, girders, beams	When concrete reaches specified 28-day compressive strength
Vertical sides of girders, beams	48-hours
Walls not supporting vertical or horizontal loads	48-hours
Walls supporting vertical or horizontal loads	When concrete reaches specified 28-day compressive strength
Footings, pipe encasements, pipe supports	24-hours

- 17 2. Do not remove forms from concrete which has been placed with outside air
- 18 temperature below 50° F without first determining if the concrete has properly set
- 19 regardless of the minimum times specified in the table above. Do not apply heavy
- 20 loading on recently poured concrete. Immediately after forms are removed, the
- 21 surface of the concrete shall be carefully examined and any irregularities in the
- 22 surface shall be repaired and finished as specified.

24 F. Formed Openings: Openings shall be of sufficient size to permit final equipment
 25 alignment without deflection or offsets of any kind. Where the items pass through the
 26 wall, allow space for packing to ensure watertightness. Provide openings with
 27 continuous keyways with waterstops where required. Provide a slight flare to facilitate
 28 grouting and the escape of entrained air during grouting. Provide reinforcement as
 29 indicated and specified. Reinforcing steel shall be at least 2-inches clear from the
 30 opening.

1 G. Embedded Items: Set anchor bolts and other embedded items accurately and hold
2 securely in position in the forms until the concrete is placed and set. Check all special
3 castings, channels, or other metal parts that are to be embedded in the concrete prior to
4 and again after concrete pour. Check all nailing, blocks, plugs, and strips necessary for
5 the attachment of trim, finish, and similar work prior to concrete pour.

6 H. Pipes and Wall Spools Cast in Concrete

- 7 1. Install wall spools, wall flanges, and wall anchors before placing concrete. Do not
8 weld, tie or otherwise connect the wall spools to the reinforcing steel.
9 2. Support pipe and fabricated fittings to be encased in concrete on concrete piers or
10 pedestals. Carry concrete supports to firm foundations so that no settlement will be
11 possible during Construction.

12 I. Form Tolerances

- 13 1. Failure of the forms to produce the specified concrete surface tolerance shall be
14 grounds for rejection of the concrete work. Rejected Work shall be repaired or
15 replaced at no cost to the County.
16 2. The following table indicates tolerances or allowable variations from dimensions or
17 positions of structural concrete work:
18

	Maximum Tolerance
Sleeves and inserts	+1/4-inch to -1/4-inch
Projected ends of anchors	+1/4-inch to -0.0-inch
Anchor bolt setting	+1/4-inch to -1/4-inch
Finished concrete	+ 1/4-inch to -1/4-inch in 10 feet of length

19
20 The planes or axes from which the above tolerances are to be measured shall be as
21 follows:
22

Sleeves and inserts	Centerline of sleeve or insert
Projected ends of anchors	Plane perpendicular to the end of the anchor as located on the Drawings
Anchor bolt setting	Centerline of anchor bolts
Finished concrete	The concrete surface as located on the Drawings

- 23
24 3. Where equipment is to be installed, comply with manufacturer's tolerances if more
25 stringent than above.
26

27 **END OF SECTION**

1 2.02 MATERIALS

- 2 A. Reinforcing Bars: ASTM A615, Grade 60, deformed billet steel bars of a USA
3 manufacturer.
- 4 B. Welded Wire Fabric: ASTM A185, galvanized.
- 5 C. Metal Bar Supports: CRSI MSP-2, Chapter 3, Class 2, Type B, Stainless Steel Protected
6 Bar Supports.
- 7 D. Coupler Splice Devices: Cadweld tension couplers capable of developing the ultimate
8 strength of the bar, as manufactured by Erico Products, Incorporated, Solon, Ohio, or
9 equal where acceptable to the County.

10 2.03 FABRICATION

- 11 A. Fabrication shall meet all requirements of the specified standards. Unless otherwise
12 indicated, the following shall apply:
- 13 1. Hooks shall be standard hooks.
- 14 2. Bottom bars shall extend a minimum of 6-inches into supporting members.
- 15 3. Minimum cover shall be measured to the outermost stirrup, tie or bar.
- 16 4. Splices are permitted only where indicated on the Drawings.

17 **PART 3 - EXECUTION**

18 3.01 INSTALLATION

- 19 A. Supporting Reinforcing: Bar supports shall be provided as required by CRSI MSP-2 and
20 AC1315. Top and bottom bars in slabs formed on earth shall be supported on precast
21 concrete block supports except where such bars are properly supported from formwork.
22 Precast concrete block supports are not required in slabs formed on tremie concrete but
23 may be used at the Contractor's option.
- 24 B. Placing Reinforcing: Placing of reinforcing steel and welded wire fabric shall conform to
25 CRSI MSP-2, ACI 315, and the Drawings. Reinforcing shall be securely tied and
26 supported to prevent displacement during concrete placement.
- 27 C. Welded Wire Fabric: Splices in welded wire fabric shall be such that the overlap between
28 outermost cross wires of each fabric sheet is not less than the spacing of the cross wires,
29 plus 2-inches. Fabric shall not be extended through expansion joints or construction
30 joints in slabs on grade except as otherwise indicated on the Drawings.
- 31 D. Coupler Splice: Unless indicated on the Drawings or where conventional lap splices
32 cannot be achieved, full positive tension connections shall be provided. Such devices
33 shall be installed in accordance with the recommendations of the manufacturer.

- 1 E. Dowels: Dowels shall be wired in position prior to placing concrete.
- 2 F. Field Bending: Heat shall not be used to bend bars. Bars shall not be bent after being
- 3 embedded in concrete.
- 4 G. Welding: Welding of reinforcing will not be permitted.
- 5 H. Place reinforcement a minimum of 2-inches clear of any metal pipe or fittings.
- 6

7 **END OF SECTION**

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- 1 2. Materials: Satisfactory evidence shall be submitted indicating those materials to be
2 used (including cement, aggregates and admixtures) meet the specified requirements.
- 3 3. Design Mix: The design mix to be used shall be prepared by qualified persons and
4 submitted for review. Submit affidavit as to design mix performance over the
5 preceding 6-months. The design of the mix is the responsibility of the Contractor
6 subject to the limitations of the Specifications. Acceptance of this submission will be
7 required only as minimum requirements of the Specifications have been met. Such
8 acceptance will in no way alter the responsibility of the Contractor to furnish concrete
9 meeting the requirements of the Specifications relative to strength and slump.
- 10 4. Ready Mix Concrete: Provide delivery tickets or weigh master's certificate per ASTM
11 C 94, including weights of cement and each size aggregate, amount of water in the
12 aggregate, and amount of water added at the plant. The amount of water added on the
13 job shall be written on the ticket.

14 **PART 2 - PRODUCTS**

15 2.01 GENERAL

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

18 2.02 MATERIALS

19 A. Cement

- 20 1. Cement for all concrete shall be domestic Portland cement that conforms to the
21 requirements of ASTM Designation C 150 Type I, Type II or Type III. All sanitary
22 sewer manholes, wetwells, pumping stations, tanks and structures exposed to
23 wastewater shall be constructed with Type II cement. Type III cement for high early
24 strength concrete shall be used only for special locations and only with the review and
25 acceptance of the County. Type I cement may be used for buildings and tremie
26 concrete.
- 27 2. Only 1 brand of cement shall be used in any individual structure unless acceptable by
28 the County. Cement that has become damaged, partially set, lumpy or caked shall not
29 be used and the entire contents of the sack or container that contains such cement will
30 be rejected. No salvaged or reclaimed cement shall be used.
- 31 3. Fly ash shall not be used in either Class A or Class B concrete.

32 B. Aggregates:

- 33 1. ASTM C 33. Coarse aggregates shall be size No. 57. Block cell fill shall be size No.
34 89.
- 35 2. In addition to requirements of ASTM C 33 for structures exposed to wastewater, the
36 following shall apply:
 - 37 a. Soft particles: 2% (2.0 percent)
 - 38 b. Chert as a soft impurity (defined in Table 3 of ASTM C 33): 1% (1.0 percent)
 - 39 c. Total of soft particles and chert as a soft impurity: 2% (2.0 percent)
 - 40 d. Flat and elongated particles (long dimension > 5 times short dimension): 15%.

- 1 C. Water: Clean and free from injurious amounts of deleterious materials.
- 2 D. Air Entraining Admixture: ASTM C 260.
- 3 E. Water Reducing and Retarding Admixture: ASTM C 494, Type D. Admixture shall not
4 contain calcium chloride.
- 5 F. Epoxy Bonding Agent: Sikastix 370, Sikadur Hi Mod, Concsive 1001-LPL or
6 acceptable equal.
- 7 G. Waterproofing Material: Concrete admixture shall be manufactured and supplied by an
8 approved manufacturer as shown in the Appendix D "List of Approved Products."

9 2.03 MIXES

10 A. General Requirements

- 11 1. Mix Design: Proportioning shall be on the basis of field experience and/or trial
12 mixtures as specified in ACI 318, Section 4.3. Data on consecutive compression tests
13 and standard deviation shall be submitted. Proportioning for small structures may be
14 by the water/cement ratio under special review and acceptance by the County.
15 Concrete mix design shall comply with the Standard Building Code requirements.
- 16 2. Air Content: 5% plus or minus (\pm) 1% (Class A and B).
- 17 3. Slump: 4-inches plus or minus (\pm) 1-inch. 8-inches plus or minus (\pm) 1-inch for
18 tremie concrete.
- 19 4. Water/cement ratio = 0.45 maximum (all concrete exposed to hydrostatic loading),
20 0.50 maximum (all other concrete).
- 21 5. Minimum Compressive Strength at 28-days
22 a. Class A, 4,000-psi: Water and wastewater structures inclusive of tanks, ditches,
23 pumping stations, tremie concrete and other structures in contact with process
24 water.
25 b. Class B, 3,000-psi: Building structures, curb and gutters, slabs, walks,
26 encasements, thrust blocks, and pipe supports, etc. not in contact with process
27 water.
28 c. Class C, 2,500-psi: Mix wherever specified in the standard drawings such as
29 A103, A112, A303, A406 and A407-2.

30 B. Production of Concrete

- 31 1. General: Concrete shall be ready mixed and shall be batched, mixed and transported
32 in accordance with ASTM C 94, except as otherwise indicated.
- 33 2. Air Entraining Admixture: Air entraining admixture shall be charged into the mixture
34 as a solution and shall be measured by means of an acceptable mechanical dispensing
35 device. The liquid shall be considered a part of the mixing water.

- 1 3. Waterproofing admixture: New concrete structures shall contain a crystalline
2 waterproofing concrete admixture. Crystalline waterproofing concrete admixture
3 shall be added to the concrete during the batching operation. The admixture
4 concentration shall be added based upon manufacturer design percent concentration
5 of admixture to the required weight of cement. The amount of cement shall remain
6 the same and not be reduced. A colorant shall be added to verify the admixture was
7 added to the concrete for all precast structures. Colorant shall be added and provided
8 at the admixture manufacturing facility, not at the concrete batch plant. It is
9 recommended that the admixture be added first to the rock and sand and blended
10 thoroughly before adding cement and water or per the manufacturer's
11 recommendations. Concrete structures without crystalline waterproofing admixture
12 or admixture without colorant for field verification shall be rejected. Contractor shall
13 provide certification the admixture was installed in accordance with the
14 manufacturer's recommendations.
- 15 4. Water Reducing and Retarding Admixture: Water reducing and retarding admixture
16 shall be added and measured as recommended by the manufacturer. The addition of
17 the admixture shall be completed within 1-minute after addition of water to the
18 cement has been completed, or prior to the beginning of the last 3/4 of the required
19 mixing, whichever occurs first. Admixtures shall be stored, handled and batched in
20 accordance with the recommendations of ACI 68.
- 21 C. Delivery Tickets: In addition to the information required by ASTM C 94, delivery tickets
22 shall indicate the cement content and the water/cement ratio.
- 23 D. Temperatures: The temperature of the concrete upon delivery from the truck shall not
24 exceed 90° F.
- 25 E. Modifications to the Mix: No modifications to the mix shall be made in the plant or on
26 the job which will decrease the cement content or increase the water/cement ratio beyond
27 that specified.

28 **PART 3 - EXECUTION**

29 3.01 PREPARATION

- 30 A. Preparations before Placing: No concrete shall be placed until the review and acceptance
31 of the County has been received. Acceptance will not be granted until forms are clean
32 and reinforcing and all other items required to be set in concrete have been placed and
33 thoroughly secured. The County shall be notified a minimum of 24-hours before
34 concrete is placed.
- 35 B. Conveying:
- 36 1. General: Concrete shall be handled from the truck to the place of final deposit as
37 rapidly as practicable by methods which will prevent segregation or loss of
38 ingredients to maintain the quality of the concrete. No concrete shall be placed more
39 than 90-minutes after mixing has begun for that particular batch.

- 1 2. Buckets and Hoppers: Buckets and hoppers shall have discharge gates with a clear
2 opening equal to no less than 1/3 of the maximum interior horizontal area, or 5 times
3 the maximum aggregate size being used. Side slopes shall be no less than 60°
4 (degrees). Controls on gates shall permit opening and closing during the discharge
5 cycle.
- 6 3. Runways: Extreme care shall be exercised to avoid displacement of reinforcing
7 during the placing of concrete.
- 8 4. Elephant Trunks: Hoppers and elephant trunks shall be used to prevent the free fall of
9 concrete of more than 6-feet.
- 10 5. Chutes: Chutes shall be metal or metal lined and shall have a slope not exceeding 1
11 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than
12 20-feet long and chutes not meeting the slope requirements may be used only if they
13 discharge into a hopper before distribution.
- 14 6. Pumping Equipment: Pumping equipment and procedures shall conform to the
15 recommendations contained in the report of ACI Committee 304 on "Placing Concrete
16 by Pumping Methods," ACI 304.2R-71. The specified slump shall be measured at the
17 point of discharge. The loss of slump in pumping shall not exceed 1-1/2-inches.
- 18 7. Conveying equipment Construction: Aluminum or aluminum alloy pipe for tremies or
19 pump lines and chutes, except for short lengths at the truck mixer shall not be
20 permitted.
- 21 8. Cleaning: Conveying equipment shall be cleaned at the end of each concrete
22 operation.

23 3.02 APPLICATION

24 A. Placing:

- 25 1. General: Concrete shall be deposited continuously, or in layers of such thickness (not
26 exceeding 2-feet in depth) that no concrete will be deposited on concrete that has
27 hardened sufficiently to cause the formation of seams or planes of weakness.
- 28 2. Supported Elements: At least 2-hours shall elapse after depositing concrete in
29 columns or walls before depositing in beams, girders, or slabs supported thereon.
- 30 3. Segregation: Concrete shall be deposited as nearly as practicable in its final position
31 to avoid segregation due to rehandling or flowing. Concrete shall not be subjected to
32 procedures that will cause segregation.
- 33 4. Concrete Underwater: All concrete, except that indicated on the Drawings as tremie
34 concrete, shall be placed in the dry.

35 B. Seals and Tremie Concrete

36 1. General

- 37 a. Wherever practicable, all foundation excavations shall be dewatered and the
38 concrete deposited in the dry. Where conditions are encountered which render it
39 impracticable to dewater the foundation before placing concrete, a concrete
40 foundation seal shall be placed. The foundation shall then be dewatered, and the
41 balance of the concrete placed in the dry.

- 1 b. When seal concrete is required to be placed, the satisfactory performance of the
2 seal in providing a watertight excavation for placing structural concrete shall be
3 the responsibility of the Contractor. Seal concrete placed by the Contractor,
4 which subsequently fails to perform properly, shall be repaired as necessary to
5 perform its required function, at the expense of the Contractor.
- 6 2. Method of Placing: Concrete deposited underwater shall be carefully placed in the
7 space in which it is to remain by means of a tremie, a closed-bottom dump bucket of
8 not less than 1-cubic yard capacity, or other approved method, and shall not be
9 disturbed after it is deposited. All seal concrete shall be deposited in 1 continuous
10 pour. No concrete shall be placed in running water. All formwork designed to retain
11 concrete underwater shall be watertight, and the design of the formwork and
12 excavation sheeting shall be by a Professional Engineer, registered in the State of
13 Florida.
- 14 3. Use of Tremie: The tremie shall consist of a tube having a minimum inside diameter
15 of 10-inches, and shall be constructed in sections having tight joints. No aluminum
16 parts that have contact with the concrete will be permitted. The discharge end shall
17 be entirely seated at all times, and the tremie tube kept full to the bottom of the
18 hopper. When a batch is dumped into the hopper, the tremie shall be slightly raised
19 (but not out of the concrete at the bottom) until the batch discharges to the bottom of
20 the hopper, after which the flow shall be stopped by lowering the tremie. The means
21 of supporting the tremie shall be such as to permit the free movement of the discharge
22 end over the entire top surface of the Work, and shall permit it being lowered rapidly
23 when necessary to choke off or retard the flow. The flow shall preferably be
24 continuous, and in no case shall be interrupted until the Work is completed. Special
25 care shall be exercised to maintain still water at the point of deposit.
- 26 4. Use of Bottom-dump Bucket: When the concrete is placed by means of a bottom-
27 dump bucket, the bucket shall be lowered gradually and carefully until it rests upon
28 the concrete already placed. The bucket shall then be raised very slowly during the
29 discharge travel; the intent being to maintain, as nearly as possible, still water at the
30 point of discharge and to avoid agitating the mixture. Aluminum buckets will not be
31 permitted.
- 32 5. Time of Beginning Pumping: Pumping to dewater a sealed cofferdam shall not
33 commence until the seal has set sufficiently to withstand the hydrostatic pressure, and
34 in no case earlier than 72-hours after placement of the concrete.
- 35 C. Consolidating Concrete:
- 36 1. General: Concrete shall be consolidated by means of internal vibrators operated by
37 competent workmen.
- 38 2. Vibrators: Vibrators shall have a minimum head diameter of at least 2-inches, a
39 minimum centrifugal force of 700-pounds and a minimum frequency of 8,000
40 vibrations per second.
- 41 3. Vibrators for Confined Areas: In confined areas, the specified vibrators shall be
42 supplemented by others having a minimum head diameter of 1-1/2-inches, a
43 minimum centrifugal force of 300-pounds and a minimum frequency of 9,000
44 vibrations per second.

- 1 4. Spare Vibrator: One (1) spare vibrator for each 3 in use shall be kept on the site
2 during all concrete placing operations.
3 5. Use of Vibrators: Vibrators shall be inserted and withdrawn at points approximately
4 18-inches apart. The duration of each insertion shall be from 5 to 15-seconds.
5 Concrete shall not be transported in the forms by means of vibrators.

- 6 D. Protection: Rainwater shall not be allowed to increase the amount of mixing water, or to
7 damage the surface finish. Concrete shall be protected from construction over-loads.
8 Design loads shall not be applied until the specified strength has been attained.

9 3.03 CONCRETE FINISHING AND CURING

- 10 A. All slabs exposed to view shall receive a steel trowel finish without local depressions or
11 high points and apply a light hair-broom finish. Do not use stiff bristle brooms or
12 brushes. Leave hair-broom lines parallel to the direction of slab drainage.

- 13 B. All other slabs and footings shall receive a smooth steel trowel finish.

- 14 C. All walls of structures or parts of buildings exposed to view shall receive the following:
15 1. Repair defective concrete, remove fins, fill depressions 1/4-inch or deeper, and fill tie
16 holes.
17 2. Any surface not receiving a special applied finish, shall receive a slurry finish
18 consisting of 1 part cement and 1-1/2 parts sand by damp loose volume. Dampen
19 surfaces and then apply the slurry with clean burlap pads or sponge rubber floats.
20 Remove any surplus by scraping and then rubbing with clean burlap.
21 3. Surfaces that will receive a special applied finish shall be of even color, have no pits,
22 pockets, holes, or sharp changes of surface elevation. Scrubbing with a stiff bristle
23 fiber brush shall produce no dusting or dislodging of cement or sand.

- 24 D. All concrete shall be wet cured a minimum of 7-days; or if not to receive special finishes,
25 coatings or concrete toppings, an acceptable curing compound may be utilized.

- 26 E. All surface defects shall be repaired by removing defective concrete down to sound
27 concrete and repairing with patching mortar. Finished repair shall match adjacent
28 concrete and be cured as specified.

29 3.04 TESTING

- 30 A. A testing laboratory, acceptable by the County, shall perform required testing. The
31 Contractor shall pay for all tests indicating a failure to comply with the Specifications.
32 The Contractor shall keep the laboratory informed of his schedule.

1 B. Standard laboratory compressive test cylinders shall be obtained by the laboratory when
2 concrete is discharged at the point of placing (i.e., discharge end of pumping equipment),
3 and cylinders shall be made and cured in accordance with the requirements of ASTM
4 Designation C 31. A set of 4 cylinders shall be obtained for each 50-cubic yards, or
5 fraction thereof, placed each day for each type of concrete. The cylinders shall be cured
6 under laboratory conditions and shall be tested at 7 and 28-days of age in accordance
7 with the requirements of ASTM Designation C 39.

8 C. The testing laboratory shall make slump tests of Class A and Class B concrete as it is
9 discharged from the mixer at the point of placing. Slump tests shall be made for each 25-
10 cubic yards or "pour" of concrete placed. Slump tests may be made on any batch, and
11 failure to meet specified slump requirements shall be sufficient cause for rejection of that
12 batch.
13

14 **END OF SECTION**

1 1.04 INSPECTION

- 2 A. The quality of all materials, the process of manufacture, and the finished sections shall be
3 subject to inspection and acceptance by the County. Such inspection may be made at the
4 place of manufacture or at the site after delivery, or at both places, and the sections shall be
5 subject to rejection at any time due to failure to meet any of the specification requirements;
6 even though sample sections may have been acceptable as satisfactory at the place of
7 manufacture. Sections rejected after delivery to the job shall be marked for identification
8 and shall be removed from the job at once. All damaged sections will be rejected. If
9 damaged sections have already been installed; they shall be acceptably repaired if
10 authorized by the County, or removed and replaced at the Contractor's expense.
- 11 B. At the time of inspection, the sections will be carefully examined for compliance with the
12 ASTM designation specified and the acceptable manufacturer's drawings. All sections
13 shall be inspected for general appearance, dimension, "scratch strength", blisters, cracks,
14 roughness, and soundness. The surface shall be dense and close textured.
- 15 C. Imperfections may be repaired subject to the review and acceptance of the County after
16 demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be
17 carefully inspected before final review and acceptance. Cement mortar used for repairs shall
18 have a minimum compressive strength of 4,000-psi at the end of 7-days and 5,000-psi at the
19 end of 28-days, when tested in 3-inch by 6-inch cylinders stored in the standard manner.
20 Epoxy mortar may be utilized for repairs subject to the review and acceptance of the County.

21 **PART 2 - PRODUCTS**

22 2.01 GENERAL

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

25 2.02 PRECAST CONCRETE SECTIONS

- 26 A. Precast concrete wetwell sections, manhole barrel and eccentric top sections shall
27 conform to specifications for precast reinforced concrete manhole sections, ASTM
28 Designation C478, except as otherwise specified below or as shown on the Drawings.
29 Details of precast sections shown on the Drawings, including thickness and reinforcing,
30 shall supersede ASTM C-478 when such details are more stringent than ASTM C-478.
31 The method of construction shall conform to the detailed Drawings appended to these
32 specifications and the following additional requirements:
- 33 1. The minimum wall thickness for the various size barrel sections shall be 5-inches, or
34 as indicated in the Drawings.
 - 35 2. Barrel sections shall have tongue and groove joints. Joints shall be sealed with cold
36 adhesive preformed plastic gaskets set in double rows on the tongue and in the groove
37 prior to setting the next section. Gaskets shall be K.T. Snyder "Ram-Nek", Conseal "CS-
38 102" or acceptable equal. All extension joints shall be sealed with Portland Type II
39 cement after setting of gasket and placement of manhole section into a watertight joint.

- 1 3. Type II cement shall be used except as otherwise accepted.
- 2 4. New concrete structures shall contain a crystalline waterproofing concrete admix for
- 3 all new concrete structures including but not limited to manholes, ARV vaults,
- 4 wetwells, and wetwell top slabs. Crystalline waterproofing concrete admix shall be
- 5 added to the concrete during the batching operation. Admixture concentration shall
- 6 be added based upon manufacturer's design percent concentration of admixture to the
- 7 required weight of cement. The amount of cement shall remain the same and not be
- 8 reduced. A colorant shall be added to verify the admixture was added to the concrete.
- 9 Colorant shall be added and provided at the admixture manufacturing facility, not at
- 10 the concrete batch plant. It is recommended that the admixture be added first to the
- 11 rock and sand and blended thoroughly before adding cement and water or per the
- 12 manufacturer's recommendations. Concrete structures without crystalline
- 13 waterproofing admixture or admixture without colorant for field verification shall be
- 14 rejected. Contractor shall provide certification from the pre-caster that the admixture
- 15 was added in accordance with the manufacturer's recommendations. Concrete
- 16 admixture shall be manufactured and supplied by an approved manufacturer as shown
- 17 in Appendix D "List of Approved Products."
- 18 5. The date of manufacture and the name or trademark of the manufacturer shall be
- 19 clearly marked on the inside of each precast section. Each section must be inspected
- 20 and stamped by an accredited testing laboratory.
- 21 6. Sections shall be cured by an acceptable method for at least 28-days.
- 22 7. Manhole top sections shall be eccentric except that precast concrete slabs shall be
- 23 used where cover over the top of the pipe is less than 4-feet for all manholes. Lift
- 24 rings or non-penetrating lift holes shall be provided for handling precast manhole
- 25 sections. Non-penetrating lift holes shall be filled with non-shrink grout after
- 26 installation of the manhole sections.
- 27 8. Precast concrete slabs over top section, where required, shall be capable of supporting
- 28 the overburden plus a live load equivalent to ASHTO H 20 loading.
- 29 9. The tops of bases shall be suitably shaped to mate with the adjoining precast section.
- 30 10. Precast leveling rings for setting cast iron frames over manholes shall be 2-inch thick
- 31 and have 1 (one) Number 2 continuous reinforcing steel bar.
- 32 11. Concrete surfaces shall have form oil, curing compounds, dust, dirt, and other
- 33 interfering materials removed by brush sand blasting and shall be fully cured prior to
- 34 delivery.
- 35 12. Interior surfaces of manholes, wetwells and valve vaults shall be lined in accordance
- 36 with Appendix D "List of Approved Products."
- 37 13. Manholes to be installed around existing gravity sewers shall consist of a cast-in-
- 38 place concrete base slab and precast concrete barrel and top sections; lined per
- 39 Section 3410 – 2.01.11. The base slab shall be as shown on the Drawings and include
- 40 a joint which is compatible with the bottom barrel section and acceptable to the
- 41 County. The bottom barrel section shall include an inverted "U-shaped" slot to allow
- 42 installation of the section over existing pipes. Flow channels shall be provided within
- 43 the manholes as shown on the Drawings. Annular space between the existing pipe
- 44 and slot shall be made watertight with non-shrink grout. Existing pipes shall be
- 45 removed within the manhole and outlets plugged watertight with non-shrink grout as
- 46 shown on the Drawings.

1 14. The manholes shall have an invert channel shaped to correspond with the lower half
2 of the pipe. The top of the shelf shall be at the elevation indicated and shall be sloped
3 to drain toward the flowing through channel. Every effort shall be made by the
4 Contractor to construct watertight structures.

5 **PART 3 - EXECUTION**

6 3.01 INSTALLATION

- 7 A. All manholes and other precast structures shall be set in the dry.
- 8 B. Manholes and other precast structures shall be constructed to the dimensions as shown on
9 the Drawings and as specified herein.
- 10 C. The base structure may be cast-in-place concrete as specified in Division 3. The concrete
11 structure shall be placed on the required crushed stone base as shown in the Drawings
12 over a dry sub base of structural fill that has been compacted to 95% (percent) of the
13 maximum dry density as determined by the modified proctor test, ASTM D1557. The
14 tops of the cast in place bases shall be shaped to mate with the precast barrel section and
15 shall be adjusted in grade so that the top of the dome section is at the correct elevation.
- 16 D. Precast bases conforming to all requirements of ASTM C478 and other requirements for
17 precast sections may be used and shall be set on a sub base as described above.
- 18 E. Precast concrete structure sections shall be set vertically with sections in true alignment
19 with a 1/4-inch maximum tolerance per 5-feet of depth. The outside and inside joint shall
20 be filled with a non-shrink mortar and finished flush with the adjoining surfaces. Allow
21 joints to set for 24-hours before backfilling. Backfilling shall be accomplished bringing
22 the fill up evenly on all sides. If leaks appear in the structures, the inside joints shall be
23 caulked with non-shrink grout to the satisfaction of the County. The Contractor shall
24 install the precast sections in a manner that will result in a watertight joint.
- 25 F. Lift rings or non-penetrating lift holes shall be provided for handling pre-cast manhole
26 sections. Non-penetrating lift holes shall be filled with non-shrink grout after installation.
- 27 G. Where holes must be cut in the precast sections to accommodate pipes, cutting shall be
28 done prior to setting them in place to prevent any subsequent jarring which may loosen
29 the mortar joints.
- 30 H. Cast iron frames shall be placed over precast concrete leveling rings, shimmed and set in
31 cement mortar to the required grade. No more than 3 courses of leveling rings shall be
32 used.
33

34 **END OF SECTION**

1 **SECTION 03600**

2 **GROUTING**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

- 5 A. Scope of Work: This Section specifies the grouting of the annular space between the host
6 pipe and the new liner and the grouting of the space left void in the abandonment of the
7 existing pipelines and structures. The Work consists of furnishing all labor, equipment
8 and materials, and performing all Work connected with the placement of the
9 cementaceous grout to fill the void.

10 1.02 QUALITY ASSURANCE

- 11 A. Grouting shall be performed by a crew under the direct supervision of a superintendent
12 that has experience in grouting of this nature.
- 13 B. Storage, mixing, handling and placement shall be in accordance with manufacturer's
14 instructions and specifications.

15 1.03 SHOP DRAWINGS AND SUBMITTALS

- 16 A. Submittals shall be submitted to the County for review and acceptance prior to
17 construction in accordance with the General Conditions and specifications Section 01300
18 "Submittals."
- 19 B. In addition, the following shall be submitted to the County for review and acceptance
20 prior to construction.
- 21 1. A detailed description of equipment and operational procedures to accomplish the
22 grouting operation.
 - 23 2. Grout mixture design data, grout mixer type, grout samples, and test data.
 - 24 3. A detailed description of the grouting time schedule.

25 **PART 2 - PRODUCTS**

26 2.01 GENERAL

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

1 2.02 GROUT MATERIAL

2 A. The grout shall be a "flowable fill" consisting of a mixture of Type 1 Portland Cement,
3 Type "F" Flyash (ASTM 618), sand and water.

4 The following is a suggested trial grout mixture for a 1-cubic yard yield:

5 Cement: 500-pounds

6 Fly Ash: 500-pounds

7 Water: 350-pounds (42-gallons)

8 Sand: 2,248-pounds

9 Darex (W.R. Grace): 3-ounces (Air Entrainment Additive or equivalent)

10 The actual grout mixture to be used shall meet the minimum requirements specified
11 below.

12 B. The mixture shall contain a minimum of 500-pounds cement and minimum of 400-
13 pounds flyash per cubic yard of grout.

14 C. Samples of the grout mixture when set aside in a standard concrete test mold shall show
15 less than 1% of the mixture height of free water on the surface after standing not less than
16 12-hours.

17 D. One (1) set of 3 (three) 3-inch by 6-inch sample test cubes shall be made for each mix
18 preparation. The minimum 28-day strength shall be no less than 1,000-psi. The
19 minimum required slump is 5-inches. The maximum allowable slump is 9-inches.
20 Slump should be as low as practical to maintain viscosity, proper flow, and still retain the
21 ability to pump.

22 2.03 EQUIPMENT

23 A. All grout shall be mixed with a high shear, high-energy colloidal type mixer to achieve
24 the best uniform density.

25 B. The grout shall be pumped with a non-pulsating centrifugal or tri-plex pump.

26 C. The mixer shall be capable of continuous mixing. Batch mixing shall not be permitted.

27 **PART 3 - EXECUTION**

28 3.01 GROUTING OF ABANDONED PIPE

29 A. Where utility pipes are to remain in place (inactive) they shall be filled with a
30 sand/cement grout as specified herein.

31 B. The grouting program shall consist of pumping sand-cement grout with suitable chemical
32 additives at pressures necessary to fill the pipe sections in order to prevent the potential
33 for future collapse.

- 1 C. Grouting of pipes shall be in sections not exceeding 300 linear feet.
- 2 D. Grout shall be placed in a maximum of 3 stages, with the initial stage volume equal to or
3 greater than 50% of the total volume for that section of pipe being grouted. The
4 maximum time wait between grouting stages shall be 24-hours.
- 5 E. For each stage, mix and pump the material in one continuous process so as to avoid
6 partial setting of some grout material during that stage; thus, eliminating voids and
7 possible subsequent surface damage due to cave-ins.
- 8 F. Each section shall be grouted by injecting grout from the lowest point and allowing it to
9 flow toward the highest point to displace water from the annulus and assure complete
10 void-free coverage. Grout shall be placed through tubes installed in the bulkheads at the
11 insertion pits or manholes. Grout tubes shall be at least 2-inch nominal diameter.
- 12 G. After the ends of each section of pipe are exposed, the entire space, not to exceed 300
13 linear feet end to end, shall be sealed by controlled pumping of grout until it flows from
14 the pipe at the opposite end of the grouting. Grouting shall be carried out until the entire
15 space is filled. The ends of these sections shall be capped and/or plugged.
- 16 H. Grout pressure in the void space is not to exceed 5-psi above maximum hydrostatic
17 groundwater level. An open ended, highpoint tap or equivalent vent must be provided
18 and monitored at the bulkhead opposite to the bulkhead through which grout is injected.
19 This bulkhead will be blocked closed as grout escapes to allow the pressuring of the
20 annular space.

21 3.02 FIELD QUALITY CONTROL

- 22 A. The quality of the grout, application of the equipment, and installation techniques are the
23 responsibility of the Contractor. The review and acceptance or approval of specific mix
24 design, equipment, or installation procedures shall in no way relieve the Contractor of his
25 obligation to provide the final product as specified herein.
- 26 B. The County may stop the grouting operations at any time if the operation does not
27 comply with these Specifications.
28

29 **END OF SECTION**

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1 1.04 REFERENCE STANDARDS

2 A. Unless otherwise specified, materials shall conform to the following:
3

Structural Steel	ASTM A36
Welded and Seamless Steel Pipe	ASTM A53
Gray Iron Castings	ASTM A48, Class 30
Galvanizing, general	ASTM A123
Galvanizing, hardware	ASTM A153
Galvanizing, assemblies	ASTM A386
Aluminum (Extruded Shapes)	
6061 T6 (Alum. alloy)	
Aluminum (Extruded Pipe)	6063 T6 (Alum. alloy)
Aluminum Bar Structural	6061 T6 (Alum. alloy)
Bolts and Nuts	
ASTM, A307	
Stainless Steel Bolts, Fasteners	AISI, Type 316
Stainless Steel Plate and Sheet, Wire	AISI, Type 316
Welding Rods for Steel	AWS Spec. for Arc Welding

4 **PART 2 - PRODUCTS**

5 2.01 GENERAL

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

8 2.02 ANCHORS, BOLTS, AND FASTENING DEVICES

9 A. Anchors, bolts, and other fastening devices shall be furnished as necessary for installation
10 of the work of this Section.

11 B. Compound masonry anchors shall be of the type shown or required and shall be Star Slug
12 compounded masonry anchors manufactured by Star Expansion Industries, by Phillips
13 Drill Co., Rahplug, or acceptable equal. Anchors shall be minimum "2-unit" type.

14 C. The bolts used to attach the various members to the anchors shall be the sizes shown or
15 required. Stainless steel shall be attached to concrete or masonry by means of stainless
16 steel machine bolts and iron or steel shall be attached with steel machine bolts unless
17 otherwise specifically noted.

18 D. For structural purposes, unless otherwise noted, expansion bolts shall be Wej it "Ankr
19 Tite", Phillips Drill Co. "Wedge Anchors", Hilti "Kwik Bolt", or acceptable equal. When
20 length of bolt is not called for on the Drawings, the length of bolt provided shall be
21 sufficient to place the wedge portion of the bolt a minimum of 1-inch behind the
22 reinforcing steel within the concrete.

1 E. Materials for anchor or expansion bolts shall be as noted on the Drawings. If no specific
2 material is listed, hot dipped galvanized steel shall be used. All hardware inside
3 wetwells, manholes, or other wetted areas shall be 316 Stainless Steel.

4 2.03 ALUMINUM ITEMS

5 A. Prefabricated checker plate aluminum hatches shall be Type "JD", or "KD" as
6 manufactured by Bilco Co., equal type by Babcock Davis Associates, Inc.; or acceptable
7 equal, sized as shown. Hatches with any single dimension over 3-feet 6-inches shall be
8 double leaf type. Hatches shall be designed for a live load of 300-pounds per square foot.
9 Hatches shall be watertight.

10 B. Check plate aluminum cover plates shall be fabricated to the details shown and installed
11 at the locations shown.

12 C. Miscellaneous aluminum shapes and plates shall be fabricated as shown. Angle frames
13 for hatches, beams, grates, etc., shall be furnished complete with welded strap anchors
14 attached. Furnish all miscellaneous aluminum shown but not otherwise detailed.
15 Structural shapes and extruded items shall conform to the detail dimensions or the plans
16 within the tolerances published by the American Aluminum Association.

17 2.04 STEEL ITEMS

18 A. Sleeves shall be steel or cast iron pipe in walls and floors with end joints as shown on the
19 Drawings. All pipe sleeves shall have anchors centered on the circumference as shown.

20 B. Miscellaneous steel pipe for sleeves, lifting attachments, and other uses as required shall
21 be Schedule 40 pipe fabricated according to the details as shown on the Drawings.

22 2.05 CAST IRON ITEMS

23 A. Outside pipe clean out frames and covers shall be heavy duty, R 6013 R 6099 series as
24 manufactured by Neenah Foundry Co., or acceptable equal. All outside pipe cleanouts
25 shall be 6-inch diameter.

26 B. Trench drain shall be of length shown on the Drawings and shall be heavy duty, cast iron,
27 open grate lid type, Series R 4990 Type A as manufactured by Neenah Foundry Co., or
28 acceptable equal.

1 C. Gray iron castings for manhole frames, covers, adjustment rings, and other items shall
2 conform to ASTM A48, Class 30B. Castings shall be true to pattern in form and
3 dimensions and free of pouring faults and other defects which would impair their strength
4 or otherwise make them unfit for the service intended. The seating surfaces between
5 frames and covers shall be machined to fit true. No plugging or filling will be allowed.
6 Lifting or "pick" holes shall be provided, but shall not penetrate the cover. Casting
7 patterns shall conform to those shown or indicated on the Drawings. All manhole frames
8 and covers shall be traffic bearing to meet AASHTO H 20 loadings. Frames shall be
9 suitable for the future addition of a cast iron ring for upward adjustment of top elevation.

10 **PART 3 - EXECUTION**

11 3.01 FABRICATION

12 A. All miscellaneous metalwork shall be formed true to detail, with clean, straight, sharply
13 defined profiles and smooth surfaces of uniform color and texture and free from defects
14 impairing strength or durability.

15 B. Connections and accessories shall be of sufficient strength to safely withstand stresses
16 and strains to which they will be subjected. Steel accessories and connections to steel or
17 cast iron shall be steel, unless otherwise specified. Threaded connections shall be made
18 so that the threads are concealed by the fitting.

19 C. Welded joints shall be rigid and continuously welded or spot-welded as specified or
20 shown. The face of welds shall be dressed flush and smooth. Exposed joints shall be
21 close fitting and jointed where least conspicuous.

22 D. Welding of parts shall be in accordance with the Standard Code for Arc and Gas Welding
23 in Building Construction of the AWS and shall only be done where shown, specified, or
24 permitted by the County. All welding shall be done only by welders certified as to their
25 ability to perform welding in accordance with the requirements of the AWS code.
26 Component parts of built up members to be welded shall be adequately supported and
27 clamped or held by other adequate means to hold the parts in proper relation for welding.

28 E. Welding of aluminum work shall be on the unexposed side as much as possible in order
29 to prevent pitting or discoloration.

30 F. All aluminum finish exposed surfaces, except as specified below, shall have
31 manufacturers' standard mill finish. Aluminum handrails shall be given an anodic oxide
32 treatment in accordance with the Aluminum Association Specification AA C22 A41. A
33 coating of methacrylate lacquer shall be applied to all aluminum before shipment from
34 the factory.

- 1 G. Castings shall be of good quality, strong, tough, even grained, smooth, free from scale,
2 lumps, blisters, sand holes, and defects of any kind which render them unfit for the
3 service for which they are intended. Castings shall be thoroughly cleaned and will be
4 subjected to a hammer inspection in the field by the County. All finished surfaces shown
5 on the Drawings and/or specified shall be machined to a true plane surface and shall be
6 true and seat at all points without rocking. Allowances shall be made in the patterns so
7 that the thickness specified or shown shall not be reduced in obtaining finished surfaces.
8 Castings will not be acceptable if the actual weight is less than 95% (percent) of the
9 theoretical weight computed from the dimensions shown. The Contractor shall provide
10 facilities for weighing castings in the presence of the County showing true weights,
11 certified by the supplier.
- 12 H. All steel finish work shall be thoroughly cleaned of all loose mill scale, rust, and foreign
13 matter before shipment and shall be given 1 shop coat of primer in accordance with
14 Section 09865 "Surface Preparation and Shop Prime Painting." Abrasions in the field
15 shall be touched up with primer immediately after erection. Final painting shall be in
16 accordance with Section 09900 "Painting."
- 17 I. Galvanizing shall be the hot dip zinc process after fabrication. Following all
18 manufacturing operations, all items to be galvanized shall be thoroughly cleaned, pickled,
19 fluxed, and completely immersed in a bath of molten zinc. The resulting coating shall be
20 adherent and shall be the normal coating to be obtained by immersing the items in a bath
21 of molten zinc and allowing them to remain in the batch until their temperature becomes
22 the same as the bath. Coating shall be not less than 2-ounces per square foot of surface.

23 3.02 INSTALLATION

- 24 A. Install all items furnished except items to be imbedded in concrete or masonry, which
25 shall be installed under Division 3 or Division 4 respectively. Items to be attached to
26 concrete or masonry after such work is completed shall be installed in accordance with
27 the details shown. Fastening to wood plugs in masonry will not be permitted. All
28 dimensions shall be verified at the site before fabrication is started.
- 29 B. All steel surfaces to come in contact with exposed concrete or masonry shall receive a
30 protective coating of an approved heavy bitumastic troweling mastic applied in
31 accordance with the manufacturer's instructions prior to installation.
- 32 C. Where aluminum is embedded in concrete, apply a heavy coat of approved bitumastic
33 troweling mastic in accordance with the manufacturer's instructions prior to installation.
- 34 D. Where aluminum contacts masonry or concrete, provide a 1/32-inch neoprene gasket
35 between the aluminum and the concrete or masonry.
- 36 E. Where aluminum contacts a dissimilar metal, apply a heavy brush coat of zinc chromate
37 primer and provide a 1/32-inch neoprene gasket between the aluminum and the dissimilar
38 metal.

- 1 F. Where aluminum contacts wood, apply 2 coats of aluminum metal and masonry paint to
2 the wood.
3

4 **END OF SECTION**

- 1 B. Both the wetwell and the valve vault shall be furnished with an access frame and door(s).
2 Equipment furnished shall include the necessary aluminum access frames, complete with
3 hinged and slide bar equipped doors, stainless steel upper guide holder and level sensor
4 cable holder. Doors shall be of aluminum diamond plate. The wetwell doors shall be
5 sized according to pump manufacturer's recommendations. The access frame and door(s)
6 shall have stainless steel hardware. The valve vault access doors size shall be a minimum
7 of inside to inside wall dimensions with a load rating of 300-pounds per square foot. The
8 support beam for loading rating shall be mounted on the door. Wetwell and valve vault
9 covers shall be permanently embossed "CONFINED SPACE" and painted lettering shall
10 not be acceptable. Each door shall be equipped with a recessed hasp enclosure.
- 11 C. Access hatches over wetwell shall have a non-removable back plate constructed of 1/4-
12 inch floor plate, welded to the frame with holes sized to allow passage of pipe flanges
13 with double modular pipe seal.

14 **PART 3 - EXECUTION**

15 3.01 INSTALLATION

- 16 A. The access hatches and doors shall be installed as recommended by the manufacturer and
17 adjusted for proper operation without binding.
- 18 B. Edges of the aluminum frame that will be in contact with concrete shall be coated with
19 coal tar epoxy prior to casting into the concrete, in accordance with Section 09900
20 "Painting."

21 **END OF SECTION**
22

1 **SECTION 09865**

2 **SURFACE PREPARATION AND SHOP PRIME PAINTING**

3 **PART 1 - GENERAL**

4 1.01 SCOPE OF WORK

- 5 A. This section specifies the labor, materials, equipment and incidentals required for the
6 surface preparation and application of shop primers on ferrous metals, excluding stainless
7 steel, as specified herein.

8 1.02 RELATED WORK

- 9 A. Field painting is included in Section 09900 "Painting."

10 1.03 SHOP DRAWINGS AND SUBMITTALS

- 11 A. Submittals shall be submitted to the County for review and acceptance prior to
12 construction in accordance with the General Conditions and specifications Section 01300
13 "Submittals."

- 14 B. Submit to the County for review and comment manufacturer's specifications and data on
15 the proposed primers and detailed surface preparation, application procedures and dry mil
16 thickness.

- 17 C. Submit representative physical samples of the proposed primers, if required by the
18 County.

19 **PART 2 - PRODUCTS**

20 2.01 GENERAL

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

23 2.02 MATERIALS

- 24 A. Submerged Services: Shop primer for ferrous metals which will be submerged or which
25 are subject to splash action or which are specified to be considered submerged service
26 shall be sprayed with 1 coat of Glidden Epoxy High Build Primer 5461/5452, or an
27 acceptable equal, at a minimum dry film thickness of 5.0-mils.

- 1 B. Non-submerged Services: Shop primer for ferrous metals, other than those covered by
2 Paragraph 2.01 A, shall be sprayed with 1 coat of Glidden T&S Primer 5205, or an
3 acceptable equal, at a minimum dry film thickness of 2.0-mils.
- 4 C. Non-primed Surfaces: Gears, bearing surfaces and other similar surfaces obviously not to
5 be painted shall be given a heavy shop coat of grease or other suitable rust-resistant
6 coating. This coating shall be maintained as necessary to prevent corrosion during all
7 periods of storage and erection and shall be satisfactory to the County up to the time of
8 the final acceptance test.
- 9 D. Compatibility of Coating System: Shop priming shall be done with primers that are
10 guaranteed by the manufacturer to be compatible with their corresponding primers and
11 finish coats specified in Section 09900 "Painting" for use in the field and which are
12 recommended for use together.

13 **PART 3 - EXECUTION**

14 3.01 APPLICATION

- 15 A. Surface Preparation and Priming
- 16 1. Non-submerged components scheduled for priming, as defined above, shall be
17 sandblasted clean in accordance with SSPC SP 6, Commercial Grade, immediately
18 prior to priming. Submerged components scheduled for priming, as defined above,
19 shall be sandblasted clean in accordance with SSPC SP 10, immediately prior to
20 priming.
- 21 2. Surfaces shall be dry and free of dust, oil, grease, dirt, rust, loose mill scale, and other
22 foreign material before priming.
- 23 3. Shop prime in accordance with acceptable paint manufacturer's recommendations.
- 24 4. Priming shall follow sandblasting before any evidence of corrosion has occurred and
25 within 24-hours.
26

27 **END OF SECTION**

1 1.04 COVERAGE

2 A. The protective lining/coating corrosion protection shall cover all concrete surfaces within
3 the wetwell or manhole including the adjustment ring area.

4 B. Coatings and lining surfaces shall be holiday free and all defects shall be repaired in
5 accordance with the manufacturer's recommendations prior to the next coat being
6 applied.

7 1.05 REFERENCE STANDARDS

8 A. American Society for Testing and Materials (ASTM)

- 9 1. ASTM C1244: Standard Test Method for Concrete Sewer Manholes by the Negative
10 Air Pressure (Vacuum) Test Prior to Backfill
11 2. ASTM D3299: Filament-Wound Glass-Fiber Reinforced Thermoset Resin Corrosion-
12 Resistant Tanks
13 3. ASTM D3350: Standard Specification for Polyethylene Plastics Pipe and Fittings
14 Materials
15 4. ASTM D3753: Glass-Fiber-Reinforced Polyester Manholes and Wetwells
16 5. ASTM D6365: Nondestructive Testing of Geomembrane Seams using the Spark Test.
17 6. ASTM F1759: Design of High-Density Polyethylene (HDPE) Manholes for Sub-
18 surface Applications
19 7. ASTM F1869: Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using
20 Anhydrous Calcium Chloride
21 8. ASTM G62: Standard Test Methods for Holiday Detection in Pipeline Coatings.

22 B. NACE INTERNATIONAL (Formerly The National Association of Corrosion Engineers)

- 23 1. NACE SP0188-2006 (formerly RP0188): Discontinuity (Holiday) Testing of New
24 Protective Coatings on Conductive Substrates.
25 2. NACE Standard SP0490-2007 (formerly RP0490): Holiday Detection of Fusion-
26 Bonded Epoxy External Pipeline Coating of 250 to 760 µm (10 to 30-mils).
27 3. NACE Standard SP0178-2007 (formerly RP0178): Design, Fabrication, and Surface
28 Finish Practices for Tanks and Vessels to Be Lined for Immersion Service

29 **PART 2 - PRODUCTS**

30 2.01 GENERAL

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

1 2.02 HDPE LINERS

- 2 A. The Work shall include the furnishing and installation of an interior protective liner
3 system including all necessary labor, materials, equipment and tools as required for a
4 complete installation. Liner shall be high-density polyethylene (HDPE). This liner shall
5 provide a waterproof, corrosion resistant liner to prevent any deterioration of concrete
6 surfaces from hydrogen sulfide and other corrosive gases/acids produced by wastewater
7 and to prevent infiltration. To ensure total unit responsibility, all materials and
8 installation thereof shall be furnished by, and coordinated with, 1 supplier/manufacturer.
- 9 B. Manhole HDPE Liner shall have a minimum thickness of 2-mm (78-mil) and wetwell
10 HDPE shall have a minimum thickness of 5-mm (195-mil). All HDPE liner sheets shall
11 be extruded with a large number of anchoring studs, a minimum of (420/m², 39/ft²),
12 manufactured during the extrusion process in 1-piece with the sheet so there is no
13 welding and no mechanical finishing work to attach the studs to the sheet. The liner shall
14 have a pull out of 112.5-lbs/anchoring stud. A manufacturer certified fabricator shall
15 custom fit the liner to the formwork in order to protect the concrete surfaces from sewer
16 gases.
- 17 C. All welding shall be performed in accordance with the published directives and
18 procedures of the manufacturer and by welders certified by the manufacturer and
19 documentation shall be provided to the County prior to the Work. Completion of
20 welding will provide a 1-piece monolithic HDPE protective liner system that will provide
21 excellent resistance to hydrogen sulfide attack and will not pull off the wall in the event
22 that infiltration occurs. Flat liner sheet, not anchored, used for overlapping joints, shall
23 have a minimum thickness of 3-mm for manholes or 5-mm for wetwells and shall contain
24 a co-extruded bottom surface layer of conductive polyethylene. Conductive cap strip
25 material shall have a free path from the back side of the sheet to a portion of the concrete
26 surface.
- 27 D. Field welding of the liner at the riser joints shall be completed only after vacuum testing
28 (ASTM C1244) of the new structure has been completed and any concrete joint
29 deficiencies have been rectified. Vacuum testing is not required on rehabilitation of
30 existing structures.
- 31 E. Testing and supervision of the installation and welding shall be performed by qualified
32 staff only and must be checked when completed by visually checking and by Spark
33 Testing all welded joints per ASTM D6365. Holiday testing 20,000 to 35,000 volts. All
34 high voltage discontinuity (spark) testing shall be performed using a Tinker & Rasor
35 model AP/W Holiday Detector or equal.
- 36 F. Penetrations (Forcemain, conduit, etc) shall have an internal boot comprising of
37 minimum of 3/8-inch 316SS band clamp compressing a 2-inch wide neoprene with full
38 circumferential welded boot around each penetration in accordance with the
39 manufacturer's details.

1 2.03 PREFORMED POLYPROPYLENE (PP) LINERS

- 2 A. The Work shall include the furnishing and installation of an interior protective liner
3 system including all necessary labor, materials, equipment and tools as required for a
4 complete installation. This liner shall provide a waterproof, corrosion resistant liner to
5 prevent any deterioration of concrete surfaces from hydrogen sulfide and other corrosive
6 gases/acids produced by wastewater and to prevent infiltration. To ensure total unit
7 responsibility, all materials and installation thereof shall be furnished by, and coordinated
8 with, 1 supplier/manufacturer.
- 9 B. All joints shall be field welded by hot air extrusion welding with PP welding bead. Field
10 welding of the PP liner at the riser joints shall be completed only after vacuum testing
11 (ASTM C1244) of the new structure has been completed and any concrete joint
12 deficiencies have been rectified. Vacuum testing is not required on rehabilitation of
13 existing structures.
- 14 C. Testing and supervision of the installation and welding shall be performed by qualified
15 staff only and must be checked when completed by visually checking and by Spark
16 Testing all welded joints per ASTM D6365. Holiday testing 20,000 to 35,000 volts. All
17 high voltage discontinuity (spark) testing shall be performed using a Tinker & Rasor
18 model AP/W Holiday Detector or equal.
- 19 D. Penetrations (Forcemain, conduit, etc) shall be gasketed PP pipe bell connectors or PP
20 sleeves for boot type connectors and shall be attached to the PP liner by hot air extrusion
21 welding with PP welding bead in accordance with the manufacturer's details.

22 2.04 FIBERGLASS LINERS

- 23 A. Fiberglass liners shall be used for new or existing precast manholes and wetwells.
24 Fiberglass liners shall meet or exceed ASTM D 3753 and shall withstand ASSHTO H-20
25 Loading.
- 26 B. FRP liner shall be 1-piece with no vertical or horizontal seams allowed. The FRP shall
27 be fabricated in accordance with NBS PS 15-69, and shall consist of commercial grade
28 polyester resin, UV inhibitor, chopped strand, woven roving, and continuous
29 reinforcement. Minimum liner thickness shall be 1/2-inch for all diameter wells, and
30 shall not have external ribs. Liner size shall be field verified by liner manufacturer's
31 representative. Tolerance of the inside diameter shall be +/- 1% of the required liner
32 diameter.
- 33 C. Exterior Surface: The exterior surface shall be relatively smooth with no sharp
34 projections and shall be free of blisters larger than 1/2-inch in diameter, delamination and
35 fiber show. Hand work finish is acceptable if enough resin is present to eliminate fiber
36 show.

1 D. Interior Surface: The interior surface shall be resin rich with no exposed fibers. The
2 surface shall be free of crazing, delamination, and blisters larger than 1/2-inch in
3 diameter, and wrinkles of 1/8-inch or greater in depth. Surface pits shall be permitted up
4 to 6 per square feet if they are less than 3/4-inch in diameter and less than 1/16-inch deep.
5 Voids that cannot be broken with finger pressure and that are entirely below the resin
6 surface shall be permitted if they are less than 1/2-inch in diameter and less than 1/16-
7 inch thick.

8 E. Physical Properties:
9

Property	Hoop Direction	Axial Direction
a. Tensile Strength (psi)	18,000	5,000
b. Tensile Modules (psi)	0.6 x 10e	0.7 x 10e
c. Flexural Strength (psi)	26,000	4,500
d. Flexural Modules (psi)	1.4 x 10e	0.7 x 10e
e. Compressive Strength (psi)	18,000	12,000

10 F. Stiffness
11

Liner Length in FT.	PSI
3 – 6.5	0.75
7 – 12.5	1.26
13 – 20.5	2.01
21 – 25.5	3.02
26 – 35	5.24

12 G. Testing: All tests shall be performed as specified in ASTM D3753 latest edition, Section
13 8. Test method D-790 (note 5) and test method D695. Each completed liner shall be
14 examined for dimensional requirements, hardness and workmanship. All required ASTM
15 D3753 testing shall be completed and records of all testing provided to the County. As a
16 basis of acceptance, the manufacturer shall provide an independent certification which
17 shall consist of a copy of the manufacturer's test report, and be accompanied by a copy of
18 the test results that the liner has been sampled, tested and inspected in accordance with
19 the provisions of this specification and meets all its requirements. The independent
20 certification and manufacturer's test report shall be provided to the County prior to
21 delivery of the Liner.

22 H. Connections: Openings for pipe connections will be core drilled in the field. Pipes shall
23 be placed through concrete wetwell and fiberglass liner in the locations indicated on the
24 Drawings. Pipes shall then be grouted in place with the grout filling the entire void and
25 being as thick as the concrete wetwell. The pipe on the interior of the wetwell shall be
26 fiberglassed to the fiberglass liner. To fiberglass the PVC or Ductile Iron pipe to the
27 fiberglass liner, the surface to be fiberglassed must first be sanded. In the case of Ductile
28 Iron pipe, the protective coating on the exterior of the pipe must be removed and then the
29 pipe sanded. After sanding and cleaning the area to be fiberglassed, apply a coat of
30 primer resin. When the resin becomes tacky, begin normal installation of the fiberglass,
31 taking care to roll out all of the air pockets. All field fiberglassing must be accomplished
32 by a manufacturer certified installer. Submit certification to the County.

- 1 I. Fiberglass Reinforced Top: The fiberglass manhole liner top shall be fabricated using
2 fiberglass material as above. Material and installation to meet all physical requirements
3 as above. Top to be attached to wetwell liner pipe with fiberglass layup to comply with
4 ASTM D3299. When reinforcement is necessary for strength, the reinforcement shall be
5 fiberglass channel laminated to the inside of the liner top and shall comply with ASTM
6 D3299. 4,000-psi concrete shall be poured around the entire manhole fiberglass cone
7 section. Lift station top slabs shall be re-poured with HDPE interior liner. Contractor
8 shall ensure an airtight connect between the Pump Station HDPE lined top slab and
9 interior wetwell liner.
- 10 J. PVC stub-outs shall be factory installed for new installations to accept approved boots for
11 gravity lines or compression seals for force mains.

12 2.05 FERROUS METAL SURFACES (INCLUSIVE OF STEEL AND DIP, HYDRANTS,
13 FITTINGS AND APPURTENANCES)

14 Cleaning, surface preparation, coating application, and thickness shall be as specified
15 herein and shall meet or exceed the coating manufacturer's recommendations. When the
16 manufacturer's minimum recommendations exceed the specified requirements,
17 Contractor shall comply with the manufacturer's minimum recommendations. All
18 cleaning, surface preparation, coating application, thickness, testing, and coating
19 materials (where available) shall be in accordance with the referenced standards of
20 AWWA, ANSI, NACE, SSPC, NSF, and ASTM. Color-coding shall be Safety Blue,
21 Safety Green and Pantone Purple 522-C for water, wastewater and reclaimed water
22 respectfully. Surfaces shall be holiday detected in accordance with ASTM G 62. Areas
23 found to have holidays shall be marked and repaired in accordance with the paint
24 manufacturer's instructions. The County shall be notified of time of testing so that he
25 might be present to witness testing.

- 26 A. Procedures for Coating Exterior of DIP, Hydrants, Fittings and Appurtenances
- 27 1. Surface Preparation: Do not abrasive blast or prepare more surface area than can be
28 coated in the same day; prepare surfaces and apply prime coatings within an 8-hour
29 period.
- 30 a. Steel: Shall require NACE-1/SSPC-SP5 White Metal Blast Cleaning minimum
31 angular anchor profile of 1.5-mils. White metal blast cleaning removes all of the
32 coating, mill scale, rust, oxides, staining, corrosion products, and other foreign
33 matter from the surface.
- 34 b. DIP: DIP with asphaltic seal coat, Hydrants, FBE (Valves and appurtenances),
35 Shall require NACE-3/SSPC-SP6 Commercial Blast Cleaning minimum angular
36 anchor profile of 1.5-mils. Commercial blast cleaning removes all visible oil,
37 grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other
38 foreign matter from all surfaces and allows stains to remain on 33% (percent) of
39 each unit area of surface.

- 1 c. Note: Primer Option - Hydrants, FBE (Valves and appurtenances), existing
2 factory coatings: Where specifically called out in the Coating System Table
3 below, NACE-4/SSPC-SP7 may be substituted for the commercial blast for
4 hydrants and factory applied FBE (Valves and appurtenances) where the coating
5 manufacturer has specifically provided compatible coatings with existing coatings
6 including urethane, epoxy, alkyd and water-based coatings. Under no
7 circumstances shall DIP with asphaltic seal coat be over-coated. NACE-4/SSPC-
8 SP7 Brush-Off Blast Cleaning shall be free of all visible oil, grease, dirt, dust,
9 loose mill scale, loose rust, and loose coating. Tightly adherent mill scale, rust,
10 and coating may remain on the surface. Mill scale, rust, and coating are
11 considered tightly adherent if they cannot be removed by lifting with a dull putty
12 knife after abrasive blast cleaning has been performed.
- 13 2. Contaminants: Remove dirt, dust, oil and all other contaminants that could interfere
14 with adhesion of the coating in accordance with SSPC-SP1 for the substrate and
15 between each coating layer.
- 16 3. Temperature: Surface temperature of substrate shall be a minimum of 5°F above the
17 dew point and rising and generally between 40°F to 100°F. Temperatures shall not
18 exceed manufacturer's recommendations.
- 19 4. Stripping: Edges, corners, crevices, welds, and bolts shall be given a brush coat/stripe
20 coat for each material/layer. The stripe coat shall be applied by a brush and worked
21 in both directions.
- 22 5. Coatings Systems: Two (2) options for coating systems are provided. Each coat shall
23 be a distinctive color or shade to verify each coating in the system.
- 24 6. Prime coat: DIP, DIP with asphaltic seal coat, Hydrants, FBE (Valves and
25 appurtenances) prime coat shall be zinc-rich. Zinc-rich shall only be used on bare
26 metal. Factory applied FBE/Asphaltic/Mastic coatings on valves and appurtenances
27 shall be completely removed per NACE 3 / SSPC-SP6.
- 28 7. Note: Where specifically called out in the Coating System Table for factory applied
29 FBE (Valves and appurtenances) surface preparation may be NACE-4/SSPC-SP7 and
30 the prime coat shall be an Inorganic water based epoxy. Asphaltic seal coats and
31 mastics shall not be overcoated with Inorganic water based epoxy.
- 32 8. Intermediate coat: Varies per coating system.
- 33 9. Final Coat: Varies per coating system.
- 34 10. Holiday Testing: Each coating layer shall be holiday tested at the recommended 100-
35 125 volts DC per mil in accordance with the latest edition of the following standards:
36 NACE SP0188-2006, NACE Standard RP0490, ASTM G62 and per the
37 manufacturers recommendations. All low voltage holiday testing shall be performed
38 using a Tinker & Razor model M-1 Holiday Detector or equal.
- 39 11. Coating Systems: Either System 1 or System 2 shall be used for above ground, non-
40 immersion ferrous metal surfaces (Inclusive of Steel, DIP, Hydrants, Fittings and
41 Appurtenances).
- 42

1

Color Codes

Generic Name	Application	Tnemec	Carboline	PPG / Ameron
Safety Blue	Water Master Meters	True Blue / Safety 11SF	9122	BL Safety Blue
Safety Green	Pump Station Piping	Hunter Green 08SF	V358	GN Safety Green
Pantone Purple 522C	Reclaimed Master Meters	Purple Rain / Safety 14 SF	7528	PL Safety Purple
Safety Green	Hydrant Bonnet & Caps	Hunter Green 08SF	V358	GN Safety Green
Safety Orange	Hydrant Bonnet & Caps	Tangerine Orange / Safety 04 SF	1420	OR 2Safety Orange
Safety Red	Hydrant Bonnet & Caps	Candy Apple Red / Safety 06SF	7573	RD 2 Safety Red
Safety Silver	Hydrant Barrel	Aluminum 57GR	J766	SL Safety Silver

2

3

System 1 - Zinc / Urethane / Fluoropolymer

Description	Generic Coating Name	Tnemec	DFT mils	Carboline	DFT mils
Prime Coat all materials. Surface Prep NACE 1 or NACE 3	Zinc-Rich	Zinc Series 90-97	2.5 - 3.5	Carbozinc 621	3.0 - 8.0
Prime Coat - option for FBE or Hydrants only. Surface Prep NACE 4	Inorganic water based epoxy – overcoat existing coatings	Typoxy Series 27WB	4.0 - 14.0	NA	NA
Intermediate Coat.	Aliphatic Acrylic Polyurethane	Endura-Shield Series 73	2.0 - 3.0	Carbothane 133 HB	3.0 - 5.0
Final Coat.	Advanced Thermoset Fluoropolymer Polyurethane	Hydroflon Series 700	2.0 - 3.0	Carboxane 950	2.0- 3.0

4

5

System 2 - Zinc / Epoxy / Urethane

Description	Generic Coating Name	Tnemec	DFT mils	Carboline	DFT mils	PPG / Ameron	DFT mils
Prime Coat all materials. Surface Prep NACE 1 or NACE 3	Aromatic Urethane, Zinc-Rich	Zinc Series 90-97	2.5 - 3.5	Carbozinc 621	3.0 - 8.0	Amercoat 68HS	3
Prime Coat option for FBE, Hydrants. Surface Prep NACE 4	Inorganic water based epoxy – overcoat existing coatings	Typoxy Series 27WB	4.0 - 14.0	NA	NA	NA	NA
Intermediate Coat.	Polyamidoamine Epoxy	Color Hi-Build Epoxoline II Series N69	4.0 - 10.0	Carboguard 60	4.0 - 6.0	Amerlock 2/400	4.0 - 6.0
Final Coat.	Aliphatic Acrylic Polyurethane	Endura-Shield Series 73	2.0 - 3.0	Carboxane 950	2.0 - 3.0	Amercoat 450H	2.0 - 3.0

1 2.06 SPECIALTY COATINGS

2 A. The Specialty Coatings are for rehabilitation of existing precast concrete manholes. New
3 precast structures shall be lined only. All specialty coatings applicators shall follow the
4 procedure as outlined below:

- 5 1. Pre-Inspection: Applicator shall take appropriate action to comply with all local, state
6 and federal regulations including those set forth by OSHA, EPA, the County and any
7 other applicable authorities. Prior to conducting any work, perform inspection of
8 structure to determine need for protection against hazardous gases or oxygen-depleted
9 atmosphere and the need for flow control or flow diversion.
- 10 2. Bypass plan: Bypass plan for flow control or bypass shall be submitted to the County
11 for approval prior to conducting the work. Any active flows shall be dammed,
12 plugged, or diverted as required to ensure all liquids are maintained below or away
13 from the surfaces to be coated until final applications are cured as recommended by
14 the corrosion protection system manufacturer.
- 15 3. Surface Preparation: NACE 6/SSPC-SP13 "Surface Preparation of Concrete." Dry
16 abrasive blasting, wet abrasive blasting, vacuum-assisted abrasive blasting, and
17 centrifugal shot blasting, high pressure water cleaning (5,000 to 10,000-psig), water
18 jetting (10,000 to 30,000-psig) or combination of methods to remove deteriorated
19 concrete, brick or mortar, laitance, hard contaminants, existing coatings, localized
20 micro-organisms and gas contaminants from the concrete walls, floor, ceiling, and
21 other concrete surfaces and shall display a surface profile suitable for application of
22 the system. Minimum surface profile shall be ICRI CSP-5 or greater. Containment
23 shall be provided to capture spent abrasive material and deteriorated concrete for
24 removal by the Contractor.
- 25 4. Substrate Inspection: After completion of surface preparation, the Contractor shall
26 inspect for: Leaks, Cracks, Holes, Exposed Rebar, Ring and Cover Condition, Invert
27 Condition, Inlet and Outlet Pipe Condition. After the defects in the structure have
28 been identified, repair with a manufacturer approved underlayment or material to
29 assure proper rehabilitation of the surface defect and compatibility with the specialty
30 coating system product to be applied. Repairs to exposed rebar, defective pipe
31 penetrations or inverts, shall be recommended by the specialty coating manufacturer
32 and approved by the County prior to proceeding with the repair. Final preparation
33 and cleaning of repaired surfaces is required prior to application of the coating and
34 shall comply with the corrosion protection system manufacturer's recommendations.
- 35 5. Manufacturer's certification: Applicators, installers, welders and application
36 equipment shall be certified by the manufacturer of the corrosion protection system
37 and documentation shall be provided to the County prior to the work.
- 38 6. Area to be coated: All exposed concrete of the entire interior surface of precast
39 structure including but not limited to benching, pipe penetrations, walls, bottom of
40 top slab, chimney, etc. Flow channel inverts are not necessary to coat. Corrosion
41 protection system shall interface with adjoining construction materials/components
42 throughout the manhole structure to effectively seal and protect substrates from attack
43 by corrosive elements and to ensure the effective elimination of infiltration into the
44 sewer system.

- 1 7. Application: Application of specialty coating system shall be in strict accordance with
2 manufacturer's recommendation. Specified surfaces should be shielded to avoid
3 exposure of direct sunlight, other intense heat source or, where cementitious products
4 are employed, excessive ventilation. Where varying surface temperatures do exist,
5 coating installation should be scheduled when the temperature is falling versus rising.
6 Verification of the corrosion protection system thickness shall be verified during
7 application via wet gauge methods or following cure of the system using appropriate
8 non-destructive or destructive methods.
- 9 8. Holiday Testing: Cure time shall be in accordance with the Manufacturers product
10 data sheet. Final concrete structure corrosion protection system shall be completely
11 free of holidays, pinholes or voids. High voltage Holiday testing shall be required
12 and holidays marked and repaired with same material and to same thickness as
13 required of original installation. All high voltage discontinuity (spark) testing shall
14 be performed using a Tinker & Rasor model AP/W Holiday Detector or equal and at
15 100-125 volts DC per mil or per the manufacturers recommendations.
- 16 9. Destructive Testing: Destructive testing may be performed as directed by the County
17 to verify coating adhesion and coating DFT. Repairs to areas tested by destructive
18 means shall be repaired by the certified applicator at the Contractor's expense.
- 19 10. Reporting: Provide final written report to the County detailing the location, date of
20 report, description of repair or original installation and manufacturer data and cut
21 sheets of the corrosion protection system and applicable testing results as per sections
22 7, 8 and 9.
- 23 11. Warranty: The report shall contain a copy of the warranty.

- 24 B. System SC-1: Sauereisen Sewergard 210 (Trowelable), 210FS (Trowelable Fast Set), 210S
25 (Sprayable) or 210RS (Rotary Spray) shall be applied and then shall be finished with a coat
26 of Sauereisen Sewergard Glaze 210G. The lining system to be utilized shall be an epoxy
27 mortar or aggregate filled epoxy. Material furnished under this specification shall be a pre-
28 packaged from the manufacturer. Materials shall be trowel applied or sprayed and shall
29 conform to the Manufactures product data sheet as supplied by the manufacturer.
- 30 1. Additional Preparation: To ensure a good bond, the newly blasted surface shall be
31 thoroughly vacuumed to remove all sand and debris and surface shall be dry prior to
32 application.
- 33 2. Surfacer for Rehabilitation/repair: Substrate in requiring repairs in excess of 1/8-inch
34 shall be repaired with Sauereisen Underlayment No F-120, F-121 or F-209 Filler
35 prior to application of protective lining/coating corrosion protection system.
- 36 3. Thickness:
 - 37 a. Sewergard 210 / 210FS / 210RS: The material shall be applied in 1 or more layers
38 for a total thickness of minimum of 125-mils DFT (1/8-inch). After application,
39 the material shall be damp rolled with excess water shaken off prior to back
40 rolling.
 - 41 b. Sprayable 210S: The material shall be applied in 1 or more layers for a total
42 thickness of minimum of 60-mils shall be required for the Spray applied 210S.
- 43 4. Finishing Glaze: After application, and curing of either the 210, 210FS, 210RS or
44 210S, the material shall be coated with a minimum of 20-mils of Sauereisen
45 Sewergard Glaze 210G by roller or spray application in accordance with the
46 manufacturers recommendations.

- 1 5. Holiday Testing: The protective lining/coating protection system shall be cured in
2 accordance with the manufacturer's recommendations prior to holiday testing at a
3 minimum of 14,500 volts.
- 4 C. System SC-2: Tnemec Perma-Shield Coating System.
- 5 1. Additional Preparation: To ensure a good bond, the newly blasted surface shall be
6 thoroughly vacuumed to remove all sand and debris and surface shall be dry prior to
7 application and surface shall be minimum 5°F above the dew point. Moisture content
8 not to exceed 3-pounds per 1,000 square feet in a 24-hour period verify dryness using
9 a "plastic film tape-down test" ASTM D4263 and perform Anhydrous Calcium
10 Chloride ASTM F1869.
- 11 2. Surfacer for Rehabilitation/repair: Substrate in requiring repairs in excess of 1/8-inch
12 shall be repaired Series 217 or 218 Filler prior to application of protective
13 lining/coating corrosion protection system. Concrete surface shall be pre-wet or
14 dampened with potable water prior to surfacer application.
- 15 3. Thickness: Lining Series 434: The material shall be applied in 1 or more layers for a
16 total thickness of minimum of 125-mils DFT (1/8-inch).
- 17 4. Finishing Glaze: After application, and curing, the material shall be coated with 15-
18 20-mils of Series 435 in accordance with the manufacturer's recommendations.
- 19 5. Holiday Testing: The protective lining/coating protection system shall be cured in
20 accordance with the manufacturer's recommendations prior to holiday testing at a
21 minimum 14,500 volts.
- 22 D. System SC-3: Sewercoat (PG and 2000 HS) Calcium aluminate mortar: The lining
23 system to be utilized shall be 100% calcium aluminate cement with 100% calcium
24 aluminate aggregate. Materials shall be spray applied by either a wet gunning (low-
25 pressure spray) or dry gunning (shotcrete) method and shall conform to the
26 manufacturer's product data sheet as supplied by the manufacturer. The equipment shall
27 be clean and free of any hydrated or un-hydrated Portland Cement.
- 28 1. Additional Preparation: To ensure a good bond, the newly blasted surface shall be
29 fully saturated with water prior to application.
- 30 2. Thickness: The material shall be applied in 1 or more layers to such total thickness as
31 required. A minimum of 1-inch shall be applied.
- 32 3. Finishing: After spraying, the material shall be brushed or trowel finished.
- 33 4. Curing: Curing by appropriate methods (curing compound, water mist, etc.) should be
34 implemented as the surface begins to harden and dry (as early as 1-hour after
35 application).
- 36 E. System SC-4: Raven 405: System shall be 100% solids epoxy. Thinning with solvents
37 shall not be permitted. Surface preparation, mixing, pot life, ambient conditions,
38 application, film thickness per coat, cure time, and recoat time shall be in accordance the
39 manufacturer's recommendations.
- 40 1. Applicator/installer shall be certified by the Manufacturer.
- 41 2. Surfacer/Repair: Raven 710, 705CA or Raven 700 shall be spray applied or trowelled
42 to repair/fill minor surface defects or applied as an underlayment.

- 1 3. Primer: Concrete exhibiting a moisture vapor emission rate greater than 3-lbs/1,000
2 square feet/24-hours, when tested according to ASTM F1869, shall be primed with
3 Raven 155. Raven 155 primer (2 component waterborne epoxy) shall be applied at a
4 maximum of 8-mil WFT (3-mil DFT). Recoat window minimum 2-4-hours at 72°F
5 with maximum 72-hours at 72°F.
 - 6 4. Top Coat: Raven 405 shall be applied with an approved plural component airless
7 spray system. Coating thickness shall be in relation to the profile of the surface to be
8 coated as recommended by the coating product manufacturer. In all cases the coating
9 shall be applied with minimum of 2 coats applied at 40-80-mils WFT/DFT each for
10 minimum final film thickness at 125-mils DFT. Subsequent top coating or additional
11 coats of the coating product(s) shall occur within the product's recoat window:
12 minimum cure to a tacky state; maximum cure of 18-hrs at 72°F substrate
13 temperature. Additional surface preparation procedures will be required if this recoat
14 window is exceeded including inspection for and removal of amine blush and/or other
15 potential contaminants.
 - 16 5. Holiday Testing: The protective lining/coating protection system shall be cured in
17 accordance with the manufacturer's recommendations prior to holiday testing at a
18 minimum of 12,500 volts.
- 19 F. SC-5: Spectrashield Multicomponent Liner System. Spectrashield multi-component
20 stress panel liner system composed of moisture barrier (modified polymer), surfaces
21 (polyurethane/polymeric blend foam) and final barrier coat (modified polymer). The
22 system is applied in three-steps and the applicator/installer shall be certified by the
23 Manufacturer.
- 24 1. Application
 - 25 a. Moisture barrier: Silicone Modified Polyurea Minimum 40-mils DFT
 - 26 b. Surfacer: Polyurethane/Polymeric blend foam
 - 27 c. Final corrosion barrier: Silicone Modified Polyurea Minimum 60-mils DFT
 - 28 2. Film Thickness: Final installation shall be a minimum of 500-mils. A permanent
29 identification and date of work performed shall be affixed to the structure in a readily
30 visible location.
 - 31 3. Holiday Testing: The protective lining/coating protection system shall be cured in
32 accordance with the manufacturer's recommendations prior to holiday testing at a
33 minimum of 50,000 volts.

34 **PART 3 - EXECUTION**

35 3.01 QUALITY ASSURANCE

- 36 A. All materials shall be delivered to the job in original sealed and labeled containers of the
37 coating manufacturer, and shall be subject to inspection by the County. Labels shall
38 show name of manufacturer, type of coating, formulation, date, color and manufacturers
39 recommendations. Coatings manufacturer date shall not exceed the manufacturer's
40 recommendations for storage and useful life and Coatings manufactured in excess of 1-
41 year prior to application shall be rejected.

- 1 B. Oil and grease shall be completely removed in accordance with SSPC-SP1 before
2 beginning any other surface preparation method. Surfaces of welds shall be scraped and
3 ground as necessary to remove all slag and weld spatter.
- 4 C. All components of equipment that can be properly prepared and coated after installation
5 shall be installed prior to surface preparation. Components that will be inaccessible after
6 installation shall have the surfaces prepared and coated before installation.
- 7 D. All ferrous metal surfaces shall be free of all defects and have all sharp edges, welds,
8 slag, defects and weld splatter ground smooth in accordance with NACE Standard
9 RPO178.
- 10 E. Edges, corners, crevices, welds, and bolts shall be given a brush coat (stripe coat) for
11 each coating. The stripe coat shall be applied by a brush and worked in both directions.
12 Special attention shall be given to filling all crevices with coating.
- 13 F. Coating shall be applied in a neat manner that will produce an even film of uniform and
14 proper thickness, with finished surfaces free of runs, sags, ridges, laps, and brush marks.
15 Each coat shall be carefully examined and faulty material, poor workmanship, holidays,
16 damaged areas and other imperfections shall be touched up prior to applying succeeding
17 coats. Each coat shall be thoroughly dry and hard before the next coat is applied in
18 accordance with the coating manufacturer's recommendations for drying time between
19 coats. In no case shall coating be applied at a rate of coverage greater than the maximum
20 rate recommended by the coating manufacturer. Each coat shall be uniform in coverage
21 and color. Successive coats shall perceptibly vary in color.
- 22 G. Coating failures will not be accepted and shall be entirely removed down to the substrate
23 and the surface recoated. Failures include but are not limited to holidays, sags, checking,
24 cracking, teardrops, fat edges, fisheyes, or delamination.
- 25 H. Surfaces not required to be coated: Brass, Bronze, Stainless steel (Not including SS bolts
26 and nuts)

27 3.02 INSPECTION FOR ACCEPTANCE

- 28 A. The quality of materials, the process of manufacture and the finished sections shall be
29 subject to inspection and approval by the County. Such inspection may be made at the
30 place of manufacture, at the site after delivery or at both places and the sections shall be
31 subject to rejection at any time due to failure to meet any of the specification
32 requirements; even though sample sections may have been accepted as satisfactory at the
33 place of manufacture. Sections rejected after delivery to the job shall be marked for
34 identification and shall be removed from the job at once. Sections that have been
35 damaged after delivery will be rejected and if already installed removed and replaced,
36 entirely at the Contractor's expense.

- 1 B. At the time of inspection, the sections will be carefully examined for compliance with the
2 specified ASTM designation and with the approved manufacturer's drawings. Sections
3 shall be inspected for general appearance, dimension, "scratch-strength" blisters, cracks,
4 roughness, soundness, etc. The surface shall be dense and close-textured.
- 5 C. Precast concrete structures shall be inspected by the County and defective materials shall
6 replaced by the Contractor at the Contractor's expense.
- 7 D. Any repairs made on surfaces shall be holiday detected. Areas found to have holidays
8 shall be marked and repaired in accordance with the coating manufacturer's instructions.
9 The County shall be notified of time of testing so that he might be present to witness
10 testing.
11

12 **END OF SECTION**

1 **SECTION 09905**

2 **PUMP STATION VALVE IDENTIFICATION SYSTEM**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

- 5 A. Scope of Work: The work included under this Section consists of providing an
6 identification system for pump station plug and check valves.

7 1.02 SUBMITTALS

- 8 A. Submit manufacturer's descriptive literature, illustrations, specifications, and other
9 pertinent data in accordance with Section 01300 "Submittals."

10 B. Schedules:

- 11 1. Provide a typewritten list of all tagged valves giving tag color, shape, letter code and
12 number, the valve size, type, use, and location.

13 C. Samples:

- 14 1. Provide a sample of each type valve tag supplied.

15 **PART 2 - PRODUCTS**

16 2.01 PUMP STATION VALVE IDENTIFICATION (ABOVE GROUND OR IN VALVE VAULTS)

- 17 A. A coded and numbered tag attached with brass chain and/or brass "S" hooks shall be
18 provided on all valves.

- 19 1. Tag Types: Tags for valves on pipe shall be brass or anodized aluminum. Square tags
20 shall be used to indicate normally closed valves and round tags shall indicate
21 normally open valves.

- 22 2. Coding: In addition to the color-coding, each tag shall be stamped or engraved with
23 wording or abbreviations to indicate the valve service and number. All color and
24 letter coding shall be approved by the County. Valve numbering shall be as shown on
25 the Drawings.

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

27 **END OF SECTION**

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1 B. Materials: Resins shall be a commercial grade unsaturated polyester resin. Reinforcing
 2 materials shall be commercial grade "E" type glass in the form of mat, chopped roving,
 3 continuous roving, roving fabric or a combination of the above, having a coupling agent
 4 that will provide a suitable bond between the glass reinforcement and resin. All materials
 5 including resins, glass reinforcement, fillers and additives shall be chemically resistant to
 6 hydrogen sulfide gas and the sanitary sewer environment. The combined thickness of the
 7 inner surface and the interior layer shall not be less than 0.10-inch. Seams shall be sealed
 8 at the factory with the same glass-resin jointing process.

9 C. Fabrication: The exterior surface shall be relatively smooth with no sharp projections and
 10 no exposed fibers. The exterior surface shall have a gray Gel-coat coating. The interior
 11 surface shall be resin rich with no exposed fibers. The interior and exterior surfaces shall
 12 be free of crazing, de-laminations, blisters larger than 1/2-inch diameter, wrinkles of 1/8-
 13 inch or greater in depth, resin runs, dry areas, sharp projections, or surface pits greater
 14 than 6 per square foot if they are less than 1/4-inch diameter and less than 1/16-inch deep.
 15 To provide UV protection, the exterior surface shall have a factory applied gray pigment
 16 for a minimum thickness of 0.125-inches.

17 D. Physical Properties: The fiberglass reinforced wetwell and manhole liner shall be designed
 18 for H-20 wheel loading and tested in accordance with ASTM D 3753 8.5 (note 1). The
 19 fiberglass reinforced wetwell liner and manholes shall meet the following physical
 20 requirements:
 21

	Hoop Direction	Axial Direction
Tensile Strength (psi)	18,000	5,000
Tensile Modulus (psi)	0.6 x 10 ⁶	0.7 x 10 ⁶
Flexural Strength (psi)	26,000	4,500
Flexural Modulus (psi)	1.4 x 10 ⁶	0.7 x 10 ⁶
Compressive (psi)	18,000	12,000

22 E. Soundness: Following installation, the Contractor shall determine soundness by applying
 23 air or water pressure (3-5-psi) to the wetwell liner. While holding at the established
 24 pressure, inspect the entire wetwell and manhole for leaks, based on loss of measured
 25 pressure. Any leakage through the laminate is cause for failure of the task. The
 26 Contractor shall be responsible for isolating the work of this Contract from existing work
 27 and shall be solely responsible for the method of such isolation. Refer to ASTM D-3253
 28 8.6.

29 F. Chemical Resistance: When tested in accordance with ASTM D3753 8.7 the log of
 30 percent retention of each property after immersion testing when plotted against the log of
 31 immersion time and extrapolated to 100,000-hours shall assure retention of at least 50%
 32 of the initial properties.

1 2.02 NON-SHRINK GROUT

2 A. Non-shrink grout used in the bench area of manholes and fillet areas of wetwells, or on
3 pipe penetrations shall be 100% calcium aluminate, un-thinned and un-altered, as
4 manufactured by Sewpercoat, Strong-Seal, or an approved equal.

5 2.03 BENCH

6 A. The existing concrete bench area of manholes and fillet areas of wetwells shall be removed
7 completely during initial preparation. Upon installation of the liner, a new bench/fillet shall
8 be constructed with non-shrink grout and shall be field coated with resin and fiberglass in a
9 dry environment after wastewater flows are diverted. The newly constructed bench shall
10 sufficiently overlap the newly installed liner to prevent migration of fluids or gases
11 between the liner and the bench. There shall be no exposed concrete between the factory
12 manufactured fiberglass liner and the field installed fiberglass bench overlay.

13 2.04 PIPE PENETRATIONS

14 A. Piping shall extend past the liner into the fiberglass wetwell or flush with the liner. If the
15 existing piping does not fully penetrate the fiberglass liner, the Contractor must extend
16 similar material piping into the fiberglass wetwell. Any gaps on joints must be sealed
17 with a non-shrink grout specified herein.

18 2.05 MANWAY NECK OR LIP

19 A. Manhole liner neck section shall extend from the ring and cover support area up to the
20 ring and cover. The neck section shall be designed to protect the adjustment ring(s),
21 brick and mortar used to bring the ring and cover to final grade.

22 2.06 MISCELLANEOUS MATERIALS

23 A. Additional items of construction necessary for the complete installation of the fiberglass
24 liner shall conform to specific details on the Drawings and shall be constructed of first-
25 class materials conforming to the applicable portions of these Specifications.

26 **PART 3 - EXECUTION**

27 3.01 INSTALLATION

28 A. Fiberglass Liner

29 1. The interior of the wetwell shall be pressure washed with an 800 to 1,000-psi water
30 blast, acid washed with a 20% muratic acid solution, and pressure washed a second
31 time. All loose materials, grease/fats, and hydrogen sulfide contamination shall be
32 removed. The existing bench/fillet areas in the wetwell/manhole shall be removed
33 prior to pressure washing. An inspection of the structures shall be conducted by the
34 County prior to the fiberglass liner installation.

- 1 2. Exterior liner diameter shall be approximately 4-inches smaller than the inside
2 diameter of the barrel section of the structure.
- 3 3. Liner depth shall be from invert to top elevation of manhole and wetwell. The top
4 12-inches of the manhole liner shall be a fiberglass neck that extends from the liner
5 corbel or cone section to the bottom of the ring and cover. The neck is used to protect
6 the concrete grade rings or brick and mortar adjustments from the sewer environment.
- 7 4. The wetwell top slab and manhole corbel or cone section shall be removed and
8 discarded by the Contractor in accordance with all applicable regulations at the
9 Contractor's expense.
- 10 5. Measure and cut wetwell liner to exact length and invert configuration. Measure and
11 cut all incoming and outgoing line openings.
- 12 6. Lower wetwell liner into wetwell and level.
- 13 7. Extend all incoming and outgoing lines inside the liner with PVC or other approved
14 pipe.
- 15 8. Construct new benches/fillets and tie-in and seal bottom of liner with a quick setting
16 non-shrink grout as specified herein.
- 17 9. Tie-in and seal all lines extending into the wetwell liner with non-shrink grout.
- 18 10. Pour or pump 3,000-psi pump mix into the annular space between the liner and
19 existing wetwell.
- 20 11. Use concrete grade rings on top of the liner cone section to bring ring and cover to
21 finish grade.
- 22 12. A non-shrinking grout as specified herein shall be applied to areas that cannot be
23 fiber-glassed due to water.

24 3.02 SHIPPING

- 25 A. Do not drop or impact the fiberglass wet well liner. Use of chains or cables in direct
26 contact with the wet well is prohibited.

27 3.03 MAINTENANCE OF SERVICE

- 28 A. The Contractor shall sequence the Work so that wastewater service is maintained to
29 existing customers at all times.

30 3.04 FIELD QUALITY CONTROL

- 31 A. Workmanship: It is imperative that the wetwell liner and appurtenances be built
32 watertight and that the Contractor adhere rigidly to the specifications for materials and
33 workmanship. Upon completion, the wetwell liner will be tested and if any damage on
34 the liner is observed, the fiberglass liner installation will be rejected.

35 B. Cleaning

- 36 1. Prior to final acceptance and final inspection of the fiberglass liner installation, flush
37 and clean all parts of the system. Remove all accumulated construction debris, rocks,
38 gravel, sand, silt, and other foreign material from the wetwell.

- 1 2. Upon the County's final inspection of the fiberglass liner installation, if any foreign
2 matter is still present in the system, flush and clean the section and portions of the
3 wetwell as required.
- 4 3. Testing: Upon installation, cleaning, and visual inspection, the Contractor shall, in the
5 presence of the County, test the entire lined surface in accordance with subsection
6 2.01, E of this specification section. Any repairs required shall be repaired in
7 accordance with the manufacturer's recommendations at the Contractor's expense.
8 The cost for the performance of this test shall be borne entirely by the Contractor.

9

END OF SECTION

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1 **SECTION 09960**

2 **HIGH PERFORMANCE FERROUS METAL COATINGS**

3 **PART 1 - GENERAL**

4 1.01 SCOPE OF WORK

5 A. The work of this section includes surface preparation, coating systems and methods of
6 application. All work shall be done in strict accordance with this specification, the
7 Contract Documents, and the manufacturer's printed instructions.

8 B. The Contractor shall furnish all supervision, labor, tools, materials, equipment,
9 maintenance of traffic, containment systems, scaffolding, other structures and incidentals
10 required for transportation, unloading, storage, surface preparation, protection of the
11 public and environment, application of products, and cleanup necessary to complete this
12 Contract in its entirety.

13 C. The scope of Work includes painting all exposed miscellaneous metal, pipe, fittings,
14 valves, hangers, straps, support, hardware, equipment, appurtenances, and all other work
15 obviously required to be painted unless otherwise specified. The Contractor shall also paint
16 all surfaces he affects or damages during his performance of the Work, which may be
17 exposed to view in the finished work including, but not limited to, metals, pipe, fittings,
18 valves, equipment and all other existing items similar to proposed items specified for
19 painting. Miscellaneous metal items to be painted shall be included in the Work of this
20 Section where they come within the general intent of the Specifications or as stated herein.

21 D. In general the following surfaces shall be painted:

- 22 1. Pipe, fittings, flanges, appurtenances and other metal surfaces to 1 ft below grade. Pipe 1
23 ft below grade and within 6-inches above grade shall be considered immersion surface
24 and shall be coated with the immersion surface high performance coating system.
- 25 2. Metal or Galvanized materials including, but not limited to: pipe straps, hangers, pipe
26 support floor stands, nuts, bolts, hardware and tapping saddles. Pipe straps to be
27 removed and coated on both sides.
- 28 3. Pipe Surfaces under pipe straps. Pipe straps shall be removed and pipe coated
29 underneath pipe straps regardless if pipe straps are to be coated. No more than two-
30 thirds of the total number of pipe straps shall be removed at any given time.
- 31 4. Pedestrian access barriers shall be removed and coated on all sides.
- 32 5. Incidentals within the limits of the project including but not limited to bollards,
33 adjacent walkways, walls or supports containing graffiti.
- 34 6. Contractor shall provide new 1/2" neoprene that shall be placed at contact interfaces
35 between materials including, but not limited to, pipe support floor stands, pipe straps, and
36 access barriers. The Contractor shall remove and replace existing neoprene where
37 exposed with new material. In situations where 1/2" neoprene is not sized properly for
38 existing conditions, the County on a case by case basis may require a different thickness.

- 1 E. The following surfaces or items are not generally required to be painted, unless noted
2 otherwise. The Contractor shall properly protect these materials from surface
3 preparation, coating application, or damage.
4 1. Products with polished chrome, aluminum, nickel, Stainless steel, brass, or bronze
5 materials.
6 2. Stainless steel finish hardware.
7 3. Flexible couplings.
8 4. Labels, signs or nameplates including but not limited to: UL, FM, equipment
9 identification, performance rating, name and nomenclature plates.
10 5. Aluminum handrails, walkways, window, louvers, and grating unless otherwise
11 specified herein.

12 1.02 REFERENCES

- 13 A. SSPC – Society for Protective Coatings
14 B. ASTM – American Society of Testing Materials
15 C. NACE – National Association of Corrosion Engineers
16 D. NSF – National Sanitation Foundation (Standard 61)
17 E. AWWA – American Water Works Association

18 1.03 DEFINITIONS

- 19 A. Field Coating is the coating of new or rebuilt items at the job site. Field coating shall be
20 the responsibility of the Contractor.
21 B. Shop Coating is the coating of new or rebuilt items in the shop prior to delivery to the jobsite.
22 C. Exterior – Outside, exposed to weather
23 D. Interior – Inside, not subject to immersion service
24 E. Immersion service – Material submerged or subject to splash or spray
25 F. WFT – Wet Film Thickness
26 G. DFT – Dry Film Thickness
27 H. MDFT – average minimum dry film thickness
28 I. SCARIFY – Roughen the entire existing coating surface by use of brush off blasting,
29 hand tools, sanding, etc to provide an anchor profile for adhesion by new coating
30 systems. Scarified surface shall be approved by the Coatings manufacturer and County
31 prior to over-coating. Existing rust spots, weld slag, sharp edges, defects etc shall be
32 removed by SSPC-SP3 Power tool cleaning.

1 J. General: The following referenced surface preparation specifications of the Joint Surface
2 Preparation Standards from NACE International (NACE) and The Society for Protective
3 Coatings (SSPC) shall form a part of this Specification:

- 4 1. SSPC-SP1 Solvent Cleaning. Remove all grease, oil, salt, acid, alkali, dirt, dust, wax,
5 fat, foreign matter, and contaminants, etc. by one of the following methods: steam
6 cleaning, alkaline cleaning, or volatile solvent cleaning. Rags and solvents must be
7 replenished frequently to avoid spreading the contaminant rather than removing it.
8 Low-pressure (1500-4000 psi) high volume (3-5 gal/min) water washing with
9 appropriate cleaning chemicals is a recognized "solvent cleaning" method. All
10 surfaces should be cleaned per this Specification prior to using hand tools or blast
11 equipment and between each coating application.
- 12 2. SSPC-SP2 Hand Tool Cleaning. Removal of loose rust, loose mill scale, loose paint
13 and loose foreign matter to a clean sound substrate by hand chipping, scraping,
14 sanding, and wire brushing. Tightly adherent rust, mill scale or paint may remain
15 providing that it cannot be removed by lifting with a dull putty knife
- 16 3. SSPC-SP3 Power Tool Cleaning. Removal of loose rust, loose mill scale, loose paint
17 and loose foreign matter, to a clean sound substrate by power tool chipping,
18 descaling, sanding, abrasive grinding wheels, needle guns, wire brushes, etc. Tightly
19 adherent rust, mill scale or paint may remain providing that it cannot be removed by
20 lifting with a dull putty knife
- 21 4. SSPC-SP5 White Metal Blasting (NACE-1). Complete removal of all visible oil,
22 grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other
23 foreign matter, leaving the surface a uniform gray-white color.
- 24 5. SSPC-SP6 Commercial Blast (NACE-3). Complete removal of all visible oil, grease,
25 dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign
26 matter, leaving only light shadows or discolorations from stains of rust, mill scale, or
27 previous coating on 33% of the unit surface area. At least 66% of each unit surface
28 area is to be free of all visible discoloration or staining.
- 29 6. SSPC-SP 7 Brush-Off Blast (NACE 4). Complete removal of oil, grease, dust, dirt,
30 loose rust, loose mill scale, and loose coatings, leaving tightly adherent mill scale,
31 rust and previous coating. Tightly adherent rust, mill scale or paint may remain
32 providing that it cannot be removed by lifting with a dull putty knife.
- 33 7. SSPC-SP10 Near White Blast (NACE 2). Complete removal of all visible oil, grease,
34 dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign
35 matter, leaving only light shadows or discolorations from stains of rust, mill scale, or
36 previous coating on 5% of the unit surface area. At least 95% of each unit surface
37 area is to be free of all visible discoloration or staining.
- 38 8. SSPC-SP 11 Power Tool Cleaning to Bare Metal. Complete removal of all visible oil,
39 grease, dirt, dust, mill scale, rust, paint, oxide, corrosion products, and other foreign
40 matter and retain or produce a minimum 1.0 mil surface profile. Slight residues of
41 rust and paint may be left in the lower portion of pits if the original surface is pitted.
- 42 9. SSPC-SP 12 Waterjetting (NACE-5). Surfaces preparation by ultra-high pressure
43 water jetting discharged from a nozzle at pressures of 70 MPa (10,000 psig) or greater
44 to prepare a surface for coating or inspection. The difference in degrees of surface
45 cleanliness is defined by the amount of pressure as follows:
46 a. Low Pressure Water Cleaning (LP WC) Less than 34 MPa (5,000 psi)
47 b. High Pressure Water Cleaning (HP WC) 34 to 70 MPa (5,000-10,000 psi)

- 1 c. High Pressure Water Jetting (HP WJ) 70 to 210 MPa (10,000-30,000 psi)
2 d. Ultra-High Pressure Water Jetting(UHP WJ) Above 210 MPa (30,000 psi)
3 e. WJ-1 Clean to Bare Substrate: Complete removal of all visible rust, dirt, previous
4 coatings, mill scale, and foreign matter. Discoloration of the surface may be present.
5 f. WJ-2 Very Thorough or Substantial Cleaning: Complete removal of all visible oil,
6 grease, dirt, and rust except for randomly dispersed stains of rust, tightly adherent
7 thin coatings, and other tightly adherent foreign matter limited to a maximum of
8 5% of the surface.
9 g. WJ-3 Thorough Cleaning: A WJ-3 surface shall be cleaned to a matte (dull,
10 mottled) finish is free of all visible oil, grease, dirt, and rust except for randomly
11 dispersed stains of rust, tightly adherent thin coatings, and other tightly adherent
12 foreign matter limited to a maximum of 33% of the surface.
13 h. WJ-4 Light Cleaning: A WJ-4 surface shall be cleaned to a finish which is free of
14 all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose coating.
15 Any residual material shall be tightly adherent.
16 10. SSPC-SP13 Surface Preparation of Concrete (NACE-6). Complete removal of
17 contaminants, laitance, form oils, dust, dirt, loosely adhering concrete, and previous
18 coating. Blasting, High-pressure water cleaning or waterjetting methods should be
19 performed sufficiently close to the surface so as to open up surface voids, bug holes, air
20 pockets, and other subsurface irregularities, but so as not to expose underlying aggregate.
21 11. SSPC-SP 14 Industrial Blast Cleaning (NACE-8). Complete removal of oil, grease,
22 dust, dirt, loose rust, loose mill scale, and loose coatings, leaving tightly adherent mill
23 scale, rust and previous coating evenly distributed on 10% of the unit surface area.
24 Stains and discolorations may be present on 90% of the unit area. Tightly adherent
25 rust, mill scale or paint cannot be removed by lifting with a dull putty knife.
26 12. SSPC-SP 15 Commercial Grade Power Tool Cleaning. Complete removal of all
27 visible oil, grease, dirt, rust, coating, oxides, mill scale, corrosion products, and other
28 foreign matter, except random staining shall be limited to no more than 33 percent of
29 each unit area of surface. Staining may consist of light shadows, slight streaks, or
30 minor discolorations caused by stains of rust, stains of mill scale, or stains of
31 previously applied coating. Slight residues of rust and paint may also be left in the
32 bottoms of pits if the original surface is pitted. (Equivalent standard as SSPC-SP6
33 Commercial Grade Blast Cleaning NACE-3).

34 1.04 SUBMITTALS

- 35 A. Submit to the Engineer as provided in the General Conditions and Division 1, shop
36 drawings, manufacturer's specifications and data on the proposed paint systems and
37 detailed surface preparation, application procedures and dry film thickness.

- 1 B. Schedule of Painting Operations: The Contractor shall submit for approval a complete
2 Schedule of Painting Operations within 30 days after the Notice to Proceed. It shall be the
3 Contractor's responsibility to properly notify and coordinate with the County for schedule
4 updates and site activities. This Schedule shall include for each surface to be painted, the
5 brand name, the volume of solids, the coverage and the number of coats the Contractor
6 proposes to use in order to achieve the specified dry film thickness. When the schedule has
7 been approved, the Contractor shall apply all material in strict accordance with the approved
8 Schedule and the manufacturer's instructions. Wet and dry paint film gauges shall be utilized
9 by the County to verify the proper application while Work is in progress.
- 10 C. Protection and Containment Plan: The Contractor shall submit for approval the process,
11 equipment, design, materials, requirements, disposal and methods to provide for
12 protection of the environment, collection of abrasive blasting material, collection of
13 existing coatings, protection of the public and protection for public access.
- 14 D. Maintenance of Traffic Plan (MOT): The Contractor shall prepare and submit a Traffic
15 Control Plan to the Owner, and Orange County Public Works Department or Florida
16 Department of Transportation for review and acceptance prior to commencing any Work
17 on the site. The Traffic Control Plan shall detail procedures and protective measures
18 proposed by the Contractor to provide protection and control of traffic affected by the
19 Work consistent with the following applicable standards:
20 1. Standard Specifications for Road and Bridge Construction, Latest Edition including
21 all subsequent supplements issued by the Florida Department of Transportation
22 (FDOT Spec.).
23 2. Manual of Traffic Control and Safe Practices for Street and Highway construction,
24 Maintenance and Utility Operations, FDOT.
25 3. Right-of-Way Utilization Regulations, Orange County, Florida, latest edition.
- 26 E. Test panels/samples: At the request of the County, samples of the finished work prepared in
27 strict accordance with these Specifications shall be furnished, and all painting shall be equal
28 in quality to the approved samples. Finished areas shall be adequate for the purpose of
29 determining the quality of workmanship. Experimentation with color tints shall be furnished
30 to the satisfaction of the County where standard chart colors are not satisfactory.
- 31 F. Equivalent materials of other manufacturers may be substituted on approval of the Engineer.
32 Substitutions that decrease the film thickness, the number of coats applied, change the
33 generic type of coating, or fail to meet the performance criteria of the specified materials will
34 not be approved. Prime and finish coats of all surfaces shall be furnished by the same
35 manufacturer. Requests for substitution shall include Manufacturer's literature for each
36 product giving the name, generic type, descriptive information, evidence of satisfactory past
37 performance, and an independent laboratory certification that their product meets the
38 performance criteria of the specified materials including but not limited to the following:
39 1. Abrasion – Fed. Test Method Std. No. 141, Method 6192, CS-17 Wheel, 1,000 grams
40 load
41 2. Adhesion – Elcometer Adhesion Tester
42 3. Exterior Exposure – Exposed at 45 degrees facing the ocean (South Florida Marine
43 Exposure)
44 4. Hardness – ASTM D3363-74

- 1 5. Humidity – ASTM D2247-68
- 2 6. Salt Spray (Fog) – ASTM B117-73

3 1.05 QUALITY ASSURANCE

4 A. Manufacturer's Qualifications

- 5 1. All paints and/or coatings applied in the performance of the Work shall be supplied
- 6 by one paint supplier and be the product of one manufacturer; unless the County
- 7 specifies or accepts a specialty paint not available from that manufacturer.
- 8 2. The paint manufacturer shall have supplied paint for water and wastewater facilities
- 9 for a minimum of ten (10) years, and products supplied shall be contained within the
- 10 manufacturer's standard water and wastewater brochure.
- 11 3. When the manufacturer's minimum recommendations exceed the specified requirements,
- 12 Contractor shall comply with the manufacturer's minimum recommendations.

13 B. Contractor / Applicator Qualifications as listed below shall be submitted at the time of

14 Bidding as part of the Bid Package.

- 15 1. The Contractor's Project Superintendent / Project Manager shall be at minimum
- 16 certified NACE Level 1 and be in good standing with NACE International prior to
- 17 bidding. The Contractor have a Competent Person onsite as defined by OSHA.
- 18 Certification credentials shall be provided to the County and verifiable through the
- 19 NACE.org certification search website.
- 20 2. The Contractor must show proof that all employees associated with this project shall
- 21 have been employed by the Contractor for a period not less than six (6) months.
- 22 3. Painting shall be performed by experienced painters in accordance with the
- 23 recommendations of the paint manufacturer and the Contract Documents. All paint
- 24 shall be uniformly applied without sags, runs, spots, or other blemishes. Work that
- 25 shows carelessness, lack of skill, or is defective in the opinion of the County, shall be
- 26 corrected at the expense of the Contractor.
- 27 4. The applicator shall have practical experience and successful history in the
- 28 application of the specified products to surfaces of water supply and wastewater
- 29 collection and treatment facilities. A written list of references shall be provided to
- 30 show experience and costs with high performance coatings on pipelines and aerial
- 31 crossings as well with all other aspects with the defined Scope of Work.
- 32 5. The Contractor shall provide a list of equipment owned and maintained by the
- 33 Contractor that shall be utilized on the project.
- 34 6. The Contractor shall provide their written QA / QC program.
- 35 7. Contractors shall submit their protection and containment plan to prevent blasting
- 36 debris, paint chips, paint overspray from entering water bodies.

37 C. Safety and Health Requirements.

- 38 1. General: In accordance with the requirements of the OSHA Regulations for
- 39 Construction, the Contractor shall provide and require the use of personal protective
- 40 and lifesaving equipment for all persons working in or about the Project including,
- 41 but not limited to, head and face protection, fall protection, safety harnesses and
- 42 respiratory devices. Applicable health and safety precautions required by appropriate
- 43 regulatory agencies such as OSHA, ANSI, etc., shall be followed.

- 1 2. Ventilation: Ventilation shall be adequate to reduce the concentration of air
2 contaminants to the degree that a hazard to workers does not exist.
- 3 3. Sound Levels: Whenever the occupational noise exposure exceeds the maximum
4 allowable sound levels, the Contractor shall provide and require the use of approved
5 ear protective devices.
- 6 4. Illumination: Adequate illumination shall be provided while work is in progress.
7 Whenever required by the County, the Contractor shall provide additional
8 illumination and necessary support sufficient to cover all areas to be checked. The
9 level of illumination required for observation purposes shall be determined by the
10 County.
- 11 5. Temporary Ladders and Scaffolding: All temporary ladders and scaffolding shall
12 conform to the applicable requirements of the OSHA Regulations for Construction.
13 The Contractor shall provide access to the County for all areas of work during each
14 phase of construction.
- 15 6. Safety of Public. Provide scaffolding, signage, temporary pedestrian access and
16 barricades as required to protect the public from the work area. Areas to be closed off
17 shall require public notice.

18 D. Pre-Job Conference

- 19 1. A pre-job meeting shall be held prior to the commencement of the Work, prior to
20 significant phases or per specific site location if the Work is not contiguous.
21 Attendance shall include the County, Engineer, Contractor, and Painters Site
22 Supervisor. The meeting will address site specific issues including but not limited to:
23 schedule, access to the site, safety requirements, surface preparation, application,
24 coating systems, inspection, quality control, MOT, protection of the public
25 and protection of the environment as covered in the specifications.
- 26 2. Copies of all manufacturer's instructions and recommendations shall be furnished to
27 the County and Engineer by the Contractor prior to the meeting.
- 28 3. It shall be the responsibility of the Coating Manufacturer to have their factory
29 representative meet in person with the Contractor and Engineer a minimum of three times
30 during the job as a consultant on surface preparation, mil thickness of coating and proper
31 application of coating unless meeting is determined to be unnecessary by the Engineer.

32 E. Surface Preparation

- 33 1. Visual Standard SSPC-VIS-1 (Swedish SIS OS 5900), "Pictorial Surface Preparation
34 Standards for Painting Steel Surfaces" and The National Association of Corrosion
35 Engineers, "Blasting Cleaning Visual Standards" (TM-01-70 and TM-01-75) shall be
36 the standards used to evaluate proper surface preparation.
- 37 2. To facilitate inspection, the Contractor shall on the first day of blasting operations, blast
38 metal panels (12" x 12" x 1/4") to the degree called for in the Specifications and as noted
39 above. Once a sample panel has been approved, it shall establish the quality of all
40 subsequent Work by reference. The sample shall then be stored in a dry, sealed plastic
41 container on the job site. Sample panels shall be prepared and approved for each type of
42 sandblasting specified and shall be maintained and utilized by the County throughout the
43 duration of sandblasting operations as reference standards of quality. Coatings shall be
44 applied only at temperatures and conditions recommended by the paint manufacturer.

1 F. Inspection Devices:

- 2 1. The Contractor shall utilize, until final acceptance of the Work, inspection devices in
3 good working condition for the detection of holidays, environmental conditions, and
4 measurements of wet and dry-film thicknesses of protective coatings. Inspection
5 devices shall be operated in strict accordance with the manufacturer's printed
6 instructions and applicable SSPC and NACE standards and guidelines.
- 7 2. Thickness and Holiday Checking: Thickness of coatings shall be checked with a
8 nondestructive, magnetic type thickness gauge. Coating integrity of coated surfaces shall
9 be tested with an approved holiday detection unit per the paint manufacturer's
10 recommendation. All pinholes shall be marked, repaired in accordance with the paint
11 manufacturer's printed recommendations and re-tested. No pinholes or other
12 irregularities will be permitted in the final coating. In cases of dispute concerning film
13 thickness or holidays, the Contractor shall abide by the County's determination unless
14 independent tests are performed by a certified lab at the Contractor's expense. Field
15 measurements of film thickness shall not exceed the requirements of SSPC-PA 2
16 Measurement of Dry Coating Thickness with Magnetic Gages. Discrepancies shall be
17 measured and verified with a micrometer or Tooke gauge if no other option is available.

18 1.06 PRODUCT DELIVERY STORAGE AND HANDLING

- 19 A. Delivery: All materials shall be delivered to the job in undamaged, original packages with
20 seals unbroken and in legible, labeled containers. Packages shall not be opened until the
21 County inspects them and they are required for use. Labels shall show name of
22 manufacturer, type of coating, formulation, date, color and manufacturers'
23 recommendations and instructions for use.
- 24 B. Storage: All painting materials shall be stored in a clean, dry, well-ventilated place,
25 protected from sparks, flame, and direct rays of the sun or from excessive heat. Paint
26 susceptible to damage from low temperatures shall be kept in a heated storage space
27 when necessary. The Contractor shall be solely responsible for the protection of the
28 materials he stores at the job site. Empty coating cans shall be neatly stacked in areas the
29 Owner designates, and shall be removed from the job site on a schedule the Owner
30 determines.
- 31 C. Mixing: Mechanical mixers, capable of thoroughly mixing the pigment and vehicle
32 together, shall mix the paint prior to use where required by manufacturer's instructions,
33 however, thorough hand mixing will be allowed for small amounts up to one gallon.
34 Pressure pots shall be equipped with mechanical mixers to keep the pigment in
35 suspension, when required by manufacturer's instructions. Otherwise, intermittent hand
36 mixing shall be done to assure that no separation occurs. Materials shall be in full
37 compliance with the requirements of pertinent codes and fire regulations.
- 38 D. Thinning: Catalysts or thinners shall only be utilized as recommended by the
39 manufacturer, and shall be added or discarded strictly in accordance with the
40 manufacturer's instruction.

1 1.07 PROJECT SITE CONDITIONS

2 A. Application: Paint shall be applied only on thoroughly dry surfaces and during periods of
3 favorable weather, unless specifically allowed by the paint manufacturer. Except as provided
4 below, painting shall not be permitted when the atmospheric temperature is below 50° F, or
5 when freshly painted surfaces may be damaged by rain, fog, dust, or condensation, and/or
6 when it can be anticipated that these conditions will prevail during the drying period.

7 B. No coatings shall be applied unless the relative humidity is below 85%.

8 C. No coatings shall be applied unless surface temperature is a minimum of 5° above dew
9 point; temperature must be maintained during curing.

10 1.08 WARRANTY

11 A. Warranty Inspection: Warranty inspection shall be conducted during the eleventh month
12 of the one (1) year warranty period following completion of all painting Work. All
13 defective Work shall be repaired in strict accordance with this Specification, and to the
14 satisfaction of the paint manufacturer and the County.

15 B. Fluoropolymer / Fluorourethane. The Contractor shall warrant through the Manufacturer
16 that the coating system shall not: check, crack, blister or delaminate from the substrate;
17 change color more than 12 MacAdam units as determined in accordance with ASTM
18 D2244; exhibit loss of gloss in excess of 24 units as measured by a gloss meter in
19 accordance with ASTM D523-8; or chalk in excess of a rating of 8 as measured in
20 accordance with ASTM D4214, Method A. Warranty coverage shall be effective for a
21 period of 15 years from Final Completion depending on color. The Contractor shall
22 notify the Manufacturer prior to ordering materials and begin the warranty process.
23 Sample panels shall be obtained from the Manufacturer, and at least 2 sample panels shall
24 be provided to the County in addition to the Manufacturers minimum requirements
25 regarding the warranty process. The Contractor shall not be permitted to install the
26 coating system until the Manufacturer has provided assurance that the color, substrate,
27 surface preparation or existing conditions are in conformance with the Manufacturer's
28 requirements for warranty.

29 **PART 2 - PRODUCTS**

30 2.01 GENERAL

31 A. The painting schedule has been prepared on the basis of Tnemec and Carboline products,
32 and their recommendations for application.

33 B. No paint containing lead shall be allowed.

34 2.02 COATING SYSTEMS

35 A. The following summarizes the painting systems for various types of applications.

1 B. The Contractor shall have the coating color matched or tinted by the coating supplier to
 2 exactly match Tnemec Color Codes as shown below. Manufacturers other than Tnemec shall
 3 submit a color matched swatch to the County for approval prior to ordering materials.
 4

Color Table

Fluid Conveyed by Pipe	Tnemec Color Codes
Potable Water (WM)	True Blue 11SF
Wastewater (FM)	Hunter Green 08SF
Reclaimed Water (RWM)	Purple Rain 14SF

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

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

18 HP – High Performance Coatings of FERROUS METALS
 19

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

20

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

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

4

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 DFT = Dry Film Thickness
 3 MDFT = Minimum Dry Film Thickness

4 2.03 EQUIPMENT

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

15 **PART 3 - EXECUTION**

16 3.01 GENERAL

- 17 A. All coating and painting shall conform to the applicable requirements of the Society for
 18 Protective Coatings (SSPC) Manual (most recent edition). Any material applied upon
 19 improperly prepared surfaces shall be removed and redone to the satisfaction of the
 20 Owner at the sole expense of the Contractor.
- 21 B. All Work shall be done by skilled craftsmen who are qualified to perform the required
 22 work and shall be done in a manner comparable to the best standards of practice found in
 23 that trade.

- 1 C. The Contractor shall provide a supervisor to be at the work site during surface preparation,
2 cleaning and coating operations. The supervisor shall have the authority to coordinate the
3 work and make other decisions pertaining to the fulfillment of their contract.
- 4 D. Prior to assembly, all surfaces that will be made inaccessible after assembly, shall be
5 prepared as specified herein, and shall receive the paint or coating system as specified herein.
- 6 E. Coating shall not be applied to wet or damp surfaces and shall not be applied in inclement
7 weather. Do not apply when the surface temperature is less than 5° F above the dew point, or
8 if relative humidity is greater than 85%. Dew or moisture condensation should be anticipated
9 and if such conditions are prevalent, coating should be delayed until the surfaces are dry.
10 Further, the day's coating should be completed well in advance of when condensation will
11 occur, in order to permit the film a sufficient drying time prior to the formation of moisture.
- 12 F. Any surfaces not specifically named in the Scope of Work, and not specifically
13 exempted, shall be prepared, primed and painted in the manner and with materials
14 consistent with these Specifications. The Owner shall select which of the manufacturer's
15 products, whether the type is indicated herein or not, shall be used for such unnamed
16 surfaces. No extra payment shall be made for this painting.
- 17 G. Contractor shall inspect each pipe joint, pipe strap, personal barriers and appurtenances after
18 providing access to the location but prior to commencing surface preparation activities. The
19 Contractor shall immediately report leaks, damage, stripped bolts or nuts to the County.

20 3.02 SURFACE PREPARATION

- 21 A. Solvent Cleaning: All dust, dirt, oil, or any contaminants that would affect the adhesion or
22 durability of the finish coating must be removed before hand tool cleaning, abrasive blasting
23 and prior to each coating layer application by cleaning per SSPC-SP1 "Solvent Cleaning."
- 24 B. Defects: All ferrous metal surfaces shall be free of all defects. The Contractor shall
25 remove by chipping or grinding all sharp edges; other defects shall be ground smooth in
26 accordance with NACE Standard RPO178, Appendix C. Weld flux, weld spatter, slag
27 and excessive rust scale shall be removed by SSPC-SP 11 Power Tool Cleaning to Bare
28 Metal. All weld seams, sharp protrusions, and edges shall be ground smooth prior to
29 surface preparation or application of any coatings.
- 30 C. Gaskets: Existing gaskets in between flanged joints shall be cut or ground flush with the
31 existing flanged joint prior to surface preparation or field blasting operations. The Contractor
32 shall not field blast into bell and spigot joints or under tapping saddles. Contractor shall blast
33 perpendicular to the pipe surface. SSPC-SP3 Power Tool Cleaning shall be used inside bells
34 and against tapping saddles to avoid damage to gaskets and locking mechanisms.
- 35 D. Field blasting cleaning for all surfaces shall be accomplished by dry sandblasting method
36 unless otherwise directed, or the County provides written approval
- 37 1. The abrasive used in blast cleaning shall produce an anchor profile in accordance
38 with the recommendations of the manufacturer of the protective coating, which is to
39 be applied to the surface being cleaned.

- 1 2. At all times during the blast cleaning operations, adequate means shall be employed
- 2 to absolutely insure that existing protective coatings shall not be exposed to abrasion
- 3 from blast cleaning operations.
- 4 3. All blast cleaned surfaces shall be carefully dried and cleaned prior to application of
- 5 specified coatings. No coatings or paint shall be applied over damp or moist surfaces.
- 6 4. Field blasting and priming shall be completed on any particular area during the same
- 7 workday, and the application of the primer shall follow immediately after surface
- 8 preparation and cleaning prior to formation of any form of corrosion. If the surface is
- 9 not primed within 8 hours, complete surface preparation shall be repeated.
- 10 5. The Contractor shall at all times keep the area of his work in reasonably clean condition
- 11 shall not permit blasting materials to accumulate in an uncontrolled manner such as to
- 12 constitute a nuisance or hazard to the satisfactory prosecution or the Work, operation of
- 13 the existing facilities, public safety, environmental nuisances or public access.
- 14 6. "Touch-up systems will be same as original specification except that approved
- 15 manufacturer's organic zinc-rich shall be used in lieu of inorganic zinc where this
- 16 system was originally used. Also, strict adherence to manufacturer's complete touch-
- 17 up recommendations shall be followed. Any questions relative to compatibility of
- 18 products shall be brought to the attention of the COUNTY and Coating Manufacturer;
- 19 otherwise, Contractor assumes full responsibility.
- 20 7. Areas that are inaccessible to abrasive blasting, including adjacent to concrete
- 21 pedestals, tapping saddles, pressure gauges or other appurtenances shall be cleaned in
- 22 accordance with SSPC-SP 11 "Power Tool Cleaning to Bare Metal" immediately
- 23 adjacent to the area as approved by the County.

24 E. Specified Surface Preparation: All surfaces shall be cleaned per SSPC-SP1 "Solvent
 25 Cleaning". In addition to the surface preparation for the specific Service Condition,
 26 surface preparation shall be as follows:
 27

Substrate	Condition	Surface Preparation
All Surfaces	All – Prior to Surface Preparation	SSPC-SP1 Solvent Cleaning
Steel	Exterior / Non-Immersion	SSPC-SP10 Near White Blast (NACE 2)
Steel	Exterior / Immersion	SSPC-SP5 White Metal Blasting (NACE-1)
Ductile Iron Pipe	Exterior / Non-Immersion	SSPC-SP6 Commercial Blast (NACE-3)
Ductile Iron Pipe	Exterior / Immersion	SSPC-SP10 Near White Blast (NACE 2)
Ferrous Metal	Exterior / Non-Immersion / Inaccessible to abrasive blasting	SSPC-SP 11 Power Tool Cleaning to Bare Metal
Galvanized Metals	Exterior / Non-Immersion	SSPC-SP 7 Brush-Off Blast (NACE 4)
PVC	Exterior / Non-Immersion	SSPC-SP1 Solvent Cleaning & Scarify by brush blast, power tools or hand sanding
Existing Coating System to be Over-Coated	Exterior / Non-Immersion	Scarify by brush blast, power tools or Hand Sanding with fine abrasive

28

- 1 1. Exposed Pipe: Bituminous coated pipe shall not be used in above ground or exposed
- 2 locations and shall be factory primed for all new pipe installations. After installation
- 3 all exterior, exposed flanged joints shall have the gap between adjoining flanges
- 4 sealed with a flexible caulking shall meeting ASTM C-920 and shall be Sika Flex 1A
- 5 or equal to prevent rust stains.
- 6 2. The Contractor shall not abrasive-blast or prepare more surface area than can be coated in
- 7 the same day; prepare surfaces and apply prime coatings within an 8-hour period.
- 8 3. Contractor shall coordinate with the County prior to surface preparation. County
- 9 approval shall be required prior to application of the prime coat.

10 3.03 APPLICATION EQUIPMENT

11 A. Brush and / or Rollers

- 12 1. Top quality, properly styled brushes and rollers shall be used. Rollers with a baked
- 13 phenolic resin core shall be utilized.
- 14 2. The brushing or rolling shall be done so that a smooth coat, as nearly uniform in
- 15 thickness as possible, is obtained. Brush or roller strokes shall be made to smooth the
- 16 film without leaving deep or detrimental marks.
- 17 3. Surfaces not accessible to brushes or rollers may be painted by spray, by dauber or
- 18 sheepskins, and paint mitt.
- 19 4. It may require 2 coats to achieve the specified dry film thickness if application is by
- 20 brush and roller.

21 B. Air, Airless or Hot Spray

- 22 1. The equipment used shall be suitable for the intended purpose, shall be capable of
- 23 properly atomizing the paint to be applied, and shall be equipped with suitable
- 24 pressure regulators and gauges.
- 25 2. Paint shall be applied in a uniform layer, with a 50% overlap pattern. All runs and
- 26 sags should be brushed out immediately or the paint shall be removed and the surface
- 27 resprayed.
- 28 3. High build coatings should be applied by a crosshatch method of spray application to
- 29 ensure proper film thickness of the coating.
- 30 4. Areas inaccessible to spray shall be brushed; if also inaccessible to brush, daubs or
- 31 sheepskins shall be used, as the manufacturer authorizes.
- 32 5. Special care shall be taken with thinners and paint temperatures so that paint of the
- 33 correct formula reaches the receiving surface.
- 34 6. Nozzles, tips, etc., shall be of sizes and designs as recommended by the manufacturer
- 35 of the paint being sprayed.
- 36 7. Edges, corners, crevices, welds, and bolts shall be given a brush coat (stripe coat) of
- 37 each coating. The stripe coat shall be applied by a brush and worked in both
- 38 directions prior to spray application. Special attention shall be given to filling all
- 39 crevices with coating.

40 3.04 WORKMANSHIP

41 A. General

- 42 1. Under no circumstances shall Asphaltic seal coats and mastics be overcoated.

- 1 2. Paints shall be mixed in proper containers of adequate capacity. All paints shall be
- 2 thoroughly stirred before use and shall be kept stirred while using. No unauthorized
- 3 thinners or other materials shall be added to any paint.
- 4 3. Only skilled painters shall be used on the Work, and specialists shall be employed
- 5 where required.
- 6 4. Extreme care shall be exercised in the painting of all operable equipment, such as valves,
- 7 electric motors, etc., so that the proper functioning of the equipment will not be affected.
- 8 5. The Contractor's scaffolding shall be erected, maintained, and dismantled without
- 9 damage to structures, machinery, equipment or pipe. Drop cloths shall be used where
- 10 required to protect the environment, the public, buildings, equipment, and areas
- 11 surrounding the Work. All surfaces required to be clear for visual observations shall
- 12 be cleaned immediately after paint application.
- 13 6. The prime coat shall be applied immediately following surface preparation within 8
- 14 hours of the same working day. All paint shall be applied by brushing, paint mitt and
- 15 roller, conventional spraying, or airless spraying, using equipment approved by the
- 16 paint manufacturer.
- 17 7. Each coat of paint shall be recoated as per manufacturer's instructions. Paint shall be
- 18 considered recoatable when an additional coat can be applied without any detrimental
- 19 film irregularities such as lifting or loss of adhesion.
- 20 8. Surfaces that will be inaccessible after assembly shall receive either the full specified
- 21 paint system or three shop coats of the specified primer before assembly.
- 22 9. Finish colors shall be as specified per the color table in section 2.02 of this
- 23 specification, and shall be factory mixed (i.e., the Contractor shall not tint the paint,
- 24 unless the COUNTY and the Coating Manufacturer so authorizes.)
- 25 10. All shop-coated surfaces shall be protected from damage and corrosion before and
- 26 after installation by treating damaged area immediately upon detection. Abraded or
- 27 corroded spots on shop-coated surfaces shall be cleaned per SSPC-SP1 Solvent
- 28 Cleaning" and then touched up with the same materials as the shop coat in accordance
- 29 with the manufacturers instruction. At the discretion of the Owner, all shop coated
- 30 surfaces that are faded, discolored, or that require more than minor touch up shall be
- 31 field blast cleaned and repainted.

- 32 B. Field Coating: All painting at the site shall be designated "Field Coating".
- 33 1. All paint shall be at ambient temperature before applying, and no painting shall be
 - 34 done when the temperature is below 50 degrees F, in dust-laden air, when rain is
 - 35 falling, mist is present, when relative humidity exceeds manufacturer's
 - 36 recommendation when temperature is less than 5° F above the dew point, or until all
 - 37 traces of moisture have completely disappeared from the surface to be painted.
 - 38 2. Protective coverings or drop cloths shall be used to protect existing appurtenances,
 - 39 concrete walkways, concrete structures, existing surfaces, the public, the environment
 - 40 and equipment. Care shall be exercised to prevent paint or coating overspray and
 - 41 spatter onto surfaces that are not to be painted. Surfaces from which such materials
 - 42 cannot be removed satisfactorily shall be painted or repainted, as required to produce,
 - 43 a finish satisfactory to the County.
 - 44 3. All edges, corners, crevices, welds, hardware and irregular surfaces shall receive a
 - 45 brush coat (stripe coat) of the specified product for each coat prior to application of
 - 46 each complete coat.

- 1 4. Coating shall be applied in a neat manner that will produce an even film of uniform
2 and proper thickness, with finished surfaces free from brush marks or other
3 irregularities. Each coat shall be carefully examined and faulty material, poor
4 workmanship, holidays, damaged areas and other imperfections shall be touched up
5 prior to applying succeeding coats. Each coat shall be thoroughly dry and hard before
6 the next coat is applied in accordance with the coating manufacturer's
7 recommendations for drying time between coats. Coating shall be cleaned in
8 accordance with SSPC-SP1 prior to the application of next coating. In no case shall
9 coating be applied at a rate of coverage greater than the maximum rate recommended
10 by the coating manufacturer.
- 11 5. Coating failures shall not be accepted and shall be entirely removed down to the
12 substrate and the surface recoated. Failures include, but are not limited to, holidays,
13 sags, checking, cracking, teardrops, fat edges, fisheyes, or delamination. Any repairs
14 made on surfaces shall be repaired in accordance with the coating manufacturer's
15 instructions.
- 16 6. Each coat shall be uniform in coverage and color. Successive coats of paint shall be
17 tinted so as to make each coat easily distinguishable from each other with the final
18 undercoat tinted to the approximate shade of the finished coat.
- 19 7. Painting shall be continuous and shall be accomplished in an orderly manner so as to
20 facilitate inspection. Surfaces of exposed members that will be inaccessible after
21 erection shall be cleaned and painted before erection.
- 22 8. All materials shall be applied in accordance with the manufacturer's instructions. If
23 spray painting is required, Contractor shall accept all responsibility for any damage
24 caused by overspray and/or drifting paint mist.
- 25 9. Caulking: The Contractor shall caulk all voids or interfaces including but not limited
26 to: flanges, threads, nuts, saddles, gaps, voids or spaces between appurtenances and
27 pipe to be coated immediately after the prime coat to prevent rust formation where
28 ferrous metal is not accessible to surface preparation or blasting. Flexible caulking
29 shall meet or exceed ASTM C-920 and shall be Sika Flex 1A or equal.

30 3.05 FIELD QUALITY CONTROL

31 At a minimum, the Contractor shall provide field quality control and verification of the
32 coating film thickness utilizing the below methods.

- 33 A. Wet Film Gauge. Both the Contractor and the County shall use a wet film gauge to
34 verify the applied coating desired wet film thickness (WFT) to produce the required
35 minimum DFT.

36
$$\text{Target WFT} = \text{County specified average MDFT} / \text{Volume Solids} \times 100\%$$

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

- 1 B. DFT Magnetic Gauge. Dry Film Magnetic Pull-Off Gauge (Type I) shall be utilized to
2 determine DFT in accordance with SSPC-PA 2 "Measurement of Dry Coating Thickness
3 with Magnetic Gages." The average of the readings shall meet the County-specified
4 MDFT for each coating application. Electromagnetic Gauge (Type II) shall not
5 considered acceptable for use on this project.
- 6 C. Holiday Testing: Each coating layer shall be holiday tested at the recommended 100-125
7 volts DC per mil in accordance with the latest edition of the following standards: NACE
8 SP0188-2006, NACE Standard RP0490, ASTM G62 and per the manufacturers
9 recommendations. All low voltage holiday testing shall be performed using a Tinker &
10 Razor Model M-1 Holiday Detector, or equal. Areas found to have holidays shall be
11 marked and repaired in accordance with the paint manufacturer's instructions.
- 12 D. Destructive Testing: Destructive testing using a Tooke gauge shall only be utilized in
13 cases of dispute regarding DFT. The County shall be permitted up to three (3) cuts using
14 the Tooke Gauge and the Contractor shall be responsible for repairing the areas examined
15 at no additional cost.
- 16 E. Environmental Testing: humidity, dew point and temperature shall be constantly
17 measured and logged. Any electronic gauges shall be first calibrated against a sling
18 psychrometer each day.

19 3.06 INSPECTION OF SURFACES

- 20 A. Before application of the prime coat and each succeeding coat, all surfaces to be coated
21 shall be subject to inspection and approval by the County. The Contractor shall correct
22 any defects or deficiencies before application of any subsequent coating. Coatings
23 applied without County approval shall be removed and reapplied at no cost to the County.
- 24 B. The Contractor shall provide the County access to all areas of the Work. All scaffolding
25 or lifts shall be in compliance with OSHA requirements.
- 26 C. The Contractor shall furnish samples of surface preparation and of painting systems to be
27 used as a standard throughout the job, unless omitted by the County.
- 28 D. When any appreciable time has elapsed or has exceeded the manufactures
29 recommendations between coatings, the County shall carefully inspect previously coated
30 areas and surfaces that are damaged or contaminated, in the opinion of the County shall
31 be cleaned and recoated at the Contractor's expense. Re-coating times of manufacturer's
32 printed instructions shall be adhered to.
- 33 E. Coating thickness shall be determined by the use of a properly calibrated "DeFelsko
34 Positest FM" Type 1 Coating Thickness Gauge (or equal) for ferrous metal or a "Tooke"
35 Paint Inspection gauge (or equal) for non-ferrous and cementitious surfaces. Please note
36 that use of the "Tooke" gauge is classified as a destructive test.

1 3.07 PROTECTION, CONTAINMENT AND CLEAN-UP

- 2 A. The premises shall at all times be kept free from accumulation of waste material and
3 rubbish caused by employees or work. At the completion of the painting remove all
4 tools, scaffolding, surplus materials, and all rubbish from and about the site and leave the
5 area "broom clean" unless more exactly specified.
- 6 B. It shall be the responsibility of the Contractor to protect at all times, in areas where
7 painting is being done, floors, sidewalks, walls, bridges, environment, public property,
8 equipment, vehicles, appurtenances, and finished surfaces adjacent to paint work. Cover
9 all electric plates, surface hardware, nameplates, gauge glasses, etc., before start of
10 painting work.
- 11 C. The Contractor shall contain all spent abrasives, old paint chips, paint overspray and
12 debris by means suitable to the County, including but not limited to, full shrouding of the
13 area. The Contractor shall provide a complete design and plan of the intended shroud or
14 cover. Care must be taken not to modify or damage the structure during the use of the
15 shroud. If damage should occur, the Contractor is held responsible for all repairs. The
16 Contractor's containment must be adequate enough to stop blasting residue from being
17 released into the environment. There should be no visible emissions of particulate matter
18 or visible deposits on the ground outside the containment area. Water jetting or wet
19 abrasive blast cleaning for the purpose of removing paint and surface debris shall be
20 conducted within a containment designed, installed, and maintained in order to capture
21 paint chips and debris. Collection of the water is not required. Mesh containment
22 materials that capture paint chips and debris while allowing the water to pass through
23 shall have openings a maximum of 25 mils (625 microns) in greatest dimension. Low
24 Pressure Water Cleaning for the purpose of removing chalk, dirt, grease, oil and other
25 surface debris can be performed without additional containment provided paint chips are
26 removed and collected prior to Low Pressure Water Cleaning (LP WC).
- 27 D. At completion of the work, remove all paint where spilled, splashed, splattered, sprayed
28 or smeared on all surfaces, hardware, equipment, painted, and unpainted surfaces.
- 29 E. After completion of all painting, the Contractor shall remove from job site all painting
30 equipment, surplus materials, and debris resulting from this work.
- 31 F. The Contractor is responsible for the removal and proper disposal of all hazardous
32 materials from the jobsite in accordance with Local, State, and Federal requirements as
33 outlined by the Environmental Protection Agency.

34 **END OF SECTION**

35

1 **SECTION 11305**

2 **SUBMERSIBLE PUMPS AND APPURTENANCES**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

5 A. Scope of Work: This Section specifies the furnishing, installation, and testing of
6 submersible pumps and associated equipment for the duplex pump station(s), complete,
7 tested and ready for operation. The pumps and associated equipment covered under this
8 Section include the following requirements:

- 9 1. Two submersible pumps and motors for each duplex pump station or three
10 submersible pumps and motors for each triplex pump station.
11 2. The following accessories and associated equipment are to be provided by the pump
12 supplier for each duplex/triplex pump station:
13 a. pump control panel
14 b. lifting cables and hooks
15 c. hatches and frames
16 d. electrical cables and cable hangers
17 e. level indicators/floats
18 f. mounting elbows, adapters and anchor bolts
19 g. seamless guide/slide rails with Type 316 stainless steel upper guide rail brackets
20 h. pump base plates

21 B. Operating Requirements: Pumping equipment provided under this Section shall conform
22 to Table 11305-A "Submersible Pumps Schedule."

23 1.02 QUALITY ASSURANCE

24 A. Unit Responsibility: All equipment including but not limited to the pumps, motors,
25 control panel and level sensors, access hatch frames and covers (for wetwell and valve
26 box), pump mounting elbows, guide rails, pump base plates, pump lifting cable, cable
27 holder, and startup service shall be supplied by the pump supplier to insure unit
28 responsibility.

29 B. Factory Tests: The pump manufacturer shall perform the following tests on each pump
30 before shipment from the factory:

- 31 1. Megger the pump for insulation breaks or moisture.
32 2. Prior to submergence, the pump shall be operated dry and be checked for correct
33 rotation.
34 3. Pump shall be operated for 30-minutes in a submerged condition.
35 4. Pump shall be removed from test tank, meggered immediately for moisture, oil plugs
36 removed for checking lower seal, inspection plug removed for checking of upper seal
37 and possible water intrusion of stator housing.

- 1 5. A written certified test report giving the above information shall be supplied with
- 2 each pump at the time of shipment.
- 3 6. All ends of pump cables shall be fitted with a rubber shrink fit boot to protect cable
- 4 prior to electrical installation.

5 C. The Contractor shall furnish and install equipment from a single manufacturer.

6 1.03 SHOP DRAWINGS AND SUBMITTALS

7 A. Submittals shall be submitted to the County for review and acceptance prior to

8 construction in accordance with the General Conditions and specifications Section 01300

9 "Submittals."

- 10 B. Certified pump test performance for:
- 11 1. Flow, gpm
 - 12 2. Total Dynamic Head (TDH), feet
 - 13 3. NPSHr, feet
 - 14 4. Input Power and Shaft Power, horsepower
 - 15 5. Overall Efficiency and Pump Efficiency, %

16 C. Layout drawings showing installation details with dimensions specific for this

17 application.

18 D. Shop Drawings for all associated equipment and accessories specified under this Section

19 in accordance with Division 1 in sufficient detail to enable the County to determine

20 compliance with all stated specification requirements.

21 E. Operating Instructions: Operating and maintenance data shall be furnished to the County

22 as provided in the General Conditions and Division 1. The instructions shall be prepared

23 specifically for this installation and shall include all required cut sheets and operating and

24 maintenance instructions for personnel unfamiliar with such equipment.

- 25 F. Manufacturer's Certification
- 26 1. After acceptance of pump Shop Drawings, factory performance test data will be
 - 27 submitted for approval on each pumping unit.
 - 28 2. Tests shall be in accordance with the standards of the Hydraulic Institute including
 - 29 head, capacity, brake horsepower and pump efficiency.
 - 30 3. A written certified test report shall be supplied with each pump at the time of
 - 31 shipment.

32 1.04 PRODUCT DELIVERY STORAGE AND HANDLING

33 A. All equipment shall be delivered in suitable packages, cases or crates, and stored or

34 placed as directed by the manufacturer. Each package shall have an identifying mark and

35 a complete list showing contents. Equipment shall not be stored directly upon the

36 ground.

- 1 B. All equipment shall be lifted and handled in a manner so as not to damage or deform the
2 equipment in any way and in any special way as instructed by the manufacturer.
- 3 C. All parts and equipment shall be properly protected so that no damage or deterioration
4 will occur during a prolonged delay from the time of shipment until installation is
5 completed and the units and equipment are ready for operation. Finished surfaces of all
6 exposed pump openings shall be protected by securely bolted wood planks. Finished iron
7 or steel surfaces not painted shall be properly protected to prevent rust and corrosion
8 during periods of storage and installation and shall be satisfactory to the County up to the
9 time of the final acceptance test.

10 1.05 WARRANTY

- 11 A. Warranty: The pump manufacturer shall warrant the pumps being supplied to the County
12 against defects in workmanship and materials for a period of 5-years or 10,000-hours
13 under normal use, operation and service. The warranty shall apply to 100% parts and
14 labor for the time specified and shall not be prorated.

15 **PART 2 - PRODUCTS**

16 2.01 GENERAL

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

19 2.02 MANUFACTURERS

- 20 A. The Contractor shall furnish and install motor driven totally submersible sewage pumps
21 and associated equipment as provided by those submersible sewage pump manufacturers
22 listed in Appendix D "List of Approved Products" to meet the requirements set forth in
23 Table 11305-A.

24 2.03 MATERIALS

- 25 A. All hardware and accessories in the wetwell shall be Type 316 stainless steel.

26 2.04 PUMPS AND ACCESSORIES

- 27 A. General
- 28 1. Brass or stainless steel nameplates identifying the name of the manufacturer, voltage,
29 phase, rated horsepower, speed and any other pertinent data shall be attached to each
30 pump.
- 31 2. Anchors and Fasteners: All necessary foundation bolts, plates, nuts, and washers shall
32 be furnished by the equipment manufacturer and shall be Type 316 stainless steel.

- 1 B. Pump Design: The pumps shall be capable of handling raw unscreened domestic
2 wastewater and passing a minimum 3-inch diameter solid sphere.
- 3 C. Casing: The stator casing and oil casing shall be of gray cast iron construction, with all
4 parts coming into contact with sewage protected by a corrosion resistant paint proven to
5 withstand an environment of raw wastewater.
- 6 D. Impeller: The impeller shall be constructed of gray cast iron, ASTM A-48, class 30 – 40.
7 All external bolts and nuts shall be Type 316 stainless steel. Each pump shall be
8 provided with a replaceable metallic wear ring system to maintain pump efficiency.
9 Impellers can be of the closed or open type. The closed type can utilize a single or
10 double vane. The open type shall be single or double vane with a self-cleaning,
11 adjustable cast iron wear plate. All impellers shall be dynamically balanced and of non-
12 clog design capable of passing solids, fibrous material, and heavy sludge and constructed
13 with long throughways with no acute turns.
- 14 E. Mechanical Seals: Each pump shall be provided with a tandem double mechanical seal
15 running in an oil or air reservoir, composed of two separate lapped face seals, each
16 consisting of one stationary and one rotating tungsten carbide or silicone ring with each
17 pair held in contact by a separate spring, so that the outside pressure assists spring
18 compression in preventing the seal faces from opening. The compression spring shall be
19 protected against exposure to the pumped liquid. Silicone carbide may be used in place
20 of tungsten carbide for the upper and lower seal. The pumped liquid shall be sealed from
21 the oil or air reservoir by one face seal and the oil reservoir from the air filled motor
22 chamber by the other. The seals shall require neither maintenance nor adjustment and
23 shall be easily replaced. Seal shall be held in place by locking ring. Conventional double
24 mechanical seals are not acceptable. Cartridge seals are acceptable.
- 25 F. Guide Rails, Lifting Cable, and Discharge Elbow
- 26 1. The design shall be such that pumping units will be automatically connected to the
27 discharge piping when lowered into place on the discharge connection. Pump
28 removal for service or inspection will be by quick disconnect and hoist retrieve.
29 Removal shall not require personnel to enter the wetwell nor shall nuts, bolts or
30 fasteners require removal. Each pump shall be fitted with 6-feet of Type 316
31 stainless steel, minimum Grade 50, 3/4-inch chain attached to the lifting mechanism
32 and air craft rated 1/4-inch stainless steel cable provided between the cable holder and
33 the chain ("Grip-eye System", or acceptable equal), to permit raising the pump for
34 inspection and removal using a closed chain hook and electric hoist. The lifting bail
35 shall be constructed of Type 316 stainless steel for each pump.
- 36 2. A sliding guide bracket shall be an integral part of the pumping unit and the pump
37 casing shall have a machined connecting flange to connect with the cast iron
38 discharge connection, which shall be bolted to the floor of the wetwell with stainless
39 steel anchor bolts and so designed as to receive the pump discharge flange without the
40 need of any bolts or nuts.

- 1 3. Sealing of the pumping unit to the discharge connection shall be accomplished by a
2 simple downward motion with the entire weight of the pumping unit guided by two
3 Schedule 40 welded seamless Type 316 stainless steel guide bars which will press it
4 tightly against the discharge connection. All Type 316 seamless tubular stainless
5 steel guides shall be 2-inch diameter for use with pumps up to 25-horsepower.
6 Pumps greater than 25-horsepower shall use 3-inch diameter Type 316 seamless
7 tubular stainless steel guides. No portion of the pump shall bear directly on the floor
8 of the wetwell and no rotary motion of the pump shall be required for sealing.
9 Sealing at the discharge connection shall be metal-to-metal contact of the pump
10 discharge and mating discharge connection.
- 11 4. The pump base elbow design shall be interchangeable such that it will provide a
12 watertight connection for any of the specified or otherwise accepted pumps without
13 requiring any special tools, gaskets or adapters. Assembly shall be capable of
14 receiving a standard Flygt pump without special modification to either the pump or
15 existing base elbow.
- 16 5. Approved pump manufacturers, if necessary to meet the above specification, shall
17 provide a sliding guide bracket adapter.
- 18 6. Pump base elbow shall be bolted to a 1-inch-thick steel pump base plate which is
19 anchored to the wetwell floor at six locations with 6-inch epoxy anchors. Pump base
20 plate shall extend 6-inches beyond the pump volute and base elbow and trimmed to fit
21 as necessary.

22 G. Pump Motor: All motors shall be built in accordance with the latest NEMA, IEEE, ANSI
23 and AFBMA Standards where applicable. The pump motor shall be housed in an air
24 filled watertight casing and shall have Class H insulated windings which shall be
25 moisture resistant. The motors shall be NEMA Design B rated 155°C maximum. Pump
26 motors shall have cooling characteristics suitable to permit continuous operation in a
27 totally, partially or non-submerged condition. The pump shall be capable of running
28 continuously in a totally dry non-submerged condition under full load without damage for
29 extended periods. Before final acceptance a field running test demonstrating this ability,
30 with 24-hours of continuous operation under the above conditions, shall be performed for
31 all pumps being supplied as required by the County. The motor shall be capable of a
32 minimum of 10 starts per hour. Motors 25-horsepower and below shall be rated 230/460-
33 volt, 3-phase and speed shall be nominal 1,750 RPM or less. Motors greater than 25-
34 horsepower shall be 460 volt, 3-phase and speed shall be nominal 1,750 RPM or less.
35 Pump motors shall be non-overloading over the entire published performance curve.

36 H. Heat and Moisture Sensors: Each motor shall incorporate a minimum of one ambient
37 temperature compensated overheat sensing device. This protective device shall be wired
38 into the pump controls in such a way that if excessive temperature is detected the pump
39 will shut down. This device shall be self-resetting.

1 I. Cables: Cables shall be designed specifically for submersible pump applications and shall
2 be properly sealed. A type CGB watertight connector with a neoprene gland shall be
3 furnished with each pump to seal the cable entry at the control panel. The pump cable
4 entry seal design shall preclude specific torque requirements to insure a watertight and
5 submersible seal. The cable entry shall be comprised of a single cylindrical elastomer
6 grommet, flanked by washers, all having a close tolerance fit against the cable outside
7 diameter and the entry inside diameter and compressed by the entry body containing a
8 strain relief function, separate from the function of sealing the cable. The assembly shall
9 bear against a shoulder in the pump top. The cable entry junction chamber and motor
10 shall be separated by a stator lead sealing gland or terminal board, which shall isolate the
11 motor interior from foreign material gaining access through the pump top. Secondary
12 sealing systems utilizing epoxy potting compounds may be used. The manufacturers
13 shall supply a cable cap as part of the spare parts for each pump when this type of sealing
14 system is used. All cables shall be continuous, without splices from the motor to the
15 control panel, unless otherwise approved by the County. The junction chamber
16 containing the terminal board shall be perfectly leak proof.

17 J. Special Tools and Spare Parts

- 18 1. Special Tools: Provide special tools for normal operation and maintenance in
19 accordance with the Appendix B "Pump Station Start-Up Report" form.
20 2. Spare Parts: The pump supplier will include at least one set of spare parts with a
21 toolbox as detailed in accordance with Appendix B "Pump Station Start-Up Report"
22 form.

23 K. Pump Access Hatch and Frame

- 24 1. Material: Structural aluminum or Type 316 stainless steel.
25 2. Design
26 a. Liveload: 300-pounds per square foot.
27 b. Regular extruded angle section frame.
28 c. Hatch cover (diamond pattern) opens 90° (degrees) and locks automatically with
29 stainless steel positive locking arm and release handle. Hatch cover shall be
30 permanently embossed "CONFINED SPACE" and painted lettering shall not be
31 acceptable. Each door shall be equipped with a recessed hasp enclosure.
32 3. Frame attachments (all Type 316 stainless steel)
33 a. Upper guide rail holders
34 b. Lift cable holder
35 4. Hatch hinges: heavy-duty Type 316 stainless steel hinges with tamper proof fasteners.
36 5. Accessories
37 a. Lifting handle: Type 316 stainless steel.
38 6. Finish: Mill finish with bituminous coating applied to exterior of frame.

39 **PART 3 - EXECUTION**

40 3.01 INSTALLATION

- 41 A. All materials and equipment shall be installed as shown on the Drawings and as
42 recommended by the manufacturers.

1 B. Additional items of construction, such as concrete work, interior grouting, piping, vents,
2 valves, controls, and other items necessary for the complete installation of the system
3 shall conform to specific details on the Drawings and shall be constructed of materials
4 conforming to the applicable portions of these Specifications.

5 3.02 INSPECTION, TESTING AND CERTIFICATION

6 A. Inspection, Testing and Certification shall comply with Section 01650 "Pump Station
7 Start-Up and Testing."

8 **END OF SECTION**

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TABLE 11305-A

SUBMERSIBLE PUMPS SCHEDULE FOR PUMP STATION # 3676		
1. Manufacturer	Flygt	ABS
2. Model Number	CP3152.181	XFP
3. Impeller Number	63-454-00-5350	100G CB1
4. No. of Pumps Required	2	2
5. Pump Size, Inches	6	4
6. Primary Capacity, GPM / Total Head, Feet	330 gpm @ 98 ft	450 gpm @ 104.5 ft
7. Run-out Capacity, GPM / Total Head, Feet	590 gpm @ 79 ft	735 gpm @ 90 ft
8. Shut-off / Total Head, Feet	127	142
9. Motor, HP (NEMA Code)	20	28.2
10. Maximum Speed, RPM	1750	1770
11. Explosion Proof Motor Required (yes or no)	YES	YES
12. Voltage, Volts	460	460
13. Phase	3	3
14. Frequency, Hertz	60	60
15. Service	Raw Unscreened Sewage	Raw Unscreened Sewage
16. Minimum solid sphere size	3-inch	3-inch
17. Minimum Pump Efficiency at Primary Capacity, %	47	62
18. Submergence Requirement, Inches	13.97 in.	13.00 in.
19. Minimum Height of Base Elbow, Inches	17.71 in.	14.60 in.
20. Distance from Pump Volute to Base Plate, Inches	17.56 in.	12.40 in.

TABLE 11305-A

SUBMERSIBLE PUMPS SCHEDULE FOR PUMP STATION # 3391		
1. Manufacturer	Flygt	ABS
2. Model Number	CP3102.181	XFP
3. Impeller Number	63-434-00-3703	100E CB1
4. No. of Pumps Required	2	2
5. Pump Size, Inches	4	4
6. Primary Capacity, GPM / Total Head, Feet	120 gpm @ 38.5 ft	152 gpm @ 44 ft
7. Run-out Capacity, GPM / Total Head, Feet	220 gpm @ 33.5 ft	240 gpm @ 38.9 ft
8. Shut-off / Total Head, Feet	47	57
9. Motor, HP (NEMA Code)	5	6.03
10. Maximum Speed, RPM	1745	1770
11. Explosion Proof Motor Required (yes or no)	YES	YES
12. Voltage, Volts	230	230
13. Phase	3	3
14. Frequency, Hertz	60	60
15. Service	Raw Unscreened Sewage	Raw Unscreened Sewage
16. Minimum solid sphere size	3-inch	3-inch
17. Minimum Pump Efficiency at Primary Capacity, %	46	44
18. Submergence Requirement, Inches	10.24 in.	12.90 in.
19. Minimum Height of Base Elbow, Inches	15.75 in.	14.60 in.
20. Distance from Pump Volute to Base Plate, Inches	15.79 in.	11.00 in.

TABLE 11305-A

SUBMERSIBLE PUMPS SCHEDULE FOR PUMP STATION # 3265		
1. Manufacturer	Flygt	ABS
2. Model Number	CP3127.181	XFP
3. Impeller Number	63-485-00-2202	100E CB1
4. No. of Pumps Required	2	2
5. Pump Size, Inches	4	4
6. Primary Capacity, GPM / Total Head, Feet	240 gpm @ 44 ft	275 gpm @ 46.7 ft
7. Run-out Capacity, GPM / Total Head, Feet	260 gpm @ 42.5	298 gpm @ 45.5 ft
8. Shut-off / Total Head, Feet	72.5	62.5
9. Motor, HP (NEMA Code)	7.5	7.5
10. Maximum Speed, RPM	1740	1760
11. Explosion Proof Motor Required (yes or no)	YES	YES
12. Voltage, Volts	230	230
13. Phase	3	3
14. Frequency, Hertz	60	60
15. Service	Raw Unscreened Sewage	Raw Unscreened Sewage
16. Minimum solid sphere size	3-inch	3-inch
17. Minimum Pump Efficiency at Primary Capacity, %	46	57
18. Submergence Requirement, Inches	11.02 in.	12.90 in.
19. Minimum Height of Base Elbow, Inches	15.75 in.	14.60 in.
20. Distance from Pump Volute to Base Plate, Inches	16.77 in.	11.00 in.

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SECTION 13423
LEVEL MEASUREMENT

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes the following:
 - 1. Cord type float switch.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, see Appendix D for manufacturers offering products which may be incorporated in Work.

2.02 FLOAT SWITCH (CORD TYPE)

- A. Free cable acting float switch shall be furnished to automatically detect liquid level change. Liquid rise of 1-inch from rest position shall operate float switch and reset will occur when liquid level drops 1-inch.
- B. Float switch shall consist of type 316 stainless steel housing, flexible 3-conductor cable with a synthetic rubber jacket, and mercury switch. Inside float housing will be a (normally open/closed) mercury switch potted in epoxy. Electrical load for switch contacts shall be rated 115 volt AC at 0.5-horsepower inductive load.
- C. Three-conductor cable shall be 14 AWG with 105-strands per conductor made for heavy flexing service and underwater use. A green grounding wire shall connect internally to float housing.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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1 **SECTION 13430**

2 **PUMP STATION CONTROL PANELS**

3 **PART 1 - GENERAL**

4 1.01 SUMMARY

5 A. Section Includes:

- 6 1. Intrinsically safe isolator relays.
7 2. Terminal blocks.

8 1.02 SUBMITTALS

- 9 A. Shop Drawings covering the items included under this Section shall be submitted in
10 accordance with Section 01300, "Submittals."

11 1.03 QUALITY ASSURANCE

12 A. Regulatory Requirements

- 13 1. Codes, Ordinances, and Industrial Standards: Design, testing, assembly, and methods of
14 installation for materials, electrical equipment, and accessories proposed under this Section
15 shall conform to National Electric Code and to applicable State and local requirements.
16 2. UL listing and labeling of custom-built panels (UL 508) shall be adhered to under this
17 Contract.

18 **PART 2 - PRODUCTS**

19 2.01 MANUFACTURERS

20 Subject to compliance with specified requirements, approved manufacturers are listed in
21 Appendix D "Orange County Utilities, Standards and Construction Specifications Manual",
22 dated February 11, 2011.

23 2.02 CONTROL PANEL

24 A. Panel Construction

- 25 1. The Contractor shall furnish and install all the necessary panels, meter cabinets,
26 disconnects, conductors, conduits, and other associated electrical components for a
27 complete electrical system. All work shall conform to the latest national and local
28 codes and be in strict conformance with Orange County standards as previously
29 identified. All material and equipment shall be Underwriters Laboratories (UL) listed.
30 All coordination for service and metering shall be accomplished by the Contractor at no
31 additional cost to the County. The Work shall include complete testing of all
32 equipment, components and wiring to demonstrate proper functioning of the system.

- 1 2. The manufacturer of the control panel shall be UL certified and provide data to
2 indicate that the manufacturer has a minimum of 3-years experience in the building of
3 pump control panels.
- 4 3. The duplex pump control panel shall be housed in a NEMA 12/3R, Type 316, 14-
5 gauge stainless steel enclosure, with drip shield and door gasket. The control panel
6 door shall be operated by a 3-point latch. An additional remote access terminal strip
7 with thirty additional terminal blocks shall be added for SCADA. Enclosure shall
8 have provisions for padlocking the door and a dead front inner door unit for mounting
9 controls. All exterior hardware and hinges shall be stainless steel. All LCD screens
10 shall have an aluminum sunshield painted white with hinged flap covering the screen
11 surrounding the manufacturer's enclosure.
- 12 4. There shall be permanently affixed to the interior side of the enclosure door both a
13 nameplate and a 10-inch by 12-inch pocket for log sheet storage. The nameplate shall
14 contain the following information:
 - 15 a. voltage
 - 16 b. phase
 - 17 c. rated horsepower
 - 18 d. rpm
 - 19 e. date manufactured
 - 20 f. pump and control panel manufacturer's name
 - 21 g. pump data
 - 22 h. impeller data
 - 23 i. operating point including design flow and head
 - 24 j. kilowatt input
 - 25 k. amperes at the operating point and at least 2 other points on the pump curve
 - 26 l. pump serial numbers.
- 27 5. The control panel enclosure shall be UL 50 type NEMA 3R listed. Overhead T-8
28 fluorescent lighting shall be controlled by a single pole switch installed inside of the
29 control panel. Light shall be mounted on the inside of the door.
- 30 6. The control panel shall consist of a main circuit breaker and generator breaker with
31 mechanical interlock, an emergency power receptacle, a circuit breaker and magnetic
32 starter for each pump motor, and 20-ampere, 120 volt circuit breakers as required.
33 The main circuit breaker and generator circuit breaker shall be equal in rating. Each
34 panel shall contain an additional 20-ampere breaker for SCADA purposes. All circuit
35 breakers shall be operable through the dead front inner door. Additional multi-lug
36 assemblies shall be provided to prevent more than 1-wire per lug. All circuit breakers
37 shall be molded case. The control panel shall respond to liquid level float switches
38 and other approved methods specified by Appendix D "List of Approved Products",
39 to automatically start and stop pumps as well as sound an alarm upon high or low
40 wetwell levels. Control switches shall provide means to operate each pump manually
41 or automatically. When operated in the automatic mode, the control assembly shall
42 provide means to manually select or automatically alternate the position of the "lead"
43 and "lag" pumps after each pumping cycle. A float type liquid level control system
44 shall continuously monitor wetwell liquid level and control operation of the low-level
45 cutoff for the pumps and shall operate off a 24-VAC circuit.

- 1 7. The control panel shall operate a minimum of 2 electrical submersible pumps at the
2 power characteristics specified. The control function shall provide for the operation
3 of the lead pump under normal conditions. If the incoming flow exceeds the pumping
4 capacity of the lead pump, the lag pump shall automatically start to handle this
5 increased flow. As the flow decreases, pumps shall be cut off at the elevation as
6 shown on the Drawings. Pumps shall alternate positions as lead pump at the end of
7 each cycle. A failure of the alternator shall not disable the pumping system. The
8 alternator shall include a safe, convenient method of manual alternation and also have
9 provisions to prevent automatic alternation without disturbing any wiring. Should the
10 "pump off" regulator fail, the system shall keep the station in operation.
11 8. The control panel shall be compatible with both of the manufacturers' pumps listed in
12 Table 11305-A - Submersible Pumps Schedule.

13 B. Power Supply and Main Disconnect

- 14 1. Power supply to the control panel shall be 240 volt, 3-phase, 4-wire (Delta) or 480
15 volt, 3-phase, 4-wire (Y). Minimum service shall be 100-amperes. Single-phase
16 power shall not be accepted.
- 17 2. A lockable, non-fused disconnect shall be used for service main disconnects at all
18 stations. In all pump stations, a main disconnect shall be installed between the meter
19 and the panel. Provide dual lugs on load side of disconnect for connection of TVSS
20 equipment. Exception: At pump stations with a generator and transfer switch,
21 provide molded case circuit breaker located ahead of transfer switch for service main
22 disconnect.
- 23 3. Disconnect shall be rated for the maximum available fault current from the utility
24 serving the pump station with electrical power.
- 25 4. On all 480 volt systems, an additional UL approved lockable, non-fused, safety type
26 switch utility service disconnect shall be installed ahead of the meter.
- 27 5. Contractor shall be responsible for coordination of the electrical service with the
28 utility providing power for the installation.

29 C. Motor Circuit Protectors

- 30 1. Each pump motor shall be protected by a 3-pole molded case circuit breaker (See
31 Appendix D "List of Approved Products"). The motor circuit breaker shall be
32 operated by a toggle type handle and shall have a quick make, quick break over-
33 center switching mechanism that is mechanically trip free from the handle so that the
34 contacts cannot be held closed against a short circuit and abnormal currents which
35 cause the motor circuit breaker to trip. Tripping shall be clearly indicated by the
36 handle automatically assuming a position midway between the normal "on" and "off"
37 positions. All latch surfaces shall be ground and polished. All poles shall be so
38 constructed that they open, close, and trip simultaneously. Motor circuit breaker must
39 be completely enclosed in a high strength glass polyester molded case. Ampere
40 ratings shall be clearly visible. Contacts shall be of non-welding silver alloy. Arc
41 extinction must be accomplished by means of arc chutes. A manual push to trip
42 button shall be provided for manual exercising of the trip mechanism.

- 1 D. Motor Starter and Selector Switches
- 2 1. The panel shall contain a motor starter for each motor. The motor starter shall be
- 3 across-the-line non-reversing magnetic starter with individual mechanical overload
- 4 protection on each power leg with reset installed through the dead front inner door
- 5 unit. Provide solid-state soft start overloads with user selectable bypass contactor for
- 6 motors greater than 50-horsepower. Local power company regulations shall govern.
- 7 2. Selector switches shall be installed on the face of the inner dead front door unit.
- 8 Selector switch shall be a heavy-duty oil tight "Hand Off Auto" 3-position switch to
- 9 control the operation mode of each pump motor starter.
- 10 3. Motor Disconnect: Where pump motor disconnect and starter is not mounted within
- 11 site of pump wetwell, (where electrical equipment is mounted within a building or
- 12 other enclosure) provide additional NEMA 4X stainless steel non-fused disconnect
- 13 for each pump within site of pump location.
- 14 E. Pump Alternator: A solid-state alternator shall be provided to change the pump starting
- 15 sequence on each pumping cycle. A 3-position alternator test switch shall be provided to
- 16 control the alternation operation. Switch positions to include the "auto" to provide
- 17 normal automatic sequence, "off" position to disable alternator, and "test" position with a
- 18 spring return to allow the alternating of the pump sequence to check alternator operation.
- 19 F. Lights and Alarms
- 20 1. Indicator Lights: There shall be installed on the face of the dead front inner door,
- 21 heavy-duty oil tight indicator lights as shown on the STANDARD DRAWINGS.
- 22 2. High Level Alarm: A vapor-proof red light shall be mounted on top of the panel and
- 23 horn shall be mounted on the side of the panel for high level alarm. Also, there shall
- 24 be an alarm silence pushbutton on the dead front inner door and a silence relay which
- 25 will silence the horn and automatically reset when these signals are restored to
- 26 normal. The pushbutton shall be heavy-duty oil tight. The red globe shall be the
- 27 screw on type.
- 28 G. Emergency Power Receptacle: This item shall be required on all stations up to and
- 29 including 200-ampere main service as approved in Appendix D "List of Approved
- 30 Products."
- 31 H. Additional Control Panel Requirements
- 32 1. Wiring
- 33 a. All power wires shall be THW or THWN 75°C insulated stranded copper
- 34 conductors and shall be appropriately sized for the given load application. All
- 35 control circuit wire shall be type THW/THWN stranded. All wiring within the
- 36 enclosure shall be neatly routed by the use of slotted type wiring duct with snap
- 37 on type covers.
- 38 b. Interior wiring shall be neatly bundled with nylon ties and include sufficient loop
- 39 across the hinges to prevent wire damage, with each end of conductor marked
- 40 (ID), color: red, 24 volt; white, neutral; black, 120 volt.

- 1 2. Terminal Points: Terminal points of all terminal strips shall be permanently
2 identified. All terminal numbers and identifying nomenclature shall correspond to
3 and be shown on electrical diagrams. All wiring shall be permanently identified with
4 heat shrink preprinted labels and be shown on electrical schematic diagrams.
- 5 3. Engraved and/or etched Nameplates: All equipment enclosures, circuit breakers,
6 control switches, indicator pilot lights and other control devices shall be identified
7 with permanently affixed legend plates and lamicoïd type engraved nameplates where
8 applicable. Nameplates may also be permanently etched into dead front cover of
9 control panel.
- 10 4. Surge Protective Device (SPD) A surge protective device shall be included and wired
11 to protect motors and control equipment from lightning induced line surges. All surge
12 protectors shall be UL approved and installed per respective power company
13 requirements and manufacturer's specifications. TVSS shall be connected to a
14 dedicated circuit breaker located within the pump control panel. and be mounted in a
15 separate NEMA 4X enclosure. SPD circuit breaker shall be sized per manufactures
16 recommendation. On larger 480 volt stations with MCC construction, a SPD shall be
17 installed on the MCC or Main Control Panel as applicable. If a transformer and
18 120/240 volt panel is installed, a second SPD shall be included for the low voltage
19 (120/240 volt) panel.
 - 20 a. The TVSS unit shall be UL listed and labeled as per UL 1449 Current edition.
 - 21 b. The unit shall meet "Testing Requirements" of IEEE 62.41 and 62.45.
- 22 5. Elapsed Time Meters: Elapsed time meters shall be 115 volt not reset type and shall
23 totalize pump running time in hours and tenths of hours to 99999.9 hours.
- 24 6. Convenience Receptacle: On the face of the dead front inner door unit, there shall be
25 installed a 20-ampere 120 volt, duplex convenience receptacle. It shall be provided
26 with its own single pole, 20-ampere circuit breaker for protection. Ground fault
27 interrupt type shall be required.
- 28 7. SCADA Circuit Breaker: A 20A-1P, 120-VAC circuit shall be provided for
29 connection to SCADA equipment provided for the pump station.
- 30 8. Control Terminal Blocks: Control terminal blocks shall be of the clamp screw type,
31 rated for 600 volts. Amperage rating shall accommodate the control circuit
32 amperage. An additional 30-space terminal strip shall be installed in the cabinet for
33 future use, with RTU equipment.
- 34 9. Control Power Transformers
 - 35 a. On 480 volt control panels, there shall be a control 480/120 volt power
36 transformer with a minimum size of 2.52 KVA to provide 120-VAC power for:
37 coils for starters, 20-ampere duplex receptacle, indicator pilot lights, alarm horn,
38 alarm light, pump alternator, elapsed time meters, SCADA control panel, etc.
39 The secondary side shall have 1 leg fused and the other grounded.
 - 40 b. A 120/24-VAC 75 VA control power transformer shall provide power for float
41 switches.
- 42 10. Control Relay: The level control relays shall operate from 24-VAC. They shall be
43 enclosed, plug in 8-pin type with octal style screw terminal sockets.
- 44 11. Electrical Schematic: There shall be permanently affixed to the interior side of the
45 exterior enclosure door an electrical schematic diagram and a copy supplied to
46 County personnel at start up. The schematic shall be laminated and include the rated
47 amperage and voltage for all components.

- 1 12. Phase Monitor: For all 240-volt stations an 8-pin plug in type phase monitor shall be
2 provided for protection of electrical components due to phase loss. Adequate dummy
3 pin protection shall be provided to prevent accidental interchanging of the 8-pin phase
4 monitor with the 8-pin alternator. All 480-volt stations shall have surface mount type
5 phase monitors. An approved breaker shall provide phase monitor protection. Fuses
6 shall not be used for phase monitor protection.
- 7 13. Panel Support: Main support posts shall be minimum 3-inch, schedule 40, Type 316
8 stainless steel with Type 316 stainless steel cap. All other control panel support
9 brackets and hardware shall be Type 316 stainless steel. Hardware shall include U-
10 channel strut systems, brackets, nuts, bolts, washers, toggle bolts, clamps, straps, etc.

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

12 **END OF SECTION**

1 1.03 SUBMITTALS

2 A. Materials and Shop Drawings

3 1. Submit Shop Drawings and piping layouts, including areas within and under
4 buildings and structures. Shop Drawings shall include dimensioning, methods and
5 locations of supports and all other pertinent technical specifications. Show locations
6 of all field cuts. Shop Drawings shall be prepared by the pipe manufacturer. Shop
7 Drawings for piping within and under buildings and structures shall be submitted
8 within 30-days of Execution of Contract.

9 B. Operating Instructions: Submit Operation and Maintenance Manuals in accordance with
10 Section 01001 "General Work Requirements."

11 C. Manufacturer's Certification

12 1. Submit manufacturer's sworn certification of factory tests and test results.

13 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

14 The Contractor shall be responsible for all materials furnished and stored until the date of
15 project completion. The Contractor shall replace, at his expense, all materials found to be
16 defective or damaged in handling or storage. The Contractor shall, if requested by the
17 County, furnish certificates, affidavits of compliance, test reports, samples or check analysis
18 for any of the materials specified herein. All pipe delivered to project site for installation is
19 subject to random testing for compliance with the designated specifications.

20 A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with
21 the manufacturer's recommendations. Stored pipe shall be covered for protection against
22 contamination and UV light. Joint gaskets shall be stored in clean, dark and dry location
23 until immediately before use.

24 B. Handling: Care shall be taken in loading, transporting and unloading to prevent damage
25 to the pipe and fittings and their respective coatings. Pipe or fittings shall not be rolled
26 off the carrier or dropped. Pipe shall be unloaded by lifting with a forklift or crane. All
27 pipe or fittings shall be examined before installation and no piece shall be installed which
28 is found to be defective. Pipe shall be handled to prevent damage to the pipe or coating.
29 Accidental damage to pipe or coating shall be repaired to the satisfaction of the County or
30 be removed from the job. When not being handled, the pipe shall be supported on timber
31 cradles or on level ground, graded to eliminate all rock points and to provide uniform
32 support along the full pipe length. When being transported, the pipe shall be supported at
33 all times in a manner which will not permit distortion or damage to the lining or coating.
34 Any unit of pipe that, in the opinion of the County, is damaged beyond repair by the
35 Contractor shall be removed from the site.

1 **PART 2 - PRODUCTS**

2 2.01 MATERIALS

3 A. Ductile Iron Pipe

4 1. Standards: ANSI A-21.50, AWWA C150 and ANSI A-21.51, AWWA C151

5 2. Thickness/Pressure Class:

6 a. Below ground piping: Class 350 (4-inch to 12-inch), Class 250 (16-inch to 24-

7 inch) and Class 200 (30-inch to 64-inch) unless otherwise noted or specified.

8 b. Above ground piping: Flanged, Class 350 (minimum) unless otherwise noted or

9 specified.

10 3. Joints

11 a. Push-on or Mechanical Joints (below ground piping)

12 (1) Standards: ANSI A21.11, AWWA C111

13 (2) Class: 350-psi working pressure rating

14 (3) Gaskets

15 (a) Potable and Reclaimed Water Service: Styrene Butadiene Rubber (SBR)

16 ring type.

17 (b) Wastewater Service: Neoprene rubber ring type.

18 b. Flanged (above ground or inside below ground vaults)

19 (1) Standards: ANSI A21.15, ANSI B16.1

20 (2) Class: 125-pound factory applied screwed long hub flanges, plain faced

21 without projection.

22 (3) Gaskets

23 (a) Spans less than 10-feet: full-face 1/8-inch thick neoprene rubber

24 (b) Spans greater than 10-feet: Toruseal gaskets as manufactured by American

25 Cast Iron Pipe or acceptable equal.

26 c. Restrained Joints

27 (1) Manufacturers: Lok-Ring system (all sizes) or locking type gasket systems

28 (for 16-inch diameter and smaller) as manufactured by American Ductile Iron

29 Pipe; MEGALUG System as manufactured by EBBA Iron; or acceptable

30 equal.

31 (2) Class: 250-psi minimum design pressure rating.

32 (3) Standard mechanical joint retainer glands shall not be acceptable.

33 d. Joint Accessories

34 (1) Mechanical joint bolts, washers and nuts: Ductile iron or Corten steel.

35 (2) Flanged joint bolts, washers and nuts: 316 stainless steel with bolts and nuts

36 conforming to ASTM A193 Grade B8M.

37 e. Pipe Length (below ground installation): 20-foot maximum nominal length.

38 4. Pipe Identification

39 a. Each length of pipe shall bear the name or trademark of the manufacturer, the

40 location of the manufacturing plant, and the class or strength classification of the

41 pipe. The markings shall be plainly visible on the pipe barrel. Pipe which is not

42 clearly marked is subject to rejection. The Contractor shall remove all rejected

43 pipe from the project site within five NORMAL WORKING DAYS.

1 B. Fittings

- 2 1. Ductile iron fittings 4-inch through 24-inch shall be pressure rated at 350-psi
3 minimum, except flanged joint type fittings which shall be rated at 250-psi minimum.
4 All 30-inch and larger fittings shall be pressure rated to 250-psi minimum. All
5 fittings shall conform to either ANSI/AWWA C110/A21.10 and/or C153/A21.53,
6 latest revision, and shall be ductile iron only. All fittings shall be cast and machined
7 allowing the bolt holes to straddle the vertical centerline. All fittings shall be
8 designed to be capable to withstand, without bursting, hydrostatic tests of three times
9 the rated water working pressure. All fittings shall have a date code cast (not printed
10 or labeled) with identification of date, factory, and the factory unit from which it was
11 cast and machined. Fittings shall have the pressure rating, nominal diameter of
12 openings, manufacturer's name, and the country where cast and number of degrees or
13 fraction of the circle distinctly cast on them. Ductile iron fittings shall have the letter
14 "DI" or "Ductile" cast on them.
- 15 2. Joints shall be as described for ductile iron pipe for above ground/exposed and buried
16 service.
- 17 3. All potable water main fittings shall have NSF 61 certification, and ISO 9001
18 certification for both the foundry and manufacturer. The NSF 61 certification shall be
19 issued on all coatings and linings, from the said manufacturers that are used for
20 potable water applications.

21 2.02 COATINGS, LININGS AND IDENTIFICATION MARKINGS

22 A. Exterior Coatings

- 23 1. Below ground/buried or in a casing pipe:
- 24 a. Type: Asphaltic coating, 1.0-mil DFT in accordance with ANSI/AWWA
25 A21.51/C151.
- 26 b. Markings: (continuous 3-inch wide strip within top 90 degrees of pipe - min.
27 drying time 30-minutes before backfill).
- 28 c. Color:
- 29 (1) Raw Wastewater: Safety Green
30 (2) Reclaimed Water: Purple (Pantone 522C)
31 (3) Potable Water: Safety Blue
- 32 2. Above ground/Exposed/In vaults
- 33 a. Coatings and coating testing for ductile iron pipe and fittings for above
34 ground/exposed applications shall be accordance with Division 9. Primer,
35 intermediate and final coats whether shop or field applied shall be compatible and
36 applied in accordance with the coating system manufacturer's recommendations.
37 Refer to Appendix D "List of Approved Products" for approved coating system
38 suppliers. Asphaltic seal coat applied to the exterior of above ground piping and
39 fittings shall be blasted and completely removed prior to coating per NACE-
40 3/SSPC-SP6 commercial blast cleaning minimum angular anchor profile of 1.5-
41 mils.

- 1 b. Color
- 2 (1) Raw Wastewater: Safety Green
- 3 (2) Reclaimed Water: Purple (Pantone 522C)
- 4 (3) Potable Water: Safety Blue
- 5 3. Inside Wetwell
- 6 a. All piping inside of wastewater wetwell shall be 316 stainless steel.
- 7 B. Interior Lining (Applied by pipe manufacturer)
- 8 1. Wastewater: Interior coating shall be Protecto 401 (amine cured novalac epoxy
- 9 containing at least 20% by volume of ceramic quartz pigment) for all pipe and
- 10 fittings. All ductile iron pipe and fittings shall be delivered to the manufacturer
- 11 certified applicator without asphalt, cement lining, or any other lining on the interior
- 12 surface and no coating shall have been applied to the first 6-inches of the exterior of
- 13 the DIP spigot ends. Minimum surface preparation shall be SSPC-SP 1 Solvent
- 14 Cleaning method to remove oil and grease followed by NACE-4 / SSPC-SP7 Brush-
- 15 Off Blast Cleaning. Protecto 401 shall be applied within 12-hours of surface
- 16 preparation to the interior of the pipe and fittings so as to obtain a continuous and
- 17 relatively uniform and smooth integral lining with a total minimum dry film thickness
- 18 of 40-mils for the complete system. No lining shall take place when the substrate or
- 19 ambient temperature is below 40°F. The lining shall not be used on the face of the
- 20 flange of fittings or flanged pipe. The system shall be holiday free and holiday
- 21 testing (minimum 2000 volts) shall be conducted and pinholes shall be repaired prior
- 22 to shipping.
- 23 2. Potable Water and Reclaimed Water: Interior coating shall be fusion-bonded epoxy
- 24 (FBE) or Cement Mortar lined with asphaltic seal coat.
- 25 a. FBE for Fittings: Fittings shall be supplied with a FBE coating, both inside and
- 26 outside for total protection including flanged and buried fittings. The exterior of
- 27 flanged fittings for above ground assemblies shall adhere to final exterior coating
- 28 requirements per 3119 2.04 A. The FBE coating system shall meet or exceed
- 29 ANSI/AWWA C-550 and C116/A21.116 requirements and shall have NSF 61
- 30 certification. FBE coating thickness shall be 6 to 8-mils dry film thickness, shall
- 31 be applied for secure adhesion, shall have a smooth surface and shall be holiday
- 32 free.
- 33 b. Cement mortar lining with a seal coat of asphaltic material shall be in accordance
- 34 with ANSI/AWWA A21.4/C104.
- 35 C. Polyethylene Encasement is required when pipe is within 10-feet of a gas main or as
- 36 indicated on the Drawings:
- 37 1. Standard: ANSI A 21.5/AWWA C105, 8-mil minimum thickness.

1 2.03 LOCATION MARKERS AND LOCATION WIRE

2 A. Electronic Markers and Locator System (for reclaimed water and wastewater ONLY)

- 3 1. Markers: Markers shall consist of a passive device capable of reflecting a specifically
4 designated repulse frequency tuned to the utility (service) being installed. Markers
5 shall be color coded in accordance with American Public Works Association's
6 "Utility Locating and Coordinating Council Standards." Colors shall be: Wastewater
7 and Reclaimed Water - #1404 Green. Markers shall be full range. Markers shall be
8 installed directly above the centerline of the respective pipeline at intervals not to
9 exceed 100-feet, at each fitting (tees, wyes, crosses, reducers, plugs, caps and bends)
10 or change in horizontal direction and at each valve along the pipeline. Markers shall
11 be hand backfilled to 1-foot above the pad and have a finished depth of burial of not
12 less than 2-feet or more than 6-feet. No separate payment shall be made for
13 furnishing and installing the respective frequency and color-coded electronic pad type
14 marker.
- 15 2. Locator System: Marker locator set shall be the Scotch Mark EM II Electronic
16 Marker Locator Path Tracing Receiver, or acceptable equal. The Contractor shall
17 furnish 1-locator set for each type of service piping installed on the project (i.e.:
18 reclaimed water, wastewater) to the County. Each unit shall incorporate the
19 following features and accessories:
- 20 a. Unit(s) shall be tuned to the proper frequency for each type (service) of piping.
 - 21 b. Field strength meter that provides visual indication of the return signal.
 - 22 c. Function switch for selection of operation mode.
 - 23 d. Sensitivity control to adjust the receiver gain.
 - 24 e. Audio speaker for signal response.
 - 25 f. Battery access panel containing condensed operating instructions.
 - 26 g. Auxiliary headset and heads set jack.
 - 27 h. Permanently attached shoulder straps.
 - 28 i. Rugged shockproof and weatherproof storage/carrying case.
- 29 3. Manufacturer: System shall be Scotch Mark Locator System, or acceptable equal.

30 B. Location Detection Wire

- 31 1. Materials: Continuous, insulated 10-gauge copper wire (color to match pipe
32 identification).
- 33 2. Installation: Directly above (1-inch maximum) centerline of pipe terminating at top of
34 each valve box collar and be capable of extending 12-inches above top of box (stored
35 inside the 2-inch brass pipe through the valve box collar) in a manner so as not to
36 interfere with valve operation. For direction drilling installations, a minimum of 2
37 (two) 10-gauge wires shall be pulled along with the pipe.
- 38 3. Continuity: Continuity of wire to be tested using Metrotech 810/9860 or acceptable
39 equal.

1 **PART 3 - EXECUTION**

2 3.01 **INSTALLATION**

3 A. Ductile iron pipes shall be installed in accordance with AWWA C600 and AWWA
4 Manual M-42. When a restraining type gasket is used, the bell shall be painted red.

5 B. Underground Ductile Iron Pipe and Fittings.

6 1. Bedding firm, dry and even bearing of suitable material. Blocking under the pipe will
7 not be permitted.

8 2. Placement

9 a. Alignment: In accordance with lines and grades shown on the Drawings.
10 Deflection of joints shall not exceed 75% of the values recommended by the pipe
11 manufacturer.

12 b. The Contractor shall provide line and grade stakes at a 100-foot maximum
13 spacing and at all line and/or grade change locations. The Contractor shall
14 provide temporary benchmarks at a maximum of 1,000-foot intervals. The
15 minimum pipe cover shall be 30-inches below the finished grade surface or 30-
16 inches below the elevation of the edge of pavement of the road surface whichever
17 is greater.

18 c. All pipe and fittings shall be inspected prior to lowering into trench to insure no
19 cracked, broken or otherwise defective materials are being used. All homing
20 marks shall be checked for the proper length so as to not allow a separation or
21 over homing of connected pipe. Homing marks incorrectly marked greater than
22 1-inch shall result in rejection of pipe and removal from site. The Contractor
23 shall clean ends of pipe thoroughly and remove foreign matter and dirt from
24 inside of pipe and keep clean during and after installation.

25 d. Proper implements, tools and facilities shall be used for the safe and proper
26 protection of the Work. Pipe shall be lowered into the trench in such a manner as
27 to avoid any physical damage to the pipe. Pipe shall not be dropped or dumped
28 into trenches under any circumstances.

29 e. Trench Dewatering and Drainage Control: Contractor shall prevent water from
30 entering trench during excavation and pipe-laying operations to the extent
31 required to properly grade the bottom of the trench and allow for proper
32 compaction of the backfill. Pipe shall not be laid in water.

33 f. Pipe Laying in Trench: Dirt or other foreign material shall be prevented from
34 entering the pipe or pipe joint during handling or laying operations and any pipe
35 or fitting that has been installed with dirt or foreign material in it shall be
36 removed, cleaned and re-laid. Pigging of pipe may be used to remove foreign
37 materials in lieu of flushing. At times when pipe installation is not in progress,
38 the open ends of the pipe shall be closed by a watertight plug or by other means
39 approved by the County to ensure absolute cleanliness inside the pipe. The pipe
40 shall be installed with the color stripe and pipe text on the top of pipe.

1 **SECTION 15064**

2 **POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

5 A. Scope of Work: Furnish all labor, materials, equipment and incidentals required and
6 install and test all polyvinyl chloride (PVC) piping, fittings and appurtenances as shown
7 on the Drawings and specified herein.

8 B. General Design: The equipment and materials specified herein are intended to be
9 standard types of PVC pipe and ductile iron fittings for use in transporting wastewater,
10 reclaimed water, and water.

11 1.02 QUALITY ASSURANCE

12 A. Qualifications: All of the PVC pipe and ductile iron fittings shall be furnished by
13 manufacturers who are fully experienced, reputable, and qualified in the manufacture of
14 the materials to be furnished. The pipe and fittings shall be designed, constructed,
15 installed in accordance with the best practices and methods and shall comply with these
16 specifications as applicable.

17 B. Standards:

- 18 1. AWWA C900/C905
19 2. ASTM D1784 / D1785 / D2241 / D2466 / D2564 / D2729 / D2774 / D3034 / D3139 /
20 D3212
21 3. NSF 14
22 4. UNI-B-1 through 5

23 C. Factory Tests: The manufacturer shall perform the factory tests described in Section 3 -
24 AWWA C900/C905.

25 D. Quality Control:

- 26 1. The manufacturer shall establish the necessary quality control and inspection practice
27 to ensure compliance with the referenced standards.
28 2. In addition to the manufacturer's quality control procedures, the County may select an
29 independent testing laboratory to inspect the material at the production facility for
30 compliance with these specifications. The County will pay for the cost of facility
31 inspection requested by the County.

1 1.03 SHOP DRAWINGS AND SUBMITTALS

2 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
3 to construction in accordance with the General Conditions and specifications Section
4 01300 "Submittals."

5 B. Materials and Shop Drawings

6 C. Manufacturer's Certification

7 1. Submit sworn certification of factory tests and their results.

8 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

9 A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with
10 the manufacturer's recommendations. PVC pipe shall be covered with black plastic with
11 a minimum thickness of 15-mil. Joint gaskets shall be stored in a clean, dark and dry
12 location until use.

13 B. Handling: Care shall be taken in loading, transporting and unloading to prevent damage
14 to the pipe or fittings and their respective coatings. Pipe or fittings shall not be rolled off
15 the carrier or dropped. Pipe shall be unloaded by lifting with a forklift or crane. All pipe
16 or fittings shall be examined before installation and no piece shall be installed which is
17 found to be defective. Pipe shall be handled to prevent damage to the pipe or coating.
18 Accidental damage to pipe or coating shall be repaired to the satisfaction of County or it
19 shall be removed from the job. When not being handled, the pipe shall be supported on
20 timber cradles or on level ground, graded to eliminate all rock points and to provide
21 uniform support along the full pipe length. When being transported, the pipe shall be
22 supported at all times in a manner to prevent distortion or damage to the lining or coating.
23 Any unit of pipe that, in the opinion of the County, is damaged beyond repair by the
24 Contractor shall be removed from the site.

25 C. The Contractor shall be responsible for all materials furnished and stored until the date of
26 project completion. The Contractor shall replace, at his expense, all materials found to be
27 defective or damaged in handling or storage. The Contractor shall, if requested by the
28 County, furnish certificates, affidavits of compliance, test reports, samples or check
29 analysis for any of the materials specified herein. All pipe delivered to project site for
30 installation is subject to random testing for compliance with the designated specifications.

31 **PART 2 - PRODUCTS**

32 2.01 GENERAL

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

1 2.02 MATERIALS

2 A. Polyvinyl Chloride (PVC) Pipe

- 3 1. Standards: AWWA C900/C905 and ASTM D1784/D3034/F679 (Gravity Sewer)
- 4 2. Compounds: Class 12454-A or Class 12454-B
- 5 3. PVC Gravity Pipe and Fittings: PVC gravity pipe (6-inch to 15-inch), shall conform
- 6 to ASTM D3034, maximum SDR 35. PVC gravity pipe (18-inch to 36-inch), shall
- 7 conform to ASTM F679 and uniform minimum "pipe stiffness" at 5% (percent)
- 8 deflection shall be 46-psi. The joints shall be integral bell elastomeric gasket joints
- 9 manufactured in accordance with ASTM D3212 and ASTM F477. Applicable UNI
- 10 Bell Plastic Pipe Association standard is UNI B.
- 11 4. PVC Pressure Pipe and Fittings: All PVC pipe of nominal diameter 4 to 12-inches
- 12 shall be manufactured in accordance with AWWA Standard C900 and greater than
- 13 12-inches shall be manufactured in accordance with AWWA Standard C905. The
- 14 PVC pipe shall have a minimum working pressure rating of 100-psi and shall have a
- 15 maximum dimension ratio of 18. Pipe shall be the same outside diameter as ductile
- 16 iron pipe.
- 17 5. Dimension Ratio/Thickness: (unless otherwise shown on the Drawings)
- 18 a. Raw Wastewater:
- 19 (1) Pressure Systems: DR 18
- 20 (2) Gravity Systems: DR 35 (ASTM D3034) or PS 46 (ASTM F679)
- 21 b. Treated Wastewater: DR 18
- 22 c. Reclaimed Water: DR 18
- 23 d. Raw Water: DR 18
- 24 e. Potable Water: DR 18
- 25 f. Irrigation Piping: Schedule 40 or SDR 21
- 26 6. Joints:
- 27 a. Push-on integral bell elastomeric gasket joints:
- 28 (1) Standards: ASTM D3212/D3139/F477 and UNI-B-1
- 29 (2) Gaskets:
- 30 (a) Potable and Reclaimed Water Service: Styrene Butadiene Rubber (SBR)
- 31 rieber type.
- 32 Wastewater Service: Styrene Butadiene Rubber (SBR) rieber type for C900 / C905
- 33 pipe. Styrene Butadiene Rubber (SBR) ring type for gravity systems.
- 34 (b)
- 35 (3) Pipe Markings: Pipes shall have a manufacturer's home-mark on the spigot.
- 36 On field cut pipe, the Contractor shall provide home-mark on the spigot in
- 37 accordance with manufacturer's recommendations.
- 38 b. Solvent weld (nominal diameter less than 4-inches):
- 39 (1) Standards: ASTM D2466/D2564
- 40 (2) Type: Slip Fitting Socket (tapered)
- 41 (3) Exclusions: Plastic saddle and flange joints will not be used.

- 1 c. Restrained Joints:
2 (1) Restrained joint devices shall be made specifically for PVC pipe and meet or
3 exceed the requirements in ASTM F-1674.
4 (2) Manufacturers: Uni-flange mechanical joint restraints and bell restraints (for
5 all sizes); Meg-a-lug system as manufactured by EBBA Iron (sizes 12-inches
6 or less), or acceptable equal.
7 (3) Design pressure rating equal to or above test pressure as specified herein.
8 d. Pipe Length:
9 (1) Pressure systems: 20-foot maximum nominal length
10 (2) Gravity systems: 13-foot minimum nominal length

11 B. Fittings - Pressure Systems (nominal diameter 4-inches and greater):

- 12 1. Materials: Ductile iron
13 2. Joints: Mechanical Joint, Minimum 350-psi pressure rating
14 3. Gaskets:
15 a. Water and Reclaimed Water Service: Styrene Butadiene Rubber (SBR) ring type
16 b. Wastewater Service: Neoprene rubber ring type
17 4. Exclusions: Standard double bell couplings will not be acceptable where the pipe will
18 slip completely through the coupling.
19 5. All fittings shall conform to either ANSI/AWWA C110/A21.10 and/or C153/A21.53,
20 latest revision, and shall be ductile iron.
21 6. All fittings shall have a date code cast (not printed or labeled), with identification of
22 the date, factory and unit at which it was cast and machined. Fittings shall have
23 distinctly cast on them the pressure rating, nominal diameter of openings,
24 manufacturer's name, the country where cast, and deflection angle. Ductile iron
25 fittings shall have the letters "DI" or "Ductile" cast on them.
26 7. All potable water main fittings shall have NSF certification and ISO 9001
27 certification for both the foundry and manufacturer. The NSF 61 certification shall be
28 issued on all coatings and linings, from the said manufacturers that are used for
29 potable water applications.
30 8. All ductile iron fittings shall have exterior coatings, including markings and colors, and
31 interior linings in conformance with Section 15062 "Ductile Iron Pipe and Fittings."

32 C. Fittings - Pressure Systems (nominal diameter less than 4-inches)

- 33 1. Material: Polyvinyl Chloride (PVC)
34 2. Joints: Slip fitting tapered socket with solvent weld
35 3. Solvent: Sure Guard 12 or acceptable equal
36 4. Exclusions: Plastic saddle and flange joint fittings shall not be used

1 2.03 LOCATION MARKERS, LOCATION WIRE AND IDENTIFICATION MARKINGS

2 A. Electronic Markers and Locator System (for reclaimed water and wastewater ONLY)

3 1. Markers: Markers shall consist of a passive device capable of reflecting a specifically
4 designated repulse frequency tuned to the utility (service) being installed. Markers
5 shall be color coded in accordance with the American Public Works Association's
6 "Utility Locating and Coordinating Council Standards." Colors shall be: Wastewater
7 and Reclaimed Water - #1404 Green. Markers shall be full range. Markers shall be
8 installed directly above the centerline of the respective pipeline at intervals not to
9 exceed 100-feet, at each fitting (tees, wyes, crosses, reducers, plugs, caps and bends)
10 or change in horizontal direction and at each valve along the pipeline. Markers shall
11 be hand backfilled to 1-foot above the pad and have a finished depth of burial of not
12 less than 2-feet or more than 6-feet. No separate payment shall be made for
13 furnishing and installing the respective frequency and color-coded electronic pad type
14 marker.

15 2. Locator System: Marker locator set shall be the 3M Dynatel 1420 or 3M Dynatel
16 1420E Electronic Marker System Marker Locator, or acceptable equal. The
17 Contractor shall furnish 1 locator set for each type of service piping installed on the
18 Project (i.e.: reclaimed water, wastewater.) to the County. Each unit shall incorporate
19 the following features and accessories:

- 20 a. Unit(s) shall be tuned to the proper frequency for each type (service) of piping.
- 21 b. Field strength meter that provides visual indication of the return signal
- 22 c. Function switch for selection of operation mode
- 23 d. Sensitivity control to adjust the receiver gain
- 24 e. Audio speaker for signal response
- 25 f. Battery access panel containing condensed operating instructions
- 26 g. Auxiliary headset and heads set jack
- 27 h. Permanently attached shoulder straps
- 28 i. Rugged shockproof and weatherproof storage/carrying case

29 3. Manufacturer: System shall be Scotch Mark Locator System, or acceptable equal.

30 B. Location Detection Wire

31 1. Materials: Continuous, insulated 10-gauge copper wire (color to match pipe
32 identification).

33 2. Installation: Directly above (1-inch maximum) centerline of pipe terminating at top of
34 each valve box collar and be capable of extending 18-inches above top of box (stored
35 inside the 2-inch brass pipe through the valve box collar) in a manner so as not to
36 interfere with valve operation. For direction drilling installations, a minimum of 2
37 (two) 10-gauge wires shall be pulled along with the pipe.

38 C. Identification Markings:

- 39 1. Pipe furnished in solid color or white with color lettering as indicated below.
 - 40 a. Lettering along top 90° (degrees) of pipe, minimum 3/4-inch in height with
 - 41 appropriate wording appearing 1 or more times every 21-inches along the entire
 - 42 length of the pipeline.

- 1 (1) Raw Wastewater: Safety Green
- 2 (2) Reclaimed Water: Purple (Pantone 522C)
- 3 (3) Potable Water: Safety Blue

4 **PART 3 - EXECUTION**

5 3.01 INSTALLATION

6 A. Standards: AWWA C900/C905/UNI-B 3 and 4

7 B. Underground Polyvinyl Chloride (PVC) Pipe and Fittings

8 1. Bedding: Firm, dry and even bearing of suitable material. Blocking under the pipe
9 will not be permitted.

10 2. Placement/Alignment:

11 a. Installation shall be in accordance with lines and grades shown on the Drawings.
12 For pressure systems, deflection of joints shall not exceed 75% of that
13 recommended by the manufacturer.

14 b. All pipe and fittings shall be inspected prior to lowering into trench to insure no
15 cracked, broken or otherwise defective materials are being used. All homing
16 marks shall be checked for the proper length so as to not allow a separation or
17 over homing of connected pipe. Homing marks incorrectly marked on pipe shall
18 result in rejection of pipe and removal from site. The Contractor shall clean ends
19 of pipe thoroughly and remove foreign matter and dirt from inside of pipe and
20 keep clean during and after installation.

21 c. Proper implements, tools and facilities shall be used for the safe and proper
22 protection of the Work. Pipe shall be lowered into the trench in such a manner as
23 to avoid any physical damage to the pipe. Pipe shall not be dropped or dumped
24 into trenches under any circumstances.

25 d. Trench Dewatering and Drainage Control: Contractor shall prevent water from
26 entering trench during excavation and pipe laying operations to the extent
27 required to properly grade the bottom of the trench and allow for proper
28 compaction of the backfill. Pipe shall not be laid in water.

29 e. Pipe Laying in Trench: Dirt or other foreign material shall be prevented from
30 entering the pipe or pipe joint during handling or laying operations and any pipe
31 or fitting that has been installed with dirt or foreign material in it shall be
32 removed, cleaned and re-laid. Pigging of pipe may be used to remove foreign
33 materials in lieu of flushing. At times when pipe installation is not in progress,
34 the open ends of the pipe shall be closed by a watertight plug or by other means
35 approved by the County to ensure absolute cleanliness inside the pipe. The color
36 stripe and pipe text shall be viewed from the top of pipe when installed. When
37 installing PVC pipe, no additional joints will be installed until the preceding pipe
38 joint has been completed and the pipe carefully embedded and secured in place.

- 1 f. Locating Wire: Locating wire, for electronically locating pipe after it is buried, or
2 installed by trenchless technology shall be attached along the length of and
3 installed with the pipe. This is applicable to all sizes and types of pressure mains.
4 At a minimum, the tracing wire is to be attached to the pipe with nylon wire ties.
5 The wire itself shall be 10-gauge single strand solid core copper wire with non-
6 metallic insulation. The insulation shall be color coded for the type of pipe being
7 installed. Continuous continuity must be maintained in the wire along the entire
8 length of the pipe run. Permanent splices must be made in the length of the wire
9 using wire connectors approved for underground applications as listed in the
10 uniform electric code handbook. The coiled wire shall extend to a minimum of
11 12-inches above the surface and be connected to a test station box at valve
12 locations.
- 13 g. PVC Pressure Pipe Installation and Training: PVC pipe shall be installed in
14 accordance with standards set forth in the UNI-BELL "Handbook of PVC Pipe",
15 AWWA C605, and AWWA Manual M-23. The pipe shall be laid by inserting the
16 spigot end into the bell flush with the insertion line or as recommended by the
17 manufacturer. At no time shall the bell spigot end be allowed to go past the
18 "insertion line" or "homing mark" for pressure pipe applications and homing mark
19 shall be visible.
- 20 h. Field Cutting: PVC pipe can be cut with a handsaw or power driven abrasive disc
21 making a square cut. The end shall be beveled with a beveling tool, wood rasp or
22 power sander to the same angle as provided on the factory-finished pipe. The
23 insertion line on the spigot shall be remarked to the same dimensions as the
24 factory-marked spigot.
- 25 i. All Contractor pipe crews utilizing PVC pressure pipe shall be trained on an
26 annual basis by Uni-Bell in coordination with the County and attended by the
27 manufacturer's representative of the respective approved Manufacturers in
28 Appendix D "List of Approved Products." The Uni-Bell PVC training session
29 will consist of proper handling, storage, installation, and compaction as well as
30 County requirements regarding PVC pipe and deflection. Every person handling,
31 installing or backfilling PVC pipe shall not be permitted to install County owned
32 and / or maintained pipe without training.
- 33 j. Approved manufacturers representatives (Appendix D "List of Approved
34 Products"), not present at the hosted Uni-Bell training session or individuals of
35 pipe crews not in attendance shall be trained on every project site. On-site project
36 training shall be for each manufacturer of pipe utilized on-site, per crew and per
37 project. Specifically each crewmember shall be trained on every project by every
38 pipe manufactures representative regardless of previous on-site training. Every
39 person handling, installing or backfilling PVC pipe shall not be permitted to
40 install County owned and / or maintained pipe without training.
- 41 k. PVC Gravity Pipe Installation: Gravity sewer pipe shall be installed to the homing
42 mark, no tolerance. Any noticeable separation shall be removed and reinstalled.
43 The homing mark may be disregarded to meet the maximum of 1-inch separation
44 between bell and spigot requirement. Joints:

1 **SECTION 15065**

2 **STAINLESS STEEL PIPE AND FITTINGS**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

- 5 A. Scope: This section specifies stainless steel pipe and fittings.
- 6 B. Types of Service: Stainless steel piping specified in this Section shall be used for raw
- 7 sewage discharge piping in the pump station wetwell.

8 1.02 QUALITY ASSURANCE

- 9 A. References: This Section contains references to the following documents. They are a part
- 10 of this Section as specified and modified. Where a referenced document contains
- 11 references to other standards, those documents are included as references under this
- 12 Section as if referenced directly. In the event of conflict between the requirements of this
- 13 Section and those of the listed documents, the requirements of this Section shall prevail.

Reference	Title
15 ANSI B16.1	16 Cast Iron Pipe Flanges and Flanged Fittings Classes 25,
	17 125, 250, and 800
18 ANSI B16.11.80	19 Forged Steel Fittings, Socket Welding and Threaded
19 ANSI B31.1	20 Power Piping
20 ANSI B36.19M	21 Stainless Steel Pipe
21 ASME Section IX (1989)	22 Boiler and Pressure Vessel Code; Welding and Brazing
	23 Qualifications
23 ASTM A182/A182M	24 Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings,
	25 and Valves and Parts for High Temperature Service
25 ASTM A193/A193M	26 Alloy-Steel and Stainless Steel Bolting Materials for High
	27 Temperature Service
27 ASTM A194/A194M	28 Carbon and Alloy Steel Nuts for Bolts for High Pressure
	29 and High Temperature Service
29 ASTM A240	30 Heat-Resisting Chromium and Chromium Nickel Stainless
	31 Steel Plate, Sheet, and Strip for Pressure Vessels
31 ASTM A276	32 Stainless and Heat-Resisting Steel Bars and Shapes
32 ASTM A312/A312M	33 Seamless and Welded Austenitic Stainless Steel Pipes
33 ASTM A320/A320M	34 Alloy Steel Bolting Materials for Low Temperature Service
34 ASTM A403/A403M	35 Wrought Austenitic Stainless Steel Piping Fittings
35 ASTM A409/A409M	36 Welded Large Diameter Austenitic Steel Pipe for Corrosive
	or High Temperature Service

1	ASTM A480/A480M	General Requirements for Flat-Rolled Stainless and Heat-
2		Resisting Steel Plate, Sheet and Strip
3	ASTM A774/A774M	As-Welded Wrought Austenitic Stainless Steel Fittings for
4		General Corrosive Service at Low and Moderate
5		Temperatures
6	ASTM A778	Welded, Un-annealed Austenitic Stainless Steel Tubular
7		Products

8 B. Qualifications: All shop fabricated stainless steel pipe and fittings shall be furnished by a
9 single manufacturer who is experienced and qualified in the manufacture and fabrication
10 of the items to be furnished. The pipe and fittings shall be shop-fabricated and field-
11 installed in accordance with common industry wide practices and methods and shall
12 comply with these specifications. Only weld procedures which have been qualified under
13 ASME Section IX and only welders who have successfully completed performance
14 qualification tests per ASME Section IX on these qualified procedures shall be utilized.

15 C. Testing: Factory testing shall conform to the requirements of ASTM A312, ASTM A409
16 HT-0, or ASTM A778, depending on the size and type of stainless steel pipe provided.

17 1.03 SHOP DRAWINGS AND SUBMITTALS

18 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
19 to construction in accordance with the General Conditions and specifications Section
20 01300 "Submittals."

21 B. Shop fabrication drawings showing details of materials, piping, fittings, couplings,
22 dielectric connections, joint locations and details, and types and locations of supports.

23 C. Certifications specified in the following documents:

- 24 1. ASTM A403, paragraph 14.1
- 25 2. ASTM A774, paragraph 14.1
- 26 3. ASTM A778, paragraph 14.1
- 27 4. ASTM A409, paragraph 17.1

28 D. Test results as specified in this Section.

29 E. Names and qualification records of proposed welders.

30 F. Other data necessary to show conformance of the piping system to these specifications.

31 **PART 2 - PRODUCTS**

32 2.01 GENERAL

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

1 2.02 PIPE

2 A. Unless otherwise specified, stainless steel piping 3-inches and larger shall be
3 manufactured from ASTM A240 annealed and pickled sheets and plates, Type 316L, in
4 accordance with ASTM A778 or ASTM A409 HT-0. Only extra-low carbon (ELC)
5 materials with 0.030% maximum carbon shall be used. Pipe shall be manufactured to
6 nominal pipe sizes as listed in ANSI B36.19 and shall have nominal wall thickness
7 corresponding to schedule 40S.

8 2.03 FITTINGS

9 A. Unless otherwise specified, stainless steel fittings 3-inch and larger shall be butt weld
10 type manufactured in accordance with ASTM A774 of the same material and in the same
11 thicknesses as the pipe. Long radius elbows less than 24-inches in diameter shall be
12 smooth flow. All short radius, special radius, reducing, and long radius elbows 24-inches
13 and greater in diameter shall be of mitered construction. Reducers shall be straight
14 tapered cone type. Tees, crosses, laterals, and wyes shall be shop-fabricated from pipe.

15 2.04 FLANGED CONNECTIONS

16 A. Connections shall be flanged as specified in Section 15062 "Ductile Iron Pipe and
17 Fittings" and be capable of being mated to ductile iron pipe flanges or pump base elbow.

18 2.05 GASKETS

19 A. Gaskets shall be as specified in Section 15062 "Ductile Iron Pipe and Fittings."

20 2.06 BOLTS

21 A. Bolts, nuts, and washers for stainless steel flange assemblies shall be Type 316 stainless
22 steel with bolts and nuts conforming to ASTM A193 Grade B8M.

23 2.07 PIPE SUPPORT SYSTEMS

24 A. Unless otherwise specified, all hangers, rods, structural attachments, and other
25 components of support systems for stainless steel pipe shall be of the same materials as
26 the pipe.

27 2.08 FINISH

28 A. After all shop operations have been completed, pipe and fittings shall be pickled and
29 passivated in the manufacturer's plant, and scrubbed and washed until discoloration and
30 possible iron picked up from manufacturing process are removed. The standard finish for
31 16-gauge through 8-gauge material shall be No. 1 or 2B per ASTM A480; 3/16-inch and
32 heavier plate material shall be No. 1-mil finish or better per ASTM A480.

1 **PART 3 - EXECUTION**

2 3.01 PIPE CUTTING, THREADING, AND JOINTING

- 3 A. Pipe cutting, threading, and jointing shall conform to the requirements of ANSI B31.1.
4 All pipe threads shall be lubricated with Teflon tape.

5 3.02 WELDING

- 6 A. General: Piping with wall thickness up to 11-gauge (0.120-inch) shall be welded with the
7 TIG (GTAW) process. Unless otherwise specified, heavier walls shall be properly
8 beveled and have a root pass with the TIG (GTAW) process followed by subsequent
9 passes with the TIG (GTAW), MIG (GMAW), or Metallic Arc (SMAW) process. Filler
10 wire of ELC grades only shall be added to all welds to provide a cross section at the weld
11 equal to or greater than the parent metal. Weld deposit shall be smooth and evenly
12 distributed and have a crown of no more than 1/16-inch on the I.D. and 3/32-inch on the
13 O.D. of the piping. Concavity, undercut, cracks, or crevices shall not be allowed. Butt
14 welds shall have full penetration to the interior surface, and inert gas shielding shall be
15 provided to the interior and exterior of the joint. Excessive weld deposits, slag, spatter,
16 and projections shall be removed by grinding. Welds on gasket surfaces shall be ground
17 smooth.
- 18 B. Field Welding: Field welding shall be minimized to the greatest extent possible by
19 prefabrication of pipe systems at the factory. Pipe butt welds may be performed at the
20 job site providing the butt welds are performed only with an inert gas shielded process
21 and that other applicable specified welding requirements are rigidly adhered to. All
22 residue, oxide, and heat stain is to be removed from any type of field weld and the
23 affected adjacent areas by the use of stainless steel wire brushes. The field weld shall
24 then be cleaned with an agent such as Eutectic Company's "Eucleen" or equal followed
25 by complete removal of the agent.
- 26 C. Preparation of Surfaces to Be Welded: Surfaces of joints to be welded shall be free from
27 mill scale, slag, grease, oil, paint, rust, and other foreign material. Joints to be welded
28 shall be wire-brushed with stainless steel wire brushes and precisely fitted before
29 welding.
- 30 D. Weather Conditions: Welding shall be done only when the surfaces are completely free
31 of any moisture. Welding of the pipe shall not be done during periods of high winds or
32 rain unless the areas being welded are properly shielded.
- 33 E. Tack Welds, Clips, and Other Attachments: Nicks, gouges, notches, and depressions in
34 the base metal in the area of the joint shall be repaired before the joint weld is made.
35 Tack welds, clips, and other attachments shall be removed and defects repaired, except
36 where the tack welds occur within the weld area and these tack welds do not exceed the
37 size of the completed weld. Cracked tack welds shall be removed. Areas to be repaired
38 shall be ground to clean metal and then repaired by building up with weld metal. The
39 repaired areas shall be ground smooth to form a plane surface with the base metal.

1 F. Defects and Repairs: Welds with cracks, slag inclusions, porosity, undercutting,
2 incomplete penetration, or which are otherwise deficient in quality or made contrary to
3 any provisions of these specifications shall be removed by chipping or grinding
4 throughout their depth to clean base metal. Calking or peening of welds to correct
5 defects shall not be done. Welds found deficient in dimension but not in quality shall be
6 enlarged by additional welding after thoroughly cleaning the surface of previously
7 deposited metal and the adjoining plate. Weld deposits, slag, weld spatter, and
8 projections into the interior of the pipe shall be removed by grinding.

9 3.03 MARKING, SHIPPING, AND STORAGE

10 A. Pipe, fittings, and fabrications shall be properly marked with type, gauge, and heat
11 number. Fabricated piping shall have openings plugged and flanges secured for storage
12 or transport after fabrication. Fabricated piping shall be piece-marked with identifying
13 numbers or codes which correspond to the Contractor's layout and installation drawings.
14 The marks shall be located on the spools at opposite ends and 180° (degrees) apart. Pipe
15 spools shall be loaded, blocked, and lagged as necessary to ensure protection from
16 damage during shipping. Stainless steel pipe and fittings shall be stored per
17 manufacturer's recommendation. Dents, gouges, and scratches in stainless steel pipe and
18 fittings are not acceptable and are reason for rejecting pipe and fittings.

19 3.04 FABRICATION/INSTALLATION REQUIREMENTS

20 A. The piping supplier and the Contractor shall use extreme care to avoid the contact of any
21 ferrous materials with the stainless steel piping during manufacturing, fabricating,
22 handling, and installation stages. All saws, drills, files, and wire brushes shall be used for
23 stainless steel piping only. Pipe storage and fabrication racks shall be nonferrous,
24 stainless steel, or rubber-lined. Nylon slings or straps shall be used for handling stainless
25 steel piping. After installation, the Contractor shall wash and rinse all foreign matter
26 from the piping surface. All welded joints shall be treated with a pickling solution,
27 brushed with stainless steel wire brushes, and rinsed clean. If rusting of embedded iron
28 occurs, the Contractor shall pickle the affected surface with Oakite Deoxidizer SS, or
29 equal, scrub with stainless steel brushes, and rinse clean.

30 3.05 COATINGS

31 A. Painting of the stainless steel pipe is not required.
32

33 **END OF SECTION**

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- 1 2. Water and Reclaimed Water Combination Air Release Valves: The valve body shall
- 2 be 316 stainless steel, 316 stainless steel float, bronze water diffuser Buna-N or Viton
- 3 seat and stainless steel trim.
- 4 3. Fittings from the main to the air release valve shall be threaded and made of brass.

- 5 B. For Wastewater Service
- 6 1. General: Wastewater force mains shall be equipped with combination air release
- 7 valves located as shown on the Drawings. Valves shall be made to remove air at high
- 8 points where elevation change is 2-feet or greater, located in an enclosure as detailed
- 9 on the Drawings.
- 10 2. Wastewater Combination Air Release Valves: The valve body shall be conical in
- 11 shape and shall be 316 stainless steel with a funnel shape lower body to automatically
- 12 drain sewage back into the system. All internal parts shall be corrosion resistant 316
- 13 stainless steel or non-metallic plastic materials.
- 14 3. On flanged connections 316 stainless steel bolts, nuts and washers are to be used
- 15 along with the proper sized gasket.

- 16 C. Air release valves shall be installed in an enclosure.

17 2.03 TAPPING SLEEVES AND VALVES

- 18 A. General: Tapping sleeves shall be mechanical joint sleeves.

- 19 B. Mechanical Joint Sleeves: Sleeves shall be cast of gray-iron or ductile-iron and have an
- 20 outlet flange with the dimensions of the Class 125 flanges shown in ANSI B16.1 and
- 21 properly recessed for tapping valve. Glands shall be gray-iron or ductile iron. Gaskets
- 22 shall be vulcanized natural or synthetic rubber. Bolts and nuts shall comply with
- 23 ANSI/AWWA C111/ANSI A21.11. Sleeves shall be capable of withstanding a 200-psi
- 24 working pressure.

- 25 C. Fabricated Mechanical Joint Tapping Sleeves: Sleeves shall be of split mechanical joint
- 26 design with separate end and side gaskets. Sleeves shall be fabricated of high strength
- 27 steel, meeting ASTM A283 Grade C or ASTM A-36. Outlet flange shall meet AWWA
- 28 C-207, Class "D" ANSI 150-pound drilling and be properly recessed for the tapping
- 29 valve. Bolts and nuts shall be high strength low alloy steel to AWWA C111 (ANSI
- 30 A21.11). Gasket shall be vulcanized natural or synthetic rubber. Sleeve shall have
- 31 manufacturer applied fusion-bonded epoxy coating, minimum 12-mil thickness.

- 32 D. Tapping Valves: Tapping valves shall be resilient seated gate valves flange by
- 33 mechanical joint ends. Valves shall be compatible with tapping sleeves as specified
- 34 above and specifically designed for pressure connection operations.
- 35 1. Tapping valves with alignment lip shall be placed vertical where possible for Water
- 36 and Reclaimed Water.

- 1 2. Tapping Valves 16-inch and larger shall be AWWA C515 resilient seated only (16-
2 inch and 24-inch no gearing required) above 24-inch shall be installed vertically with
3 a spur gear actuator. When tapping existing mains, valves 24-inch and above shall be
4 furnished with NPT pipe plugs for flushing the tracks.

5 2.04 VALVE BOXES FOR BURIED VALVES

- 6 A. Standard 2-piece Cast Iron Valve Box: Required for mains less than 6-feet below finished
7 grade and less than or equal to 12-inches in diameter.
8 1. Valve boxes shall be provided with suitable heavy bonnets and shall extend to such
9 elevation at or slightly above the finished grade surface as directed by the County's
10 Representative.
11 2. The barrel shall be 2-piece, screw type only, having 5-1/4-inch shaft. The upper
12 section shall have a flange at the bottom having sufficient bearing area to prevent
13 settling and shall be complete with locking cast iron covers. Coat buried cast iron
14 pieces with coal tar epoxy.
- 15 B. Valve Box Assembly: Valve box assemblies with operating nut extension is required for
16 any size main that is 6-feet or greater below finished grade or if mains are greater than
17 12-inches in diameter.
18 1. Valve boxes shall be 1 complete assembled unit composed of the valve box and
19 extension stem that attaches and locks to the 2-inch wrench nut. The extension shall
20 be high strength, corrosion resistant steel construction, and permanently attached to
21 the operating nut.
22 2. The operating nut extension insert shall be 1 complete assembled unit with a self-
23 adjusting extension stem system that fits inside a standard valve box that will
24 accommodate variable trench depths 6-feet and greater as shown in the Drawings.
25 All moving parts of the extension stem shall be enclosed in a housing to prevent
26 contact with the soil.
27 3. A valve box-centering device designed to eliminate the shifting of the valve box
28 against the operating nut of the valve shall be used. Valve box assembly shall be
29 adjustable to accommodate variable trench depths 6-foot and greater as shown in the
30 Drawings.
- 31 C. The stem assembly shall be of a telescoping design that allows for variable adjustment
32 length. The material shall be at minimum galvanized square steel tubing. The stem
33 assembly shall have a built-in device that prevents the stem assembly from disengaging at
34 its fully extended length. The extension stem must be capable of surviving a torque test
35 to 1,000-foot-pounds without failure.
- 36 D. Valve boxes shall have locking cast iron covers utilizing a 5-sided nut with a special
37 wrench needed to open. Covers shall have "WATER", "SEWER", or "RECLAIMED
38 WATER" cast into the top, as applicable
- 39 E. Concrete Collar: Each valve installed in an unimproved area (outside of pavement,
40 driveways or sidewalks) shall require a 24-inch by 24-inch by 6-inch concrete pad or
41 collar as shown in the Drawings.

- 1 F. Identification Disc: Each 16-inch or larger valve (unless otherwise shown on the
2 Drawings) installed shall be identified by a 3-inch diameter bronze disc anchored in the
3 concrete pad or collar in unimproved areas and/or anchored on a 4-inch by 4-inch by 18-
4 inch long concrete post set flush with the pavement surface in improved areas. The disc
5 shall be stamped with the following information as shown on the Drawings:
6 1. Size of the valve
7 2. Type of valve
8 3. Service
9 4. Direction and number of turns to open
- 10 G. Valve markers are to be made of schedule 80 PVC and have decal applied containing
11 information as shown on the Drawings. The marker shall be the same color as the pipe
12 being marked.

13 2.05 LINE STOPPING ASSEMBLIES

- 14 A. Sleeves used to line-stop existing mains shall be provided and installed at locations as
15 shown on the Drawings. Line-stopping sleeve shall be steel fusion epoxy coated body
16 with stainless steel straps, bolts, nuts, and washers. Contractor shall determine the
17 outside diameter of the existing main prior to ordering sleeve.
- 18 B. The line-stopping equipment shall consist of a resilient sealing element, which shall be
19 attached to and transported by a plug inserter perpendicularly into the pipe. The linear
20 actuator shall extend and retract the Line-Stopper into and out of the pipe. When
21 retracted from the pipe, the element and inserter shall be contained within the stopper
22 housing.
- 23 C. The hollow cylindrical sealing element shall be molded of natural rubber. The lower
24 interior chamber of the element shall be enlarged into a hemispherical cavity to allow
25 symmetrical deformation into sealing conformity with the bore of the pipe.
- 26 D. The linear actuator shall be hydraulic and shall have a self-contained hand operated
27 pump. The actuator shall exert a force sufficient to perpendicularly deform the
28 cylindrical element into axially symmetrical sealing contact with the bore of the pipe.
29 Design of actuator shall provide adequate stroke and means to continually align the line-
30 stop bullet stopping assemblies in sizes 14-inch through 20-inch with pressure rating to
31 250-psig.
- 32 E. Equalization of pressure across the sealed element shall not be required to retract the
33 element from the pipe. No equalization fittings shall be required downstream of the line-
34 stopper.
- 35 F. The line-stopping equipment shall be accurately aligned on the 4-inch through 8-inch
36 fittings by locating in the external threads of the fitting nozzle. With sizes 10-inch and
37 12-inch the location shall be made on the centering groove of the fitting flange.
- 38 G. Line-stopping equipment must be capable of function and acceptance of multiple stopper
39 heads and shall be compatible with existing system fittings.

1 2.06 FIRE HYDRANTS AND VALVE ASSEMBLIES

- 2 A. Fire hydrants shall be 5-1/4-inch minimum valve opening and shall comply with the
3 current AWWA Standard Specifications C502-54 for 150-psi working pressure. Fire
4 hydrants shall be of ample length for 3-1/2-foot depth of bury with necessary extensions
5 to place safety flange the required 3-inches above finished grade. Each hydrant shall be
6 made in at least 2 sections bolted together. All interior working parts of the hydrant shall
7 be removable from the top of the hydrant to allow repairs without removing the hydrant
8 barrel after it has been installed. It shall be provided with 2 (two) 2-1/2-inch hose
9 nozzles and 1 (one) 4-1/2-inch pumper nozzle, all having its specific Fire District
10 Standard hose threads. All nozzles shall have caps attached by chains. Operating nuts
11 shall be AWWA Standard. Drain or weep holes shall be permanently plugged by the
12 manufacturer.
- 13 B. Fire hydrant painting and coating shall meet the requirements of Section 09900
14 "Painting." Fire hydrants shall be painted silver in accordance with the present Orange
15 County standards. Three (3) operating wrenches shall be furnished for every 10 hydrants
16 installed or relocated.
- 17 C. All hydrant assemblies shall incorporate anchoring hydrant fittings, including M.J.
18 Locked Hydrant Tee with split gland to provide the locking together of the entire
19 assembly. Gate valve shall be as specified in Specification Section 15111 "Plug Valves."
- 20 D. All hydrants shall have a 24-inch to 48-inch square by 6-inch thick reinforced concrete
21 shear pad as shown in the Drawings.
- 22 E. Fire hydrants shall be located in the general location as shown on the Drawings. Final
23 field location of all hydrants shall be as approved by the County. All hydrants shall be
24 located no less than 5 and no more than 10-feet from the edge of pavement of the
25 adjacent roadway and no less than 5-feet from any physical feature which may obstruct
26 access or view of any hydrant unless otherwise approved by the County.

27 2.07 SERVICE SADDLES

- 28 A. Stainless Steel Service Saddles: Shall be epoxy or nylon coated ductile iron body with
29 stainless steel, 18-8 type 304 straps, AWWA tapered threads for 1-inch and 2-inch to be
30 iron pipe threads. Controlled OD saddles to be used on C905 PVC pipe, double straps to
31 be 2-inch minimum width each, single strap to be minimum of 3-inches wide.
- 32 B. PVC Pipe Service Saddle
- 33 1. One-inch and 2-inch services utilize brass body saddle with controlled OD for 12-
34 inches and smaller pipe.
- 35 2. One-inch and 2-inch taps on existing pipes larger than 12-inches shall use controlled
36 OD epoxy or nylon coated ductile iron body with stainless steel 18-8 type 304 straps.
- 37 3. Four-inch or larger services shall be mechanical tapping sleeves.
- 38 C. Ductile Iron Pipe Service Saddle
- 39 1. One-inch services shall be direct tapped.

- 1 2. Two-inch service shall use a controlled OD service tapping saddle with stainless steel
- 2 straps and a ductile iron body that is either nylon or epoxy coated
- 3 3. Four-inch or larger services shall be mechanical tapping sleeves.

- 4 D. HDPE Pipe Service Saddle
- 5 1. One-inch and 2-inch shall utilize controlled O.D. tapping saddle with epoxy or nylon
- 6 coated stainless steel 18-8 type 304 double straps.
- 7 2. Four-inch or larger, shall use wide body tapping sleeves with a broad cross section
- 8 gasket set in a retaining groove that increases sealing capability as pressure increases.

- 9 E. Concrete Pressure Pipe Service Saddle
- 10 1. Tapped concrete pressure pipe shall be in accordance with AWWA M-9, using a
- 11 strap-type saddle made specifically for concrete cylinder pressure pipe.

- 12 F. Steel Pipe Service Saddle
- 13 1. Welded-on steel sleeves shall be used for all sizes and applications.

14 2.08 CORPORATION STOPS AND CURB STOPS

- 15 A. Corporation Stops: Shall be brass body reduced port type compatible with the
- 16 polyethylene tubing and threaded in accordance with AWWA C800, AWWA C901, and
- 17 shall comply with NSF-61.

- 18 B. Curb Stops: Shall be brass body reduced port type compatible with the polyethylene
- 19 tubing and threaded in accordance with AWWA C800, AWWA C901, and shall comply
- 20 with NSF-61.

21 2.09 WATER MAIN AND RECLAIMED WATER MAIN SERVICE PIPE

- 22 A. Polyethylene Service Pipe: One-inch and 2-inch service lines shall be polyethylene
- 23 tubing conforming to AWWA C901 and AWWA C800. Tubing shall be approved for
- 24 potable water use and bear the seal of the National Sanitation Foundation (NSF). The
- 25 product shall be rated for a minimum working pressure of 150-psi and a (Dimension
- 26 Ratio) DR-9 size. The tubing shall be designated copper tube size and the material PE-
- 27 2406 cell classification minimum PE213323C in accordance with ASTM 3350.

- 28 B. Ductile Iron Service Pipe: Services 4-inch and larger shall be DIP. If the existing main is
- 29 on the same side of the street as the property to be serviced, the service pipe shall be DIP
- 30 from the point of connection to the existing main to the meter assembly. If the existing
- 31 main is on the opposite side of the street as the property to be serviced, at a minimum, the
- 32 segment of pipe immediately upstream from the meter assembly shall be DIP.

- 33 C. No service pipe shall terminate under a driveway.

1 2.10 PRESSURE GAUGES

2 A. Pressure gauges shall be installed on each pump station discharge pipe as indicated on the
3 Drawings.

4 B. Pressure gauge shall be direct mounted, diaphragm (type) gauge, stainless steel case,
5 stainless steel sensing element, liquid filled, with a 4-1/2-inch diameter dial and furnished
6 with a clear glass crystal window and 1/4-inch shut-off (isolation) valve. Gauges shall be
7 weatherproof.

8 C. The pressure gauge face dial shall be white finished aluminum with jet-black graduations
9 and figures and shall indicate the units of pressure measured in psi. Gauges shall be
10 provided with pressure at normal operation at the mid range of the gauge.

11 D. As wastewater flows through the housing, the cylinder shall transmit pressure through the
12 sensing liquid. Gauge outlet in the spool or ring shall be threaded, 1/4-inch, per ANSI
13 B2.1.

14 E. Nipples for connecting gauges to piping shall be Schedule 80S, Grade TP 316 seamless
15 stainless steel, conforming to ASTM A 312. Fittings shall conform to ASTM A 403,
16 Class WP316. Threads shall conform to ANSI B2.1. Size of pipe nipple shall match the
17 gauge connection size.

18 2.11 TIE RODS

19 A. Steel for tie rods and tie bolts shall conform to the requirements of ASTM Designation A
20 242, and rods shall be galvanized in conformance with requirements of ASTM
21 Designation A 123.

22 2.12 BACK FLOW PREVENTION

23 A. Reduced Pressure Backflow Preventer shall conform to the requirements of ASSE 1013,
24 rated to 180°F and supplied with full port ball valves. The main body and access covers
25 shall be bronze and meet ASTM B 584, the seat ring and all internal polymers shall be
26 NSF Noryl and the seat disc elastomers shall be silicone.

27 B. Dual check valves shall be required and shall be accessible for maintenance without
28 removing the relief valve or the entire device from the line.

29 C. The bottom of the preventer shall be installed a minimum of 12-inches above grade and
30 not more than 30-inches above grade.

31 2.13 FLANGED COUPLING ADAPTERS

32 A. All adapters shall be harnessed with the bolts across the joint (flange to flange or flange
33 to lug) designed for the pipe test pressure.

- 1 B. Adapter Size: Conform in size and bolt hole placement to ANSI standards for steel and/or
2 cast iron flanges 125 or 150-pound standard unless otherwise required for connections.
- 3 C. Exposed Sleeve Type
4 1. Material: Steel
5 2. Coating: Enamel
6 3. Bolting: Carbon steel
7 4. Acceptable Manufacturers: Dresser Manufacturing Co. - Style 128 for cast iron
8 ductile iron and steel pipes with diameters of 2-inches through 96-inches, or equal.
- 9 D. Buried Sleeve Type
10 1. Material: Cast iron
11 2. Bolting: Type 304 stainless steel conforming to ASTM A 193, Grade B8 for bolts,
12 and ATM A 194, Grade 8 for nuts and washers. Bolts and nuts greater than 1-1/8-
13 inches shall be carbon steel, ASTM A 307, Grade B, with cadmium plating, ASTM A
14 165, Type NS.
15 3. Acceptable manufacturers: Dresser Manufacturing Co. - Style 127 locking type for
16 cast iron, ductile, iron, asbestos cement and steel pipes with diameters of 3-inches
17 through 12-inches, or equal.
- 18 E. Split Type
19 1. Material: Malleable or ductile iron.
20 2. Design: For use with grooved or shouldered end pipe.
21 3. Coating: Enamel
22 4. Acceptable Manufacturers: Victaulic Company of America - Style 741 for pipe
23 diameters of 2-inches through 12-inches, Victaulic Company of America - Style 742
24 for pipe diameters of 14-inches through 16-inches, or equal.

25 **PART 3 - EXECUTION**

26 3.01 INSTALLATION

- 27 A. All ancillary equipment shall be installed in the locations shown, true to alignment and
28 rigidly supported. Any damage to the above items shall be repaired to the satisfaction of
29 the County before installation.
- 30 B. After installation, all ancillary equipment shall be tested as specified for adjacent piping.
31 If any joint or equipment proves to be defective, it shall be repaired and retested to the
32 satisfaction of the County.
- 33 C. Install all floor boxes, brackets, extension rods, guides, the various types of operators and
34 appurtenances as shown on the Drawings that are in masonry floors or walls, and install
35 concrete inserts for hangers and supports as soon as forms are erected and before concrete
36 is poured. Before setting these items, the Contractor shall check all plans and figures,
37 which have a direct bearing on the location and shall be responsible for the proper
38 location of these valves and appurtenances during the Construction of the structures.

1 D. Notification and Connections to Existing Mains

- 2 1. The Contractor shall submit a completed "System Connection" form to the County to
3 schedule the connection. The request shall be made a minimum of 5-working days
4 prior to the proposed tie-in to the existing main for pressure connections and 10-
5 working days prior to the proposed tie-in to the existing main for non-pressure
6 connections. In this request, the Contractor shall provide the following information:
7 a. Points of connection, fittings to be used and method of flushing and disinfection if
8 applicable
9 b. Estimated construction time for said connections
10 c. Identify pressure and non-pressure connections
11 2. Connections shall only be made on the agreed upon date and time. If the Contractor
12 does not perform the Work in the agreed upon manner or schedule, the Contractor
13 shall be required to reschedule the connection by following the procedure outlined
14 above.

15 E. Pressure Connections: Sufficient length of main shall be exposed to allow for installation
16 of the tapping sleeve and valve and the operation of the tapping machinery. The main
17 shall be supported on concrete pedestals or bedding rock at sufficient intervals to
18 properly carry its own weight, plus the weight of the tapping sleeve, valve and
19 machinery. Any damage to the main due to improper or insufficient supports will be
20 repaired at the Contractor's expense.

- 21 1. Prior to the tap, the Contractor shall assemble all materials, tools, equipment, labor,
22 and supervision necessary to make the connection.
23 2. The Contractor shall excavate a dry and safe working area pit of sufficient size to
24 enable the necessary Work.
25 3. The inside of the tapping sleeve and valve, the outside of the main and the tapping
26 machine shall be cleaned and swabbed or sprayed with 1% liquid chlorine solution
27 prior to beginning installation for water system pressure connections and must
28 comply with AWWA C-651-99 or most current version.
29 4. After the tapping sleeve has been mounted on the main, the tapping valve shall be
30 bolted to the outlet flange, making a pressure tight connection. Prior to beginning the
31 tapping operation, the sleeve and valve shall be pressure tested under the observation
32 of County personnel to 150-psi for 30-minute duration to ensure that no leakage will
33 occur.
34 5. For pressure connections 4-inch through 20-inch installation, the minimum diameter
35 cut shall be 1/2-inch less than the nominal diameter of the pipe to be attached. For
36 larger taps, the allowable minimum diameter shall be 2 to 3-inches less than the
37 nominal diameter of the pipe being attached. After the tapping procedure is
38 complete, the Contractor shall submit the coupon to the County.
39 6. The tapping valve shall be placed horizontally for pressure connections to wastewater
40 force mains. A plug valve shall be attached to the tapping valve after the tapping
41 procedure is complete. The tapping valve shall be left in the open position prior to
42 backfilling.
43 7. Adequate restrained joint fittings shall be provided to prevent movement of the
44 installation when test pressure is applied.
45 8. The Contractor shall be responsible for properly backfilling the work area pit after the
46 Work is completed.

- 1 F. Non-Pressure Dry Connections
2 1. For water service connections, no customer shall be without service for more than 6-
3 hours. For wastewater connections, provide bypass operations per Section 01516
4 "Collection System Bypass." This accommodation to customers may include
5 scheduling after Normal Working Hours.
6 2. The Contractor shall be ready to proceed by pre-assembling as much material as
7 possible at the site to minimize the length of service interruption.
8 3. Needed pipe restraints must be installed prior to the initiation of the shutdown.
9 4. The excavation shall be opened and needed site preparations must be completed
10 before the initiation of the connection work.
11 5. County shall postpone a service cut-off if the Contractor is not ready to proceed at the
12 scheduled time.
13 6. Only County personnel shall operate the valves needed to perform the shutdown on
14 the existing system.

15 3.02 PAINTING

- 16 A. All exterior surfaces of iron body valves shall be clean, dry, and free from rust and grease
17 before coating.
18 B. For valves installed underground or in valve vaults, all exterior ferrous parts of valve and
19 actuator shall be coated at the factory with a thermally bonded epoxy coating in
20 accordance with AWWA C550, latest revision.
21 C. For aboveground service, the exterior ferrous parts of all valves shall be coated in
22 weatherproof paint. The color of the finish coats shall be in accordance with the Orange
23 County Utilities Standards.

24 **END OF SECTION**

1 **SECTION 15105**

2 **CHECK VALVES**

3 **PART 1 - GENERAL**

4 1.01 SCOPE OF WORK

5 A. Scope of Work: Furnish, install, and test check valves including all appurtenances
6 required as shown on the Drawings and as specified herein.

7 B. General Design

- 8 1. Valves larger than 2-1/2-inch diameter shall meet or exceed the requirements of
9 AWWA C-508.
- 10 2. All of the equipment and materials specified herein are intended to be standard for
11 use in controlling the flow of sewage, water, sludge, chemicals, air, etc., depending
12 on the applications.
- 13 3. All valves and appurtenances shall have the name of the manufacturer and the
14 working pressure for which they are designed cast in raised letters upon some
15 appropriate part of the body.
- 16 4. For all buried valves in which the operating nut is deeper than 4-feet from the finish
17 ground surface, an extension rod with 2-inch operating nut and upper guide shall be
18 installed permanently in the riser section. Extend nut to 1-foot below finish grade.

19 1.02 QUALITY ASSURANCE

20 A. All gate valves of same type and style shall be manufactured by one manufacturer.

21 B. All equipment furnished under this Specification shall be new and unused and shall be a
22 standard product which has a successful record of reliable service in similar installations
23 for a minimum of 5-years.

24 1.03 SHOP DRAWINGS AND SUBMITTALS

25 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
26 to construction in accordance with the General Conditions and specifications Section
27 01300 "Submittals."

28 B. Shop Drawings and submittals shall be submitted to the County/Professional Engineer for
29 review and acceptance prior to construction for the following:

- 30 1. Certified Shop Drawings showing details of construction, dimensions (including
31 laying length), and weight.
- 32 2. Descriptive literature, bulletins, and/or catalogs showing all valve parts and
33 describing material of construction by material and specification, e.g., AISI.
- 34 3. Valve coatings and linings, if any.
- 35 4. A complete bill of materials for all equipment.

1 1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

2 A. Shipping

- 3 1. All parts shall be properly protected so that no damage or deterioration will occur
4 during a prolonged delay from the time of shipment until installation is completed.
5 2. Factory assembled parts and components shall be dismantled for shipment unless
6 permission is received in writing from the County/Professional Engineer.
7 3. Finished surfaces of all exposed openings shall be protected by wooden blanks,
8 strongly built and securely bolted thereto.
9 4. Finished iron or steel surfaces not painted shall be properly protected to prevent rust
10 and corrosion.
11 5. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment,
12 and proper care shall be taken to protect parts from the entrance of water during
13 shipment, storage, and handling.
14 6. Each box or package shall be properly marked to show its net weight in addition to its
15 contents.

16 B. Storage

- 17 1. Store valves and accessories in an area on the construction site protected from
18 weather, moisture, or possible damage.
19 2. Do not store valves or accessories directly on the ground.

20 C. Handling

- 21 1. Handle valves and accessories to prevent damage of any nature.
22 2. Carefully inspect all materials for:
23 a. Defects in workmanship and materials
24 b. Removal of debris and foreign material in valve openings and seats
25 c. Proper functioning of all operating mechanisms
26 d. Tightness of all nuts and bolts

27 1.05 WARRANTY AND GUARANTEES

28 A. The manufacturer's warranty period shall be concurrent with the Contractor's for 1-year,
29 unless otherwise specified, commencing at the time of final acceptance by the County.

30 B. The Contractor shall be responsible for obtaining certificates for equipment warranty for
31 all equipment which lists for more than \$500.00 (major equipment). The County reserves
32 the right to request warranties for equipment not classified as "major". The Contractor
33 shall still warrant equipment not considered to be "major" in the Contractor's 1-year
34 warranty period even though certificates of warranty may not be required.

35 C. In the event that the equipment manufacturer or supplier is unwilling to provide a 1-year
36 warranty commencing at the date of substantial completion, the Contractor shall obtain
37 from the manufacturer a 2-year warranty commencing at the time of equipment delivery
38 to the job site. This 2-year warranty from the manufacturer shall not relieve the
39 Contractor of the 1-year warranty starting at the time of County acceptance of the
40 equipment.

- 1 D. The County shall incur no labor or equipment cost during the guarantee period.
- 2 E. Guarantee shall cover all necessary labor, equipment, and replacement parts resulting
3 from faulty or inadequate design, improper assembly or erection, defective workmanship
4 and materials, leakage, breakage, or other failure of equipment or components furnished
5 by the manufacturer.

6 **PART 2 - PRODUCTS**

7 2.01 MATERIALS AND EQUIPMENT

- 8 A. Ball Check Valves, 2-1/2-inches and smaller.
- 9 1. Valves shall be all bronze construction with screwed ends.
- 10 2. Minimum valve working pressure shall be 150-psi.
- 11 3. Valves shall be as manufactured by Crane, Watts, or equal.
- 12 B. Rubber Flapper Swing Check Valves (Sewage/Sludge and Low Pressure Effluent
13 Pumping Application; i.e., less than 50-psi).
- 14 1. Valves shall have a cast iron body and cover meeting ASTM A126, Class B
15 specifications.
- 16 2. Flapper shall be Buna-N reinforced and shall be easily removed without any need to
17 remove the valve from line.
- 18 3. Ends shall be flanged, 125-pound ANSI B16.1. The flapper shall be Buna-N having
19 an "O" ring seating edge and be internally reinforced with steel.
- 20 4. Valve shall provide drip-tight shutoff.
- 21 5. Each check valve shall be provided with an NEMA 4X limit switch mounted on the
22 horizontal centerline of the body seat.
- 23 6. Provide a manually operated backflow device which shall positively lock open
24 flapper during full backflow.
- 25 7. The FLEX portion of the disc shall have a 20-year warranty.
- 26 8. Valves shall be manufactured by Apco Valve and Primer Corp., Series 100, Val-
27 Matic Valve and Manufacturing Corp., Swing Flex, or equal.
- 28 C. Swing Check Valves
- 29 1. Swing check valves shall conform to AWWA C508.
- 30 2. The valve body shall be 2-piece cast iron conforming to ASTM A126 with flanged
31 ends conforming to ANSI B16.1. The area throughout the valve body shall be equal
32 to the full pipe area.
- 33 3. The valve disc shall be ductile iron with bronze or resilient seating face. The disc
34 shall be partially balanced with a short travel to resist slamming.
- 35 4. The seat ring and disc ring shall be ASTM B763 Alloy 84400 bronze, with beveled
36 edges, firmly clamped or screwed into the valve body. Seat rings and disc rings shall
37 be field replaceable.
- 38 5. The hinge pin shall be of stainless steel with bronze bushings, allow free movement
39 of the disc without binding, and shall be guaranteed not to stick in the closed position.
- 40 6. The valve shall be designed for a minimum working pressure of 150-psi.
- 41 7. Valves shall be supplied with an outside lever and adjustable weight.

- 1 8. Valves 4-inches and larger shall be 8-mil epoxy lined.
- 2 D. Cushioned Swing Check Valves (Potable Water and High Pressure Effluent Application
- 3 greater than 50-psi).
- 4 1. All materials shall be as follows:
- 5

Table 15105-1
Materials of Construction

PART	MATERIAL	ASTM or SAE
Body, Cover, Disc	Cast Iron	A 126 GR.B
Disc Arm	Ductile Iron	A 536
Seat	Aluminum bronze or Stainless Steel	B 148 A 276
Seat Ring	Buna-N rubber or Metal	
Hinge Shaft	Stainless Steel	Type 303

- 6
- 7 2. Valve body shall have integral flanges.
- 8 3. The seat shall be centrifugally cast bronze with an o-ring seal and be locked in place
- 9 with stainless steel lock screws and be field replaceable without the use of special
- 10 tools.
- 11 4. The shaft shall be single and continuous stainless steel, extending both sides of the
- 12 body with a lever and weight, using a side-mounted air cushion cylinder.
- 13 5. The air cushion cylinder shall be constructed of corrosion resistant material and the
- 14 piston shall be totally enclosed. The cylinder assembly shall be externally mounted to
- 15 the valve body and will permit adjustability to cushion the closure of the check valve.
- 16 6. The valve shall prevent backflow of water on normal pump shut-off or power failure
- 17 and shall be watertight.
- 18 7. A valve position indicator and micro switch shall be provided to remotely indicate
- 19 open/close position of check valve.
- 20 8. Valve body area shall equal or exceed the full pipe area.
- 21 9. Valve shall be Series 6,000 air cushioned swing check valve as manufactured by
- 22 APCO or acceptable equal.

23 PART 3 - EXECUTION

24 3.01 INSTALLATION

- 25 A. Install valves and accessories in strict accordance with manufacturer's instructions and
- 26 recommendations, as shown on the Drawings and/or as directed by the Owner.
- 27 B. Carefully erect all valves and support them in their respective positions free from
- 28 distortion and strain.

- 1 C. Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the
2 pipe run to which the valves are attached. Clean flanges by wire brushing before
3 installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads
4 with oil and graphite, and tighten nuts uniformly and progressively. Clean threaded
5 joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to
6 pipe threads before installing threaded valves. Joints shall be watertight.
- 7 D. Support all valves connected to pumps and equipment, and in piping systems that cannot
8 support valves.
- 9 E. Repair any scratches, marks and other types of surface damages, etc., with original prime
10 coating as supplied by the factory.
- 11 F. Apply finish coating in accordance with Division 9.

12 3.02 DEMONSTRATION AND TESTING

- 13 A. Demonstration, start-up (adjustment) and testing shall demonstrate that all valves have
14 been properly installed and that check valves operate properly.
- 15

16 **END OF SECTION**

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1 **SECTION 15110**

2 **PLUG VALVES**

3 **PART 1 - GENERAL**

4 1.01 DESCRIPTION

5 Wastewater force mains shall have plug valves installed as shown on the Drawings. This
6 Section specifies plug valves, manual actuators and associated valve boxes.

7 1.02 QUALITY ASSURANCE

8 A. References

Reference	Title
ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800
ASTM A126	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A276	Stainless and Heat-Resisting Steel Bars and Shapes
ASTM A436	Austenitic Gray Iron Castings
ASTM A536	Ductile Iron Castings
AWWA C504	Rubber Seated Butterfly Valves

10 B. Proof-of-Design Tests

11 The Contractor shall furnish the County three (3) certified copies of a report from an
12 independent testing laboratory certifying successful completion of proof-of-design testing
13 conducted in accordance with AWWA C504, Section 5.2, except that where the word
14 "disc" appears in the standard, it is understood to mean "plug." In lieu of testing the
15 valves at an independent testing laboratory, proof-of-design testing may be performed at
16 the valve manufacturer's laboratory, but must be witnessed by a representative of a
17 qualified independent testing laboratory, and all test reports must be certified by the
18 laboratory representative. Proof-of-design testing shall have been performed on at least 3
19 (three) 6-inch diameter valves, with all 3 (three) test units demonstrating full compliance
20 with the test standards. Failure to satisfactorily complete the test shall be deemed
21 sufficient evidence to reject all valves of the proposed make or manufacturer's model
22 number.

23 1.03 SHOP DRAWINGS AND SUBMITTALS

24 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
25 to construction in accordance with the General Conditions and specifications Section
26 01300 "Submittals."

- 1 B. PRODUCT DATA: The following information shall be provided in accordance with 1.03
2 of Section 01300 "Submittals."
3 1. Manufacturer's product data
4 2. Proof-of-design test reports specified in paragraph 1.02 B

5 **PART 2 - PRODUCTS**

6 2.01 GENERAL

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

9 2.02 MANUFACTURERS

10 Plug valves meeting the requirements of this Section shall be supplied from the approved
11 manufacturers as listed in Appendix D "List of Approved Products."

12 2.03 MATERIALS

13 Materials of construction shall be as follows:
14

Component	Material
Body	Cast iron, ASTM A126, Class B
Plug	Cast iron, ASTM A126, Class B, or cast iron ASTM A436 (Ni-resist), or ductile iron, ASTM A536
Plug facing	Neoprene
Body seats	
3-inches and larger	Nickel
Packing	Buna V-flex or TFE

15 2.04 MANUFACTURE

- 16 A. Plug Valves: Valves shall be straight-flow non-lubricated resilient plug type suitable for
17 drip tight, bi-directional shutoff at the specified valve design pressure.
18 1. Plug valves shall be eccentric, ball centric or full port. All valves shall open counter-
19 clockwise.
20 2. All buried valves shall be fitted with valve boxes as specified in Paragraph 2.03.B of
21 this Section. One 2-inch square tee-handled valve wrench, made by the valve
22 manufacturer, of suitable length to operate all valves within valve boxes shall be
23 furnished for every 5 valves installed.
24 3. Plug valves shall be installed complete with extension stems, buried gear actuators,
25 and 2-inch operating nuts (buried) or operating hand wheels (exposed), as required
26 for normal operation. All valve nuts shall be brought up to 1-foot below the proposed
27 finish grade.

- 1 4. Valves shall have the name of the manufacturer and the size of the valve cast or molded
2 onto the valve body. A permanent plate shall be attached to the valve or operator
3 indicating serial number, order number, accessories, operator model and manufacturer.
- 4 5. Ball centric/eccentric plug valves shall be of the non-lubricated type. The port area
5 for valves 4-inches to 20-inches shall have a minimum 80% nominal pipe diameter
6 and valves 24-inches and larger shall have a minimum port area of 70% of nominal
7 pipe diameter unless noted on the Drawings as "full port". Plug valves denoted as full
8 port shall have a port area equal to the full area of the nominal pipe diameter.
- 9 6. Minimum pressure rating of valves 4-inches to 12-inches shall be 175-psi; valves 14-
10 inches to 72-inches shall be 150-psi. Valve bodies shall be cast iron ASTM A126,
11 Class B and fusion-bonded epoxy coated.
- 12 7. Valve ends shall be mechanical joint (buried) or flanged (exposed) as indicated on the
13 Drawings. Valve flange drilling for valves 3-inches and larger shall be per ANSI
14 B16.1, Class 125. Plugs shall be cast iron or ductile iron with neoprene facing and shall
15 be of the single piece design. The plug shall be of the same configuration for all valves
16 and shall require no stiffening member opposite the plug for balance or support. Valve
17 body seats shall have a welded-in overlay of not less than 90% nickel. Packing shall be
18 adjustable and safely replaceable without disassembling the valve. Bushing shall be
19 316 stainless steel in both upper and lower journals and shall be protected from foreign
20 matter with the use of a grit seal or similar. The valve should be capable of drip tight
21 shut off with flow in either direction at the full pressure of the valve. All exposed nuts,
22 bolts, springs and washers on buried service valves shall be 304 stainless steel. All
23 above- grade valves shall have 316 stainless steel hardware.
- 24 8. Actuators: Manual valves shall have lever or gear actuators and tee wrenches,
25 extension stems, and floor stands as indicated on the Drawings. Valves 6-inch and
26 larger shall be equipped with buried service rated gear actuators. Buried valves shall
27 have a 2-inch square operating nut. All gearing shall be enclosed in a steel housing
28 and be suitable for running in a lubricant with seals provided on all shafts to prevent
29 entry of dirt and water into the actuator. Actuator shafts shall be supported on
30 permanently lubricated bronze bearings. Actuators shall clearly indicate valve
31 position and an adjustable stop shall be provided to set closing torque. Exposed nuts,
32 bolts and washers shall be 316 stainless steel. Valve packing adjustment shall be
33 accessible without disassembly of the actuator.
- 34 9. Valve Testing: Plug valves shall be tested in accordance with AWWA C504. Each
35 valve shall meet the performance, leakage, and hydrostatic tests described in AWWA
36 C504. The leakage test shall be applied to the face of the plug tending to unseat the
37 valve. The manufacturer shall furnish certified copies of reports covering proof-of-
38 design testing as described in AWWA C504.

39 B. Valve Boxes

- 40 1. All valves installed underground shall have cast iron 2-piece valve boxes. Valve boxes
41 shall be provided with suitable heavy bonnets and shall extend to such elevation at or
42 slightly above the finished grade surface as directed by the County. The barrel shall be
43 screw type only, with a 5-1/4-inch shaft. The upper section shall have a flange at the
44 bottom having sufficient bearing area to prevent settling and shall be complete with
45 locking cast iron covers. Covers shall have "SEWER" cast into the top for all
46 wastewater mains which shall be so constructed as to prevent tipping or rattling.

- 1 3. Finished surfaces of all exposed openings shall be protected by wooden blanks,
2 strongly built and securely bolted thereto.
- 3 4. Finished iron or steel surfaces not painted shall be properly protected to prevent rust
4 and corrosion.
- 5 5. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment,
6 and proper care shall be taken to protect parts from the entrance of water during
7 shipment, storage, and handling.
- 8 6. Each box or package shall be properly marked to show its net weight in addition to its
9 contents.

10 B. Storage

- 11 1. Store valves and accessories in an area on the construction site protected from
12 weather, moisture, or possible damage.
- 13 2. Do not store valves or accessories directly on the ground.

14 C. Handling

- 15 1. Handle valves and accessories to prevent damage of any nature.
- 16 2. Carefully inspect all materials for:
 - 17 a. Defects in workmanship and materials.
 - 18 b. Removal of debris and foreign material in valve openings and seats.
 - 19 c. Proper functioning of all operating mechanisms.
 - 20 d. Tightness of all nuts and bolts.

21 1.05 WARRANTY AND GUARANTEES

- 22 A. The manufacturer's warranty period shall be concurrent with the Contractor's for 1-year,
23 unless otherwise specified, commencing at the time of final acceptance by the County.
- 24 B. The Contractor shall be responsible for obtaining certificates for equipment warranty for
25 all equipment which lists for more than \$500.00 (major equipment). The County reserves
26 the right to request warranties for equipment not classified as "major". The Contractor
27 shall still warrant equipment not considered to be "major" in the Contractor's 1-year
28 warranty period even though certificates of warranty may not be required.
- 29 C. In the event that the equipment manufacturer or supplier is unwilling to provide a 1-year
30 warranty commencing at the date of substantial completion, the Contractor shall obtain
31 from the manufacturer a 2-year warranty commencing at the time of equipment delivery
32 to the job site. This 2-year warranty from the manufacturer shall not relieve the
33 Contractor of the 1-year warranty starting at the time of County acceptance of the
34 equipment.
- 35 D. The County shall incur no labor or equipment cost during the guarantee period.
- 36 E. Guarantee shall cover all necessary labor, equipment, and replacement parts resulting
37 from faulty or inadequate design, improper assembly or erection, defective workmanship
38 and materials, leakage, breakage, or other failure of equipment or components furnished
39 by the manufacturer.

1 **PART 2 - PRODUCTS**

2 2.01 GENERAL

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

5 2.02 MATERIALS

6 A. Gate valves shall be resilient seat gate valves, manufactured to meet or exceed the
7 requirements of AWWA C509/C515, latest revision, and these Specifications. All valves
8 are to be tested in strict accordance with AWWA C509/C515.

9 B. Valves shall have an unobstructed waterway equal to or greater than the full nominal
10 diameter of the valve.

11 C. The minimum design working water pressure shall be minimum 250-psig.

12 D. Gate valves shall be installed vertically per the Drawings and with minimum depth of
13 cover per Table 15111-1.
14

**Table 15111-1
Minimum Pipe Cover Required for Valves**

Pipe Diameter (Inches)	Vertical Gate Valve Cover	
	LOCAL Roadway	Non-LOCAL Roadway*
4-inch – 8-inch	30-inch	36-inch
12-inch	36-inch	36-inch
16-inch	44-inch	48-inch
20-inch	-	50-inch
24-inch	-	54-inch
* Additional 12-inches of cover is required for all vertical valves 16-inches and greater located in the pavement		

15 E. Valves 16-inches and larger shall be AWWA C515 resilient seated only (16-inches
16 through 24-inches no gearing required).

17 F. The valve body, bonnet, and bonnet cover shall be cast iron ASTM A126, Class B for
18 C509 valves and ductile iron ASTM A536 for C515 valves. All ferrous surfaces inside
19 and outside shall have a fusion-bonded epoxy coating in accordance with AWWA C 550.

20 G. A 2-inch wrench nut shall be provided for operating the valve. Valves 30-inches and
21 larger shall be provide with spur gear actuators. Side actuated gate valves are not
22 acceptable. All valves shall open left or counter clockwise.

23 H. The valves shall have non-rising stems with the stem made of cast, forged, or rolled
24 bronze as specified in AWWA C509. Two (2) stem seals shall be provided and shall be
25 of the O-ring type. The stem nut must be independent of the gate.

- 1 I. The resilient sealing mechanism shall provide zero leakage at test and normal working
2 pressure when installed with the flow from either direction.
- 3 J. Tapping valves shall be placed vertical where possible for Water and Reclaimed Water.
4 When tapping existing mains, valves 24-inches and above shall be furnished with NPT
5 pipe plugs for flushing the tracks.
- 6 K. All materials shall be in accordance with Appendix D "List of Approved Products."

7 **PART 3 - EXECUTION**

8 3.01 PREPARATION

- 9 A. All valves shall be inspected upon delivery in the field to insure proper working order
10 before installation. Valves shall be set and jointed to the pipe in the manner as set forth
11 in the AWWA Standards for the type of connection ends furnished. All buried gate
12 valves shall be connected using restrained joints. All valves and appurtenances shall be
13 installed true to alignment and rigidly supported. Any damage to the above items shall be
14 repaired to the satisfaction of the County before installation.

15 3.02 INSTALLATION

- 16 A. Install valves and accessories in strict accordance with manufacturer's instruction and
17 recommendations as shown on the Drawings and as directed by the County.
- 18 B. Carefully erect all valves and support them in their respective positions free from
19 distortion and strain.
- 20 C. Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the
21 pipe run to which the valves are attached. Clean flanges by wire brushing before
22 installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads
23 with oil and graphite, and tighten nuts uniformly and progressively. Clean threaded
24 joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to
25 pipe threads before installing threaded valves. Joints shall be watertight.
- 26 D. Support all valves connected to pumps and equipment and in piping systems that cannot
27 support valves.
- 28 E. Repair any scratches, marks and other types of surface damage with original coating as
29 supplied by the factory.
- 30 F. Valves shall be carefully inspected, opened wide and then tightly closed and the nuts and
31 bolts shall be tested for tightness. Special care shall be taken to prevent any foreign
32 matter from becoming lodged in the valve seat. Any valve that does not operate correctly
33 shall be removed and replaced.

1 3.03 INSPECTION AND TESTING

2 A. Check and adjust all valves and accessories for smooth operation.

3 B. Test valves for leakage at the same time that connecting pipelines are tested. See Section
4 02660 "Potable Water Distribution Piping" for pressure testing requirements. Protect or
5 isolate any parts of valves, operators, or control and instrument systems whose pressure
6 rating is less than the pressure tests.
7

8 **END OF SECTION**

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1 **SECTION 16010**

2 **ELECTRICAL GENERAL PROVISIONS**

3 **PART 1 - GENERAL**

4 1.01 WORK INCLUDED

5 A. The Work covered under this Division of the Specifications is intended to include the
6 furnishing of all materials, equipment and labor necessary for or reasonably incidental to,
7 the installation of a complete and fully operative electrical system as indicated on the
8 Drawings and specified in this Section.

9 1. The Work shall consist generally of, but is not limited to, the following major items:

- 10 a. Circuit Protective Devices
- 11 b. Conduit and Wiring
- 12 c. Equipment Connections
- 13 d. Temporary power

14 B. Work Not Included: The following work is not included in this Section:

- 15 1. Furnishing of pump control panels.

16 C. Fees and Permits

- 17 1. Obtain all permits required for the Work and include the cost of same in bid.
- 18 2. The Contractor shall also include in the bid, the cost for the power company service.

19 D. Certificate of Inspection

20 The Contractor shall pay for a final inspection made of the complete electrical installation
21 and shall deliver a certificate of approval of the complete Work to the County before
22 receiving final payment.

23 E. Service

24 Voltage and Phase as indicated on the Drawings. Secondary metered electrical power
25 underground or overhead as indicated on the Drawings. Serving electrical utility
26 company is as noted on the Drawings.

27 1.02 SHOP DRAWINGS AND SUBMITTALS

28 A. Submittals shall be submitted to the County for review and acceptance prior to
29 construction in accordance with the General Conditions and specifications Section 01300
30 "Submittals."

31 B. Submit to the County as provided in the General Conditions, Shop Drawings,
32 manufacturer's literature and technical data on the proposed electrical systems before
33 commencing work.

1 C. Shop Drawings

- 2 1. Submit copies of manufacturer's drawing of surge protection devices, circuit
3 protective devices, panel boards, conduit, wire, wiring devices, and any other special
4 electrical equipment to be installed, and shall receive the County's acceptance before
5 ordering the same for installation.
6 2. All Shop Drawings shall be submitted in a 3-ring binder with each specification
7 section indicated with tabs.
8 3. If Shop Drawings are submitted intermittently and not in 3-ring binders, they will not
9 be reviewed and they will be returned to the Contractor for proper submittal.
10 4. Acceptable Equivalent
11 a. Any manufacturer and/or catalog number listed on the Drawings or in the Project
12 Manual shall be construed to mean "or acceptable equivalent" as listed in
13 Appendix D "List of Approved Products."
14 b. Any substitutions to be considered as "Acceptable Equivalent" shall be submitted
15 with both the cut of the proposed substitution and a cut of the specified equipment
16 to the County in writing, and returned to the Contractor at least 10-days prior to
17 bid opening.
18 c. No substitutions shall be submitted or will be allowed after the contract has been
19 awarded.

20 1.03 QUALITY ASSURANCE

21 A. Qualifications of manufacturers, materials and equipment

- 22 1. Material and equipment, except as herein otherwise noted, shall be new and conform
23 to standards specified herein defined to include conduits, cable, wiring materials and
24 devices and panel boards.
25 2. Materials and equipment shall be of an approved design.
26 a. Similar materials shall be of one manufacturer wherever possible.
27 3. Equipment offered under these Specifications shall be limited to products regularly
28 produced and recommended for service ratings in accordance with manufacturer's
29 catalogs, engineering data, or other comprehensive literature made available to the
30 public and in effect at the time of opening of bids.
31 4. Install equipment in strict accordance with manufacturer's instruction for type,
32 capacity and suitability of each piece of equipment used.
33 a. Obtain these instructions, which shall be considered a part of these Specifications.

34 B. Qualifications of supervisor, workmanship and installers

- 35 1. The Contractor shall have a Master Electrician constantly supervising the Work
36 covered by these Specifications, and so far as possible shall keep the same foreman
37 on the job from start to finish.
38 a. The workmanship of the entire job shall be excellent and only experienced and
39 competent workers shall be employed for the Work.

1 1.04 CODES AND REGULATIONS

2 A. Work shall be installed in accordance with the regulations and requirements of the
3 National Electrical Code NFPA No. 70; Life Safety Code NFPA No. 101, Standard
4 Building Code as well as all rules, state and local codes, regulations and requirements of
5 the telephone and power companies.

6 B. Where conduits and/or cables penetrate wetwell walls, the penetrations shall be sealed in
7 accordance with NFPA 70, Article 500.

8 1. The above shall be ascertained and fully coordinated before the installation of any
9 material, equipment, and the like, and any discrepancy shall be immediately brought
10 to the attention of the County in writing, and the Contractor shall receive a disposition
11 of same before proceeding with the Work.

12 2. Furnish, without additional charge, any additional materials and labor that may be
13 required for compliance with these codes, law, rules, regulations or requirements even
14 though the work is not mentioned in these Specifications or shown on the Drawings.

15 C. Material and equipment shall bear the label of approval of the National Board of Fire
16 Underwriters Laboratory.

17 1.05 INSPECTIONS

18 A. All work and materials covered by these Specifications and shown on the Drawings shall
19 be subject to inspection at any and all times by the County.

20 B. If the County finds that any material does not conform with these Specifications, the
21 Contractor shall within 3-days after being notified by the County; remove the material
22 from the premises, and if said material has been installed, the entire expense of removing
23 and replacing same, including any cutting and patching that may be necessary, shall be
24 borne by the Contractor.

25 C. Tests

26 The County reserves the right to inspect and test any portion of the equipment during the
27 progress of this Work.

28 1. The Contractor shall test the entire system in the presence of the County when the
29 Work is completed to insure that all portions are free from short circuits and grounds.

30 2. All equipment, material and labor necessary to conduct the above tests shall be
31 furnished at the Electrical Contractor's expense.

1 1.06 PRODUCT HANDLING

- 2 A. Protection of Equipment, Material and Work: The Contractor shall effectively protect and
3 pay for protection of the work, materials or equipment, as is liable to injury during the
4 construction period.
- 5 1. Openings into any part of the conduit system as well as associated fixtures,
6 equipment, and the like, both before and after being set in place, shall be securely
7 covered or otherwise protected to prevent obstruction of the conduit, or injury due to
8 carelessness or maliciously dropped tools or materials, grit, dirt, or any foreign
9 matter.
- 10 a. The Contractor will be held responsible for all damage done until the Work is
11 fully and finally accepted.
- 12 2. Cover conduit ends with capped bushings.
- 13 B. Repair of damage: In the event of damage, repair shall be made immediately, to the
14 County's satisfaction and at no additional cost to the County.
- 15 C. Special Handling: Special care, storage and handling of new and existing lighting fixtures
16 shall be taken to minimize breakage of lenses and lamps shipped with fixtures.
- 17 1. Immediately replace any breakage with the exact lens or lamp.

18 1.07 JOB CONDITIONS

- 19 A. Accuracy of Data: The data given herein and on the Drawings are as exact as could be
20 secured.
- 21 1. The Specifications and Drawings are for the assistance and guidance of the
22 Contractor.
- 23 2. Exact locations, distances, levels, and the like, will be governed by the building field
24 conditions and the Contractor shall use the data contained herein with this
25 understanding.
- 26 B. Drawings
- 27 1. The electrical drawings are diagrammatic, but shall be followed as closely as actual
28 construction and work of other Contractors will permit.
- 29 2. Deviations from diagrammatic electrical drawings required by either building
30 construction or the work of other Contractors shall be made by the Contractor at
31 his/her expense.
- 32 3. It is not the intention of the Drawings or specifications to indicate each piece of
33 conduit and fittings required for the satisfactory operation of the installation and
34 whereby one is indicated, but not specified, or specified but not indicated on the
35 Drawings, it shall be considered to be both specified and indicated.
- 36 C. Measurements
- 37 1. Review the Contract Drawings and Specifications and visit the job site to ascertain all
38 conditions, including conduit runs, interfacing, interferences, conflicts, discrepancies,
39 etc., and shall report the same to the County for clarification 10-days prior to
40 submittal of the bid.

- 1 2. Failure to comply with this condition shall constitute an acceptance of the conditions
- 2 and any necessary changes will be at Contractor's expense.
- 3 3. The Contractor shall make all measurements necessary for his/her work and shall
- 4 assume responsibility for their accuracy.
- 5 4. Install necessary pull boxes, manholes and junction boxes as may be required to
- 6 accomplish the distribution system indicated on the riser diagram.

7 D. Structural difficulties: Should any structural difficulties prevent the setting of cabinets,
8 running conductors, and the like, at points indicated on the Drawings, the necessary
9 deviation will be as determined by the County shall be made without additional cost.

10 E. Cooperation with Other Contractors

- 11 1. The Contractor shall arrange all parts of his/her work in proper relation to the work of
- 12 other Contractors.
- 13 2. Where interferences occur, the Contractor shall, before installing the work involved,
- 14 consult with the County as to exact location and level of his/her work.
- 15 3. The County's decision will be final.
- 16 4. The Contractor shall be responsible for arrangement of his/her work and equipment
- 17 and maintenance of proper headroom under this Work.
- 18 5. Should work installed under this Section require any modifications to avoid
- 19 interference with the other work, such changes shall be made without additional cost.
- 20 6. The County's decision as to determination or allocation or responsibility where
- 21 conditions require changing of work, shall be final.
- 22 7. If any work of the Contractor is dependent for its proper execution on contiguous
- 23 work, examine such work and report in writing any defect thereon or conditions
- 24 rendering it unsuitable.
- 25 8. The beginning of work, without making such report, shall constitute an acceptance of
- 26 such work, and any defects in his/her own work consequently shall be his/her
- 27 responsibility.

28 1.08 TEMPORARY SERVICE

- 29 A. Temporary power: Provide, maintain and remove after construction is completed, a
- 30 temporary, receptacle and power system in accordance with the progress schedule.
- 31 1. Receptacles: Ground fault interrupter type.
- 32 2. Three Phase Power for Testing Motors: Provided at all necessary points.
- 33 B. Temporary telephone service: Each respective trade shall be responsible for providing
- 34 and maintaining their telephone services.

35 1.09 CLEANING

- 36 A. Keep the premises free of debris and unusable materials resulting from the Work, and
- 37 immediately upon completion of the Work remove such debris and material from the site
- 38 and leave floors broom clean in areas affected by the Work.

1 1.10 GUARANTEE

2 A. Leave the electrical installation in proper working order and without charge, replace any
3 work or materials which develop defects within 1-year from date of final inspection and
4 acceptance by the County.

5 1.11 DEFINITIONS

6 A. In this Division "provide" is used as a term contraction meaning "to furnish, install and
7 connect up completely in the specified or in an approved manner for the item and/or
8 material described."

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

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

11

12

END OF SECTION

1 **SECTION 16110**

2 **RACEWAYS**

3 **PART 1 - GENERAL**

4 1.01 RELATED DOCUMENTS

- 5 A. Drawings and general provisions of Contract, including General and Supplementary
6 Conditions and Division 1 Specification sections, apply to work of this Section.

7 1.02 DESCRIPTION OF WORK

- 8 A. Extent of raceway work is indicated by drawings and schedules.

- 9 B. Types of raceway specified in this Section include the following:

- 10 1. Liquid tight flexible metal conduit
11 2. Rigid non-metallic conduit (PVC)
12 3. Rigid aluminum conduit

- 13 C. Electrical non-metallic tubing (ENT) is not acceptable.

14 1.03 QUALITY ASSURANCE

- 15 A. Manufacturers: Firms shall have sufficient experience that will allow for quality and
16 successful manufacture of raceway systems of types and sizes required for this Project.

- 17 B. Installer's Qualifications: Firms shall have sufficient experience to allow for quality and
18 successful installation of electrical raceway work required for this Project.

19 1.04 CODES AND STANDARDS

- 20 A. NEMA Compliance: Comply with applicable requirements of NEMA Standards
21 Publications pertaining to raceways.

- 22 B. UL Compliance and Labeling: Comply with applicable requirements of UL safety
23 standards pertaining to electrical raceway systems. Provide raceway products and
24 components which have been UL listed and labeled.

- 25 C. NEC Compliance: Comply with applicable requirements of NFPA-70 pertaining to
26 construction and installation of raceway systems.

- 27 D. Comply with NECA "Standard of Installation."

- 28 E. Coordinate layout and installation of raceway and boxes with other construction elements
29 to ensure adequate headroom, working clearance, and access.

1 1.05 SHOP DRAWINGS AND SUBMITTALS

2 A. Submittals shall be submitted to the County for review and acceptance prior to
3 construction in accordance with the General Conditions and specifications Section 01300
4 "Submittals."

5 B. Product Data: Submit manufacturer's technical product data, including specifications and
6 installation instructions for each type of raceway system required. Include data
7 substantiating that materials comply with requirements.

8 C. A copy of this specification section, with addendum updates included, and all referenced
9 and applicable sections, with addendum updates included, with each paragraph check-
10 marked to indicate specification compliance or marked to indicate requested deviations
11 from specification requirements. Check marks shall denote full compliance with a
12 paragraph as a whole.

13 D. If deviations from the specifications are indicated, and therefore requested by the
14 Contractor, each deviation shall be underlined and denoted by a number in the margin to
15 the right of the identified paragraph, referenced to a detailed written explanation of the
16 reasons for requesting the deviation.

17 E. The County shall be the final authority for determining acceptability of requested
18 deviations. The remaining portions of the paragraph not underlined will signify
19 compliance on the part of the Contractor with the specifications.

20 F. Failure to include a copy of the marked-up specification sections, along with
21 justification(s) for any requested deviations to the specification requirements, with the
22 submittal shall be sufficient cause for rejection of the entire submittal with no further
23 consideration.

24 **PART 2 - PRODUCTS**

25 2.01 GENERAL

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

28 2.02 NON-METALLIC CONDUIT

29 A. General: Provide non-metallic conduit and fittings of types, sizes, and weights for each
30 service indicated. Where types and grades are not indicated, provide proper selection
31 determined by Installer to fulfill wiring requirements, which comply with provisions of
32 NFPA-70 for raceway.

- 1 B. Electrical Plastic Conduit
2 1. Extra Heavy Wall Conduit: Schedule 80, UL rated, construct of polyvinyl chloride
3 compound C 200 PVC, and UL listed in accordance with NFPA-70 Article 347 for
4 direct burial, or above ground use. Conduits shall be UL listed and marked for use
5 with conductors having 90°C insulation. Use conduits, couplings, bushings, elbows,
6 nipples, and other fittings meeting the requirements of NEMA TC 2 and TC 3,
7 Federal Specification W C 1094, UL, NEC, and ASTM specified tests for the
8 intended use. Use only conduit with a factory formed bell on 1 end. Conduit that
9 requires the use of couplings for straight runs will not be acceptable. Minimum size
10 3/4-inch exposed, 1-inch embedded or buried.
- 11 C. Conduit and Tubing Accessories: Provide conduit and accessories of types, sizes, and
12 materials, complying with manufacturers published product information, which mate and
13 match conduit.
- 14 D. Conduit Bodies: Provide extra heavy PVC conduit bodies of types, shapes and sizes as
15 required to fulfill job requirements and NFPA-70 requirements. Construct conduit bodies
16 with threaded conduit entrance ends, removable covers, either cast or of galvanized steel
17 and corrosion resistant screws.
- 18 E. Available Manufacturers: Subject to compliance with requirements, manufacturers
19 offering conduit bodies which may be incorporated in the Work include, but are not
20 limited to the following:
21 1. Appleton Electric; Div. of Emerson Electric Co.
22 2. Arrow Hart Div.; Crouse Hinds Co.
23 3. Bell Electric Div.; Square D Co.
24 4. Killark Electric Mfg. Co.
25 5. O Z/Gedney Div.; General Signal Co.
26 6. Spring City Electrical Mfg. Co.

27 2.03 RIGID ALUMINUM CONDUIT

- 28 A. Meet requirements of ANSI C80.1 and UL6.
- 29 B. Material: Type 6063, copper free aluminum alloy.
- 30 C. Available Manufacturers
31 1. Appleton Electric, Div. Of Emerson Electric Co.
32 2. Arrow Hart Div; Crouse Hinds Co.
33 3. Bell Electric Div.; Square D Co.
34 4. O-Z/Gedney Div.; General Signal Co.
- 35 D. Minimum size shall be 3/4-inch unless noted otherwise or permitted by the following:
36 1/2-inch may be used for connections to individual instruments, outlets, wiring devices
37 and indoor lighting fixtures.

1 2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT AND FITTINGS

2 A. Liquid-tight Flexible Steel Conduit (LFS): UL listed liquid tight consisting of an extruded
3 thermoplastic cover over a galvanized steel core. Minimum size 3/4-inch unless for
4 equipment with 1/2-inch knockout.

5 B. Fittings and Conduit Bodies: NEMA FB-1; galvanized steel compression type with 0-
6 ring.

7 **PART 3 - EXECUTION**

8 3.01 INSTALLATION

9 A. General: Install raceways as indicated; in accordance with manufacturer's written
10 installation instructions, and in compliance with NFPA-70, and NECA's "Standards of
11 Installation."

12 B. Coordinate with other work including wires/cables, boxes and panel work, as necessary
13 to interface installation of electrical raceways and components with other work.

14 C. Install conduits concealed below grade or in slabs. Where conduits turn up and/or cannot
15 be concealed, route conduits exposed.

16 D. Mechanically fasten together conduits, enclosures and raceways for conductors to form
17 continuous system. Connect to electrical boxes, fittings and cabinets to provide firm
18 mechanical assembly.

19 E. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis.
20 Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting
21 compound before assembling.

22 F. Cap conduits or plug flush conduits during construction to prevent entrance of dirt, trash,
23 and water. Cap or plug empty conduits designated as "future", "spare", or "empty" and
24 include a pulling line accessible at both ends. Use anti-seize compound on cap and plug
25 threads prior to installation.

26 G. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved
27 portion of bends is not visible above the finished slab.

28 H. Make bends and offsets so the inside diameter is not reduced. Unless otherwise
29 indicated, keep the legs of a bend in the same plane and the straight legs of offset parallel.

30 I. Use raceway fittings compatible with raceway and suitable for use and location. Fitting
31 sizes shall be such that the enclosed conductors do not exceed the permissible percentage
32 of fitting area/volume.

- 1 J. Install miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split
2 couplings, and plugs that have been specifically designed and manufactured for their
3 particular application. Install expansion fittings in raceways every 200-foot linear run or
4 wherever structural expansion joints are crossed.
- 5 K. Use roughing in dimensions of electrically operated unit furnished by supplier. Set
6 conduit and boxes for connection to units only after receiving review of dimensions and
7 after checking location with other trades.
- 8 L. Provide nylon pull cord in all empty conduits. Test conduits required to be installed, but
9 left empty; test with ball mandrel. Clear any conduit, which rejects ball mandrel. Pay
10 costs involved for restoration of conduit and surrounding surfaces to original condition.

11 3.02 CONDUIT INSTALLATION

- 12 A. Use Schedule 80 PVC throughout above grade and for turn ups including elbows and
13 bends and where required.
- 14 B. Use rigid aluminum above grade between control panel and conduit seals.
- 15 C. Cut conduits straight and properly ream.
- 16 D. Field bend conduit with benders designed for purpose so as not to distort nor vary
17 internal diameter.
- 18 1. Size conduits to meet NFPA-70, except no conduit smaller than 3/4-inches shall be
19 embedded in concrete or installed below grade.
- 20 2. Fasten conduit terminations in sheet metal enclosures by threaded hubs, and terminate
21 with insulating bushings.
- 22 3. Complete installation of electrical raceways before starting installation of
23 cables/wires within raceway.

24 3.03 CONCEALED CONDUITS

- 25 A. Install coupling full depth to ensure watertight integrity.
- 26 B. Install underground conduits minimum of 24-inches below finished grade.

27 3.04 CONDUITS IN CONCRETE SLAB

- 28 A. Place conduits between bottom reinforcing steel and top reinforcing steel.
- 29 B. Place conduits either parallel, or at 90° (degrees) to main reinforcing steel.
- 30 C. Separate conduits by not less than diameter of largest conduit to ensure proper concrete
31 bond.
- 32 D. Conduits crossing in slab must be reviewed for proper cover by the County.

1 E. Embedded conduit diameter is not to exceed 1/3 (one-third) of slab thickness.

2 F. Install conduits as not to damage or run through structural members.

3 3.05 NON METALLIC CONDUITS

4 A. Make solvent cemented joints in accordance with recommendations of manufacturer.

5 B. Install PVC conduits in accordance with NFPA-70 and in compliance with local
6 practices.

7 3.06 CONDUIT FITTINGS

8 A. Construct locknuts for securing conduit to metal enclosure with sharp edge for digging
9 into metal, and ridged outside circumference for proper fastening.

10 B. Install insulated type bushings for terminating conduits. Bushings shall have cast flared
11 bottom and ribbed sides. Upper edge to have phenolic insulating ring molded into
12 bushing. Bushings shall be "O.Z" type or "B" or equal.

13 C. Bushings shall have screw type grounding terminal.

14 D. Miscellaneous fittings such as reducers, chase nipples, 3-piece unions, and plugs to be
15 specifically designed for their particular application.
16

17 **END OF SECTION**

- 1 D. UL Compliance: Comply with applicable requirements of UL Std. 83, "Thermoplastic
2 Insulated Wires and Cables" and Std. 486A, "Wire Connectors and Soldering for Use
3 With Copper Conductors".
- 4 E. UL Compliance: Provide wiring/cablings and connector products, which are UL, listed
5 and labeled.
- 6 F. NEMA/ICEA Compliance: Comply with NEMA/ICEA Std. Pub/No's WC5,
7 Thermoplastic Insulated Wires and Cable for the "Transmission and Distribution of
8 Electrical Energy", and WC30, "Color Coding of Wires and Cables", pertaining to
9 electrical power type wires and cables.
- 10 G. IEEE Compliance: Comply with applicable requirements of IEEE Standards 82, "Test
11 Procedures for Impulse Voltage Tests on Insulated Conductors", and Standard. 241,
12 "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings"
13 pertaining to wiring.
- 14 H. ASTM Compliance: Comply with applicable requirements of ASTM B1, 2, 3, 8, and D-
15 573. Provide copper conductors with conductivity of not less than 98% at 20°C (68°F.)
- 16 I. FOIST Compliance: Comply with Federal Specifications J C 30, "Electrical Cable and
17 Wire (Power, Fixed, Installation)", and W-S-610, "Splice Conductor."
- 18 J. Listing and Labeling: Provide products specified in this Section that are listed and
19 labeled.
- 20 1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code",
21 Article 100.
- 22 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing
23 Laboratory" (NTRL) as defined in OSHA Regulation 1910.7.

24 1.04 SHOP DRAWINGS AND SUBMITTALS

- 25 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
26 to construction in accordance with the General Conditions and specifications Section
27 01300 "Submittals."
- 28 B. Product Data: Submit manufacturer's data on electrical wires, cables, and conductors.
- 29 C. A copy of this specification section, with addendum updates included, and all referenced
30 and applicable sections, with addendum updates included, with each paragraph check-
31 marked to indicate specification compliance or marked to indicate requested deviations
32 from specification requirements. Check marks shall denote full compliance with a
33 paragraph as a whole.
- 34 D. If deviations from the specifications are indicated, and therefore requested by the
35 Contractor, each deviation shall be underlined and denoted by a number in the margin to
36 the right of the identified paragraph, referenced to a detailed written explanation of the
37 reasons for requesting the deviation.

- 1 E. The County shall be the final authority for determining acceptability of requested
2 deviations. The remaining portions of the paragraph not underlined will signify
3 compliance on the part of the Contractor with the specifications.
- 4 F. Failure to include a copy of the marked-up specification sections, along with
5 justification(s) for any requested deviations to the specification requirements, with the
6 submittal shall be sufficient cause for rejection of the entire submittal with no further
7 consideration.

8 **1.05 DELIVERY, STORAGE, AND HANDLING**

- 9 A. Deliver wire and cable properly packaged in factory-fabricated type containers, or wound
10 on NEMA specified type wire and cable reels.
- 11 B. Store wire and cable in clean dry space in original containers. Protect products from
12 weather, damaging fumes, construction debris and traffic.
- 13 C. Handle wire and cable carefully to avoid abrasing, puncturing, and tearing wire and cable
14 insulation and sheathing. Ensure that dielectric resistance integrity of wires/cables is
15 maintained.

16 **PART 2 - PRODUCTS**

17 **2.01 GENERAL**

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

20 **2.02 ACCEPTABLE MANUFACTURERS**

- 21 A. Available Manufacturers: Subject to compliance with requirements, manufacturers
22 offering products which may be incorporated in the Work include, but are not limited to
23 the following:
- 24 1. Wire and Cable
 - 25 a. Alpha Wire Corporation
 - 26 b. Apex Wire and Cable Corp.
 - 27 c. American Insulated Wire Corp.
 - 28 d. American Wire and Cable Co.
 - 29 e. Anaconda-Ericson Inc., Wire and Cable Div.
 - 30 f. Beldon Div.; Cooper Industries
 - 31 g. Brand-Rex Div.; Pyle National Co.
 - 32 h. Cablec
 - 33 i. Cerro Wire and Cable Corp.
 - 34 j. Cleveland Insulated Wire Co.
 - 35 k. Dekoron
 - 36 l. Konite
 - 37 m. Penn

- 1 n. Pirelli
- 2 o. Phelps Dodge Cable and Wire Co.
- 3 p. Rome Cable Corp.
- 4 q. Southwire Corp.
- 5 r. Triangle PWC, Inc.
- 6 2. Connectors
- 7 a. AMP, Inc.
- 8 b. Anderson
- 9 c. Appleton Electric Co.; Emerson Electric Co.
- 10 d. Burndy Corporation
- 11 e. Brand-Rex Div.; Pyle National Co.
- 12 f. Electrical Products Div.; Midland Ross Corp.
- 13 g. General Electric Co.
- 14 h. Ideal Industries, Inc.
- 15 i. 3M Company
- 16 j. Monograms Co.
- 17 k. O-Z/Gedney Co.
- 18 l. Pyrotenax
- 19 m. Southport Industries Inc.
- 20 n. Square D Company
- 21 o. Thomas and Betts Corp.

22 2.03 WIRES, CABLES, AND CONNECTORS

- 23 A. General: Provide electrical wires, cables, and connectors of manufacturer's standard
- 24 materials, as indicated by published product information; designed and constructed as
- 25 recommended by manufacturer, for a complete installation, and for application indicated.
- 26 Except as otherwise indicated, provide copper conductors with conductivity of not less
- 27 than 98% at 20°C (68°F.)

- 28 B. Building Materials: Provide factory-fabricated wires of sizes, ampacity ratings, and
- 29 materials for applications and services indicated. Where not indicated, provide proper
- 30 wire selection as determined by installer to comply with project's installation
- 31 requirements, NFPA-70 and NEMA standards. Select from the following UL types,
- 32 those wires with construction features, which fulfill project requirements.
- 33 1. Type THW/THHN/ THWN, dual rated: For dry or wet locations; maximum operating
- 34 temperature 75°C (167°F.) Insulation, flame retardant, moisture and heat resistant,
- 35 thermoplastic; outer covering, nylon jacket; conductor, annealed copper. NEMA WC-
- 36 5 thermoplastic insulated building wire. 98% conductivity copper, 600V PVC
- 37 insulated with nylon jacket, 75/90 wiring type. Minimum size #12 AWG. For
- 38 control circuits minimum size #14 AWG.
- 39 2. Type XHHW: For dry and wet locations; maximum operating temperature 90°C
- 40 (194°F.) Insulation, flame retardant, cross-linked synthetic polymer; conductor,
- 41 annealed copper.

- 1 3. Type 1 (600 Volt Multi-Conductor Control Conductor Cable, Type TC)
- 2 a. General: Multi conductor control circuit interconnection cable with ground.
- 3 Suitable for installation in open air, in cable trays, conduit or other approved
- 4 raceways. Minimum cable temperature rating 90°C dry locations, 75°C wet
- 5 locations. Passes vertical tray flame test.
- 6 b. Individual Conductors: No. 14 AWG, 7-strand copper.
- 7 c. Insulation and Jackets: Provide conductors having 15-mil PVC insulation with 4-
- 8 mil nylon jacket, and UL listed as Type THHN/THWN.

9 2.04 CABLES FOR VARIABLE FREQUENCY MOTORS

- 10 A. General: All AC motors rated 600 volt (maximum) which are powered from AC Variable
- 11 Frequency Drives (VFDs), so as to permit variable speed operation, shall be wired with
- 12 shielded multiconductor Variable Frequency Drive Cable, specifically manufactured for
- 13 that application in exposed applications. When in conduit, 600V THHN/THWN copper
- 14 wire is acceptable

- 15 B. Conform to NEC Article 336.

- 16 C. Ratings
- 17 1. 1,000 Volt UL flexible motor supply cable
- 18 2. XLPE insulated, XHHW-2 90°C Wet/Dry

- 19 D. Suitable for Class 1, Div. 2 hazardous locations.

- 20 E. Suitable for direct burial, cable tray installation and conduit installation.

- 21 F. Full-sized ground wire or equivalent.

- 22 G. Overall shield with full-sized drain wire or equivalent.

- 23 H. Belden Part No. 295XX, or approved equal.

24 2.05 TYPE 2 (600 VOLT NO. 16 AWG TWISTED, SHIELDED PAIR INSTRUMENTATION

25 CABLE, TYPE TC)

- 26 A. General: Single pair instrumentation cable designed for noise rejection for process
- 27 control, computer, or data log applications. Suitable for installation in cable trays,
- 28 conduit, or other approved raceways. Minimum cable temperature rating shall be 90°C
- 29 dry locations, 75°C wet locations.

- 30 B. Individual Conductors: Bare soft annealed copper, Class B, 7-strand concentric per
- 31 ASTM B 8; 20 AWG, 7-strand tinned copper drain wire.

- 32 C. Insulation and Jacket: Each conductor 15-mil nominal PVC and 4-mil nylon insulation.
- 33 Pair conductors pigmented black and red. Jacket flame-retardant and sunlight and oil
- 34 resistant PVC with 45-mil nominal thickness. Shield 1.35-mil aluminum/mylar
- 35 overlapped to provide 100% coverage.

1 D. Dimension: 0.31-inch nominal OD.

2 2.06 TYPE 3 (600 VOLT NO. 16 AWG, MULTIPLE TWISTED SHIELDED PAIRS WITH A
3 COMMON OVERALL SHIELD INSTRUMENTATION CABLE, TYPE TC)

4 A. General: Twisted, shielded pairs of instrument cables, grouped in a single cable, designed
5 for use as instrumentation, process control, and computer cable. Suitable for installation
6 in cable tray, conduit or other approved raceways. Minimum cable temperature rating
7 shall be 90°C dry locations, 75°C wet locations.

8 B. Conductors: Bare soft annealed copper Class B, 7-strand, concentric per ASTM B 8.
9 Tinned copper drain wires. Pair drain wire size AWG 20, group drain wire size AWG
10 18.

11 C. Insulation and Jacket: Each conductor 15-mil PVC and 4-mil nylon insulation. Pair
12 conductors pigmented black and red with red conductor numerically printed for group
13 identification. Outer jacket flame retardant and sunlight and oil resistant PVC with
14 nominal thickness as shown in table. Individual pair shield 1.35-mil aluminum/mylar.
15 Group shield 2.35-mil aluminum/mylar, overlapped for 100% coverage.

16 D. Dimensions as noted in table below:
17

No. of Pairs	Max. Outside Dimension (inches)	Nominal Jacket Thickness(mils)
4	0.50	45
8	0.77	60
12	0.82	60
24	1.16	60

18

19 2.07 TYPE 4 (600 VOLT NO. 16 AWG, SINGLE TWISTED, SHIELDED TRIAD
20 INSTRUMENTATION CABLE)

21 A. General: Twisted, shielded triad instrument cables, designed for use as instrumentation,
22 process control, and computer cable. Suitable for installation in cable tray, conduit or
23 other approved raceways. Minimum cable temperature rating shall be 90°C dry
24 locations, 75°C wet locations.

25 B. Conductors: Bare soft annealed copper Class B, 7-strand, concentric per ASTM B 8.
26 Tinned copper drain wires. Triad drain wire size AWG 18.

27 C. Insulation and Jacket: Each conductor 15-mil PVC and 4-mil nylon insulation. Triad
28 conductors pigmented black, white and red. Outer jacket flame retardant and sunlight
29 and oil resistant PVC with nominal thickness. Individual triad shield 1.35-mil
30 aluminum/mylar.

1 2.08 EQUIPMENT GROUNDING CONDUCTORS

2 A. Provide stranded copper conductors, as indicated or as required by NEC, for equipment
3 grounding.

4 B. Provide conductors bare.

5 2.09 CONNECTORS

6 A. General: Provide UL type factory-fabricated, metal connectors of sizes, ampacity ratings,
7 materials, types and classes for applications and for services indicated. Where not
8 indicated, provide proper selection as determined by Installer to comply with project's
9 installation requirements, NFPA-70 and NEMA standards. Select from the following
10 those types, classes, kinds and styles of connectors to fulfill project requirements:

- 11 1. Type: Pressure
- 12 2. Type: Crimp
- 13 3. Type: Threaded
- 14 4. Class: Insulated
- 15 5. Kind: Copper (for CU to CU connection)
- 16 6. Style: Butt connection
- 17 7. Style: Elbow connection
- 18 8. Style: Combined "T" and straight connection
- 19 9. Style: "T" connection
- 20 10. Style: 2 or 4 bolt parallel connection. Use of split bolt connectors is prohibited
- 21 11. Style: Tap connection
- 22 12. Style: Pigtail connection
- 23 13. Style: Wire nut connection

24 **PART 3 - EXECUTION**

25 3.01 INSTALLATION OF WIRES AND CABLES

26 A. General: Install electrical cables, wire and wiring connectors as indicated, in compliance
27 with applicable requirements of NFPA-70, NEMA, UL, and NECA's "Standard of
28 Installation" and in accordance with recognized industry practices.

29 B. Coordinate wire/cable installation work including electrical raceway and equipment
30 installation work, as necessary to properly interface installation of wires/cables with other
31 work.

32 C. Install UL type wiring in conduit, for feeders and branch circuits.

33 D. Pull conductors simultaneously where more than 1 is being installed in same raceway.

34 E. Use pulling compound or lubricant, where necessary; compound used must not
35 deteriorate conductor or insulator.

- 1 F. Use pulling means including, fish tape, cable, rope and basket weave wire/cable grips,
2 which will not damage cables or raceways.
- 3 G. Keep conductor splices to a minimum.
- 4 H. Install splices and tapes, which possess equivalent or better mechanical strength and
5 insulation ratings than conductors being spliced.
- 6 I. Use splice and tap connectors, which are compatible with conductor material.
- 7 J. Tighten electrical connectors and terminals, including screws and bolts, in accordance
8 with manufacturer's published torque tightening values. Where manufacturer's torquing
9 requirements are not indicated, tighten connectors and terminals to comply with
10 tightening torques specified in UL Standard 486A and B.
- 11 K. Use only stranded conductors. Exception: Solid conductors size #12 and #10 AWG may
12 be used for receptacle branch circuit wiring and lighting.
- 13 L. Use #10 AWG conductor for 20-ampere, 120-volt branch circuit home runs longer than
14 75-feet, and for 20-ampere, 277-volt branch circuit home runs longer than 200-feet.
- 15 M. Neatly train and lace wiring inside boxes, equipment, and panel boards. Support to
16 prevent conductor movement under fault conditions.
- 17 N. All underground wiring shall be suitable for wet locations per NEC.
- 18 O. Discrete control 120-VAC and 4-20mA signals must not be run in same conduit.
19 Discrete control 120-VAC and 4-20mA signal wiring in control panels and cabinets shall
20 be separated from each other and when required, should cross perpendicular with each
21 other to reduce signal noise.
- 22 P. Avoid unnecessary splices. Splice only in accessible junction or outlet boxes.
- 23 Q. Make all connections with solderless lugs.
- 24 R. Use mechanical connectors for low voltage splices, taps, fixture and motor connections.
- 25 S. Use insulated spade type crimp on connectors for strap screw device terminals.
- 26 T. Where possible use connectors with integral, insulating covers. Otherwise tape
27 uninsulated conductors and connectors to 150% of the insulation value of conductor.
- 28 U. Thoroughly clean wires before installing lugs and connectors.
- 29 V. Make splices, taps and terminations to carry full ampacity of conductors without
30 perceptible temperature rise.

1 3.02 FIELD QUALITY CONTROL

2 A. Prior to energization of circuitry, check installed wires and cables with megohm meter to
3 determine insulation resistance levels to ensure requirements are fulfilled.

4 B. Prior to energization, test wires and cables for electrical continuity and for short circuits.

5 C. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in
6 accordance with requirements. Where necessary, correct malfunctioning units, and then
7 retest to demonstrate compliance.
8

9 **END OF SECTION**

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1 **SECTION 16135**

2 **ELECTRICAL BOXES AND FITTINGS**

3 **PART 1 - GENERAL**

4 1.01 RELATED DOCUMENTS

5 A. Drawings and general provisions of Contract, including General and Supplementary
6 Conditions and Division 1 Specification sections, apply to work of this Section.

7 B. Work described in this Section includes furnishing all labor, materials, equipment, tools
8 and incidentals required for a complete and operable installation of boxes, bushings and
9 locknuts. All equipment shall be installed, adjusted, tested and placed in operation in
10 accordance with these Specifications, the manufacturer's recommendations and as shown
11 on the Drawings.

12 1.02 DESCRIPTION OF WORK

13 A. Extent of electrical box and associated fitting work is indicated by drawings and
14 schedules.

15 B. Types of electrical boxes and fittings specified in this Section include the following:

- 16 1. Outlet boxes
- 17 2. Junction boxes
- 18 3. Pull boxes
- 19 4. Bushings
- 20 5. Locknuts

21 1.03 QUALITY ASSURANCE

22 A. Manufacturers: Firms shall have sufficient experience that will allow for quality and
23 successful manufacture of electrical boxes and fittings of types, sizes and capacities
24 required for manufacture of electrical boxes and fittings required for use in this Project.

25 B. Installer's Qualifications: Firms shall have sufficient experience that will allow for quality
26 and successful installation of electrical boxes and fittings required for this Project.

27 C. NFPA-70 Compliance: Comply with NFPA-70 as applicable to construction and
28 installation of electrical wiring boxes and fittings.

29 D. UL Compliance: Comply with applicable requirements of UL 50, UL 514 Series, and UL
30 886 pertaining to electrical boxes and fittings which are UL listed and labeled.

- 1 E. NEMA Compliance: Comply with applicable requirements of NEMA Standard
2 Publication Numbers OS1, OS2, and Pub.250 pertaining to outlets and device boxes,
3 covers and box supports.
- 4 F. Comply with NECA "Standard of Installation."
- 5 G. Listing and Labeling: Provide products specified in this Section that are listed and
6 labeled.
- 7 1. The Terms "Listed" and "Labeled." As defined in the "National Electrical Code",
8 Article 100.
- 9 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing
10 Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

11 1.04 SHOP DRAWINGS AND SUBMITTALS

- 12 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
13 to construction in accordance with the General Conditions and specifications Section
14 01300 "Submittals."
- 15 B. Product Data: Submit manufacturer's data on electrical boxes and fittings.
- 16 C. A copy of this specification section with addendum updates included, and all referenced
17 and applicable sections with addendum updates included, with each paragraph check-
18 marked to indicate specification compliance or marked to indicate requested deviations
19 from specification requirements. Check marks shall denote full compliance with a
20 paragraph as a whole.
- 21 D. If deviations from the specifications are indicated and therefore requested by the
22 Contractor, each deviation shall be underlined and denoted by a number in the margin to
23 the right of the identified paragraph, referenced to a detailed written explanation of the
24 reasons for requesting the deviation.
- 25 E. The County shall be the final authority for determining acceptability of requested
26 deviations. The remaining portions of the paragraph not underlined will signify
27 compliance on the part of the Contractor with the specifications.
- 28 F. Failure to include a copy of the marked-up specification sections along with
29 justification(s) for any requested deviations to the specification requirements, with the
30 submittal shall be sufficient cause for rejection of the entire submittal with no further
31 consideration.

1 **PART 2 - PRODUCTS**

2 2.01 GENERAL

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

5 2.02 FABRICATED MATERIALS

6 A. Outlet Boxes: Provide corrosion resistant cast metal rain tight outlet wiring boxes, of
7 types, shapes and sizes, including depth of boxes, with threaded conduit holes for
8 fastening electrical conduit, cast metal face plates with spring-hinged watertight caps
9 suitably configured for each application, including face plate gaskets and corrosion
10 resistant plugs and fasteners.

- 11 1. Manufacturers: Subject to compliance with requirements, provide rain tight outlet
12 boxes of 1 of the following:
- 13 a. Appleton Electric; Emerson Electric Co.
 - 14 b. Arrow Hart Div.; Crouse-Hinds Co.
 - 15 c. Bell Electric; Square D Co.
 - 16 d. Harvey Hubbell, Inc.
 - 17 e. OZ/Gedney; General Signal Co.
 - 18 f. Pass and Seymour, Inc.

19 B. Junction and Pull Boxes: Provide NEMA 4X Stainless Steel junction and pull boxes, with
20 screw-on covers; of types, shapes, and sizes to suit each respective location and
21 installation; with welded seams and equipped with stainless steel nuts, bolts, screws and
22 washers.

- 23 1. Manufacturers: Subject to compliance with requirements, provide junction and pull
24 boxes of 1 of the following:
- 25 a. Adalet-PLM Div.; Scott Fetzer Co.
 - 26 b. Appleton Electric; Emerson Electric Co.
 - 27 c. Arrow Hart Div.; Crouse Hinds-Co.
 - 28 d. Bell Electric; Square D Company
 - 29 e. OZ/Gedney Co.; General Signal Co.
 - 30 f. Spring City Electrical Mfg. Co.

31 C. Bushings, Knockout Closures and Locknuts: Provide corrosion resistant box knockout
32 closures, conduit locknuts and malleable iron conduit bushings, offset connectors, of
33 types and sizes, to suit respective installation requirements and applications.

- 34 1. Manufacturers: Subject to compliance with requirements, provide bushings, knockout
35 closures, locknuts and connectors of 1 of the following:
- 36 a. Adalet-PLM Div.; Scott Fetzer Co.
 - 37 b. AMP, Inc.
 - 38 c. Arrow Hart Div.; Crouse-Hinds Co.
 - 39 d. Appleton Electric Co.; Emerson Electric Co.
 - 40 e. Bell Electric; Square D Co.
 - 41 f. Midland Ross Corp.

- 1 g. Midwest Electric; Cooper Industries, Inc.
- 2 h. OZ/Gedney Co.; General Signal Co.
- 3 i. RACO Div.; Harvey Hubbell, Inc.
- 4 j. Thomas and Betts Co. Inc.

5 **PART 3 - EXECUTION**

6 3.01 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

- 7 A. General: Install electrical boxes and fittings as indicated, in accordance with
- 8 manufacturer's written instructions, applicable requirements of NFPA-70 and NECA's
- 9 "Standard of Installation", and in accordance with recognized industry practices to fulfill
- 10 project requirements.

- 11 B. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices,
- 12 and raceway installation work.

- 13 C. Provide weather tight outlets at all locations.

- 14 D. Provide knockout closures to cap unused knockout holes where blanks have been
- 15 removed.

- 16 E. Install electrical boxes in those locations, which ensure ready accessibility to enclosed
- 17 electrical wiring.

- 18 F. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which
- 19 attached, or solidly embed electrical boxes in concrete or masonry.

- 20 G. Provide electrical connections for installed boxes.

- 21 H. Subsequent to installation of boxes, protect boxes from construction debris and damage.

22 3.02 GROUNDING

- 23 A. Upon completion of installation work, properly ground electrical boxes and demonstrate
- 24 compliance with requirements.
- 25

26 **END OF SECTION**

1 1.03 QUALITY ASSURANCE

- 2 A. Manufacturers: Firms shall have sufficient experience and be regularly engaged in
3 manufacture of electrical connectors and terminals, of types and rating required, and ancillary
4 connection materials, including electrical insulating tape, soldering fluxes, and cable ties,
5 whose products have been in satisfactory use in projects with similar service as this Project.
- 6 B. Installer's Qualifications: Firms shall have sufficient experience to allow for quality and
7 successful installation utilizing electrical connections for equipment for this Project.
- 8 C. NFPA-70 Compliance: Comply with applicable requirements of NFPA-70 as to type of
9 products used and installation of electrical power connections (terminals and splices), for
10 junction boxes, motor starters and disconnect switches.
- 11 D. IEEE Compliance: Comply with Std. 241, "IEEE Recommended Practice for Electric
12 Power Systems in Commercial Buildings" pertaining to connections and terminations.
- 13 E. ANSI Compliance: Comply with applicable requirement of ANSI/NEMA and ANSI/EIA
14 standards pertaining to products and installation of electrical connections for equipment.
- 15 F. UL Compliance: Comply with UL Std.486A, "Wire Connectors and Soldering Lugs for
16 Use with Copper Conductors" including, but not limited to, tightening of electrical
17 connectors to torque values indicated. Provide electrical connection products and
18 materials which are UL listed and labeled.

19 1.04 SHOP DRAWINGS AND SUBMITTALS

- 20 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
21 to construction in accordance with the General Conditions and specifications Section
22 01300 "Submittals."
- 23 B. Product Data: Submit manufacturer's data on electrical connections for equipment
24 products and materials.
- 25 C. A copy of this specification section with addendum updates included, and all referenced
26 and applicable sections with addendum updates included, with each paragraph check-
27 marked to indicate specification compliance or marked to indicate requested deviations
28 from specification requirements. Check marks shall denote full compliance with a
29 paragraph as a whole.
- 30 D. If deviations from the specifications are indicated, and therefore requested by the
31 Contractor, each deviation shall be underlined and denoted by a number in the margin to
32 the right of the identified paragraph, referenced to a detailed written explanation of the
33 reasons for requesting the deviation.
- 34 E. The County shall be the final authority for determining acceptability of requested
35 deviations. The remaining portions of the paragraph not underlined will signify
36 compliance on the part of the Contractor with the specifications.

1 F. Failure to include a copy of the marked-up specification sections along with
2 justification(s) for any requested deviations to the specification requirements, with the
3 submittal shall be sufficient cause for rejection of the entire submittal with no further
4 consideration.

5 **PART 2 - PRODUCTS**

6 2.01 GENERAL

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

9 2.02 ACCEPTABLE MANUFACTURERS

10 A. Manufacturers: Subject to compliance with requirements, provide products of one of the
11 following (for each type of product):

- 12 1. Adalet PLM Div., Scott and Fetzer Co.
- 13 2. Allen Stevens Conduit Fittings Corp.
- 14 3. AMP Inc.
- 15 4. Appleton Electric Co.
- 16 5. Arrow Hart Div., Crouse Hinds Co.
- 17 6. Burndy Corp.
- 18 7. General Electric Co.
- 19 8. Harvey Hubbell Inc.
- 20 9. Ideal Industries, Inc.
- 21 10. Pyle National Co.
- 22 11. Reliable Electric Co.
- 23 12. Square D Company
- 24 13. Thomas and Betts Corp.

25 2.03 MATERIALS AND COMPONENTS

26 A. General: For each electrical connection indicated, provide complete assembly of materials,
27 including but not necessarily limited to; pressure connectors, terminals (lugs), electrical
28 insulating tape, heat shrinkable insulating tubing, cables ties, solderless wire nuts, and other
29 items and accessories as needed to complete splices and terminations of types indicated.

30 2.04 CONDUIT, TUBING AND FITTINGS

31 A. General: Provide conduit, tubing, and fittings of types, grades, sizes, and weights (wall
32 thickness) indicated for each type service. Where types and grades are not indicated,
33 provide proper selection to fulfill wiring requirements, and comply with NFPA-70
34 requirements for raceways. Provide products complying with Section 16110 "Raceways"
35 and in accordance with the following listing of conduit, tubing and fittings:

- 36 1. Schedule 80 PVC conduit
- 37 2. Schedule 80 PVC fittings

- 1 3. Liquid-tight flexible metal conduit
- 2 4. Liquid-tight flexible metal conduit fittings
- 3 5. Rigid aluminum conduit
- 4 6. Rigid aluminum conduit fittings

5 2.05 WIRES, CABLES AND CONNECTORS

- 6 A. General: Provide wires, cables, and connectors complying with Section 16120 "Wires
7 and Cables."
- 8 B. Wires/Cables: Unless otherwise indicated, provide wires/cables (conductors) for
9 electrical connections which match, including sizes and ratings, of wires/cables which are
10 supplying electrical power. Provide copper conductors with conductivity of not less than
11 98% at 20°C (68°F)
- 12 C. Connectors and Terminals: Provide electrical connectors and terminals which mate and
13 match, including sizes and ratings, with equipment terminals and are recommended by
14 equipment manufacturer for intended applications.
- 15 D. Electrical Connection Accessories: Provide electrical insulating tape, heat shrinkable
16 insulating tubing and boots, wire nuts and cable ties as recommended for use by
17 accessories manufacturers for type services indicated.

18 **PART 3 - EXECUTION**

19 3.01 INSPECTION

- 20 A. Inspect area and conditions under which electrical connections for equipment are to be
21 installed and notify Contractor in writing of conditions detrimental to proper completion
22 of the Work. Do not proceed with the Work until unsatisfactory conditions have been
23 corrected in a manner acceptable to Installer and/or owner as applicable.

24 3.02 INSTALLATION OF ELECTRICAL CONNECTIONS

- 25 A. Install electrical connections as indicated; in accordance with equipment manufacturer's
26 written instructions and with recognized industry practices, and complying with
27 applicable requirements of UL, NFPA-70, and NECA's "Standard of Installation" to
28 ensure that products fulfill requirements.
- 29 B. Coordinate with other work, including wires/cables, raceways and equipment installation,
30 as necessary to properly interface installment of electrical connections for equipment
31 with other work.
- 32 C. Connect electrical power supply conductors to equipment conductors in accordance with
33 equipment manufacturer's written instructions and wiring diagrams. Mate and match
34 conductors of electrical connections for proper interface between electrical power
35 supplies and installed equipment.

- 1 D. Cover splices with electrical insulating material equivalent to, or of greater insulation
2 resistivity ratings, than electrical insulation rating of those conductors being spliced.
- 3 E. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation
4 properly to ensure uniform and neat appearance where cables and wires are terminated.
5 Exercise care to avoid cutting through tapes, which will remain on conductors. Also
6 avoid "ringing" copper conductors while skinning wire.
- 7 F. Tighten connectors and terminals, including screws and bolts, in accordance with
8 equipment manufacturers published torque-tightening values for equipment connectors.
9 Accomplish tightening by utilizing proper torquing tools, including torque screwdriver,
10 bean type torque wrench, and ratchet wrench with adjustable torque settings. Where
11 manufacturer's torquing requirements are not available, tighten connectors and terminals
12 to comply with torquing values contained in UL's 486A.
- 13 G. Provide liquid tight flexible conduit for connections of motors and other electrical
14 equipment where subject to movement and vibration.
- 15 H. Fasten identification markers to each electrical power supply wire/cable conductor which
16 indicates their voltage, phase and feeder number in accordance with Section 16195
17 "Electrical Identification." Affix markers on each terminal conductor, as close as
18 possible to the point of connection.

19 3.03 FIELD QUALITY CONTROL

- 20 A. Upon completion of installation of electrical connections, and after circuitry has been
21 energized with rated power source, test connections to demonstrate capability and
22 compliance with requirements. Ensure that direction of rotation of each motor fulfills
23 requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.
24

25 **END OF SECTION**

1

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- 1 E. IEEE Compliance: Comply with applicable requirements of IEEE Standard 241,
2 "Recommended Practice for Electric Power Systems in Commercial Buildings",
3 pertaining to electrical wiring systems.
- 4 F. NEMA Compliance: Comply with applicable portions of NEMA Standards Publication
5 Number WD 1, "General Purpose Wiring Devices," and WD 5 "Specific Purpose Wiring
6 Devices."
- 7 G. OSHA Compliance: Comply with latest standards of the U.S. Department of Labor,
8 Occupational Safety and Health Administration.
- 9 H. Listing and Labeling: Provide products that are listed and labeled for their applications
10 and installation conditions and for the environments in which installed.
- 11 1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code,"
12 Article 100.
- 13 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing
14 Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

15 1.04 SHOP DRAWINGS AND SUBMITTALS

- 16 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
17 to construction in accordance with the General Conditions and specifications Section
18 01300 "Submittals."
- 19 B. Product Data: Submit manufacturer's data on electrical wiring devices.
- 20 C. A copy of this specification section, with addendum updates included, and all referenced
21 and applicable sections, with addendum updates included, with each paragraph check-
22 marked to indicate specification compliance or marked to indicate requested deviations
23 from specification requirements. Check marks shall denote full compliance with a
24 paragraph as a whole.
- 25 D. If deviations from the specifications are indicated, and therefore requested by the
26 Contractor, each deviation shall be underlined and denoted by a number in the margin to
27 the right of the identified paragraph, referenced to a detailed written explanation of the
28 reasons for requesting the deviation.
- 29 E. The County shall be the final authority for determining acceptability of requested
30 deviations. The remaining portions of the paragraph not underlined will signify
31 compliance on the part of the Contractor with the specifications.
- 32 F. Failure to include a copy of the marked-up specification sections, along with
33 justification(s) for any requested deviations to the specification requirements, with the
34 submittal shall be sufficient cause for rejection of the entire submittal with no further
35 consideration.

1 **PART 2 - PRODUCTS**

2 2.01 GENERAL

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

5 2.02 ACCEPTABLE MANUFACTURERS

6 A. Manufacturers: Subject to compliance with requirements, provide wiring devices of one
7 of the following (for each type and rating of wiring device):

- 8 1. Arrow Hart Div., Crouse Hinds Co.
- 9 2. Bryant Electric Co.
- 10 3. Harvey Hubbell Inc.
- 11 4. Leviton Mfg. Co.
- 12 5. Pass and Seymour Inc.
- 13 6. Crouse Hinds.
- 14 7. Appleton.
- 15 8. Or approved equal.

16 B. Wiring devices shall be UL approved for the current and voltage specified and shall
17 comply with NEMA WD 1. Devices shall contain provisions for back wiring and side
18 wiring with captive binding screws.

19 Provide devices colored to conform to manufacturer's or industry standard for special use
20 such as orange for isolated ground receptacles, blue for surge suppression receptacles,
21 and red for emergency power receptacles. Unless shown otherwise on the Drawings or
22 Schedules, normal use devices shall be gray, except those located in finished areas shall
23 be ivory.

24 2.03 FABRICATED WIRING DEVICES

25 A. General: Provide factory fabricated wiring devices, in types, colors, and electrical ratings
26 for applications indicated and which comply with NEMA Standards Publication Number
27 WD 1.

28 2.04 RECEPTACLES

29 A. Comply with NEMA Standard WD 1.

30 B. Enclosures: NEMA 1 equivalent, except as otherwise indicated.

31 C. Color: Unless noted otherwise by Architect or required by Code.

- 32 1. Surface mounted unfinished areas: Gray.
- 33 2. Flush mounted finished areas: Ivory.

- 1 D. Receptacles, Straight-Blade and Locking Type: Comply with UL Standard 498, heavy-
2 duty specification grade except as otherwise indicated.
- 3 E. Receptacles, Straight-Blade, Special Features: Comply with the basic requirements
4 specified herein for straight-blade receptacles of the class and type indicated, and with the
5 following additional requirements:
- 6 1. Ground-Fault Circuit Interrupter (GFCI) Receptacles: UL Standard 943, feed-through
7 type, with integral NEMA 5-20R duplex receptacles arranged to protect connected
8 downstream receptacles on the same circuit. Design units for installation in a 2-1/2-
9 inch deep outlet box without an adapter. Ground-fault trip level shall be 5
10 milliamperes, and shall be noise-suppressed to the extent that nuisance tripping will
11 be either eliminated or minimized.
- 12 2. Line and load terminal screws: Ensure that connection to load terminals will ensure
13 ground fault protection for other receptacles and loads connected to those terminals.
- 14 F. Receptacles, Industrial Heavy-Duty: Conform to NEMA Standard PK 4.
- 15 G. Except as otherwise noted on the Drawings or specified herein, receptacles shall be 125
16 Volt, 20-Ampere, ANSI C73.12, configuration 5-20R; grounded type; conforming to FS
17 W-C-596/41 for single and FS W-C-596/40 for duplex receptacles and shall accept
18 NEMA 5-15P and 5-20P plugs. Where the manufacturer of cord-connected equipment
19 requires an isolated ground, a receptacle with isolated ground shall be provided.
- 20 H. Ground Fault Interrupter (GFI) Receptacles: Provide duplex specification grade GFI
21 receptacles tripping at 5-milliamperes; rated 20-amps, 120 volts, NEMA Configuration 5-
22 20R. Use units meeting NEMA WD 1, fitting standard sized outlet boxes having
23 provision for testing, and ivory in color. Use standard model where ground fault
24 protection is needed. Acceptable manufacturers are Square D, General Electric, or equal.
- 25 I. Except as otherwise noted on the Drawings or specified herein, outdoor, process
26 corrosive and chemical areas, receptacles shall be duplex, 20-ampere, NEMA 5-20R, and
27 shall accept NEMA 5-15P and 5-20P plugs. Receptacle and plug shall be corrosion
28 resistant but not marine duty with weatherproof lift covers. For outdoor locations use
29 plastic or Lexan phenolic cover which can maintain the weatherproof integrity while in
30 use.
- 31 J. Receptacles shall be side or back wired with two screws per terminal.
- 32 K. Body shall be thermoplastic compound or impact resistant nylon face supported by
33 mounting yoke having plaster ears.
- 34 L. Three phase receptacles and plugs shall be suitable for 480 volt, 3-phase, 4-wire service, with
35 ampere ratings as specified. Receptacles and plugs shall be designed so that the grounding
36 pole is permanently connected to the housing. The grounding pole shall make contact before
37 the line poles are engaged when the plug is connected to the receptacle housing. The plug
38 sleeve shall also make contact with the receptacle housing before the line and load poles
39 make contact. Receptacles shall be provided complete with cast back box, angle adapter,
40 gaskets, and a gasketed screw-type, weathertight cap with chain fastener.

1 M. Install convenience outlets, in suitable steel outlet boxes centered at the height of 18-
2 inches above the finished floor, 6-inches above countertop or at the backsplash level, or
3 as indicated on the Drawings. Coordinate with equipment and architectural Drawings.

4 2.05 SWITCHES

5 A. Snap: General purpose switches NEMA WD-1, shall be quiet AC type, NRTL listed and
6 labeled as complying with UL Standard 20 "General Use Snap Switches," and with
7 Federal Specification W-S 896, specification grade, back and side wired, and shall be
8 provided in accordance with rated capacities as required or as indicated on Drawings or
9 Schedules. Switches shall match receptacles in color. Unless otherwise indicated
10 switches shall be 20-amp, 120/277 volt, toggle handle.

11 B. Double Snap: Provide general duty flush double pole AC quiet switches, 20-amperes,
12 120/277 volts, with mounting yoke insulated from mechanism, equip with plaster ears,
13 switch handles, side wired screw terminals, with break off tab features, which allow
14 wiring with separate or common feed.

15 C. Switches shall be 20-ampere with weatherproof/corrosion resistant neoprene plate for
16 corrosive and outdoor areas. Switches shall be mounted in "FS" type copper-free
17 aluminum or PVC mounting boxes.

18 D. Switches shall be totally enclosed, specification grade, rated 20-ampere, 277/120 volt
19 AC; conforming to FS W-S-896E, with phenolic body, base and toggles.

20 2.06 WIRING DEVICE ACCESSORIES

21 A. Cover plates: Provide cover plates for single and combination wiring devices, of types,
22 sizes and with ganging and cutouts as indicated. Select plates which mate and match
23 wiring devices to which attached. Construct with metal screws for securing plates to
24 devices. Cover plates shall be cast ferrous or aluminum, weatherproof, gasketed type.

25 **PART 3 - EXECUTION**

26 3.01 INSTALLATION OF WIRING DEVICES

27 A. Install wiring devices as indicated, in accordance with manufacturer's written
28 instructions, applicable requirements of NFPA-70 and NECA's "Standard of Installation"
29 and in accordance with recognized industry practices to fulfill project requirements.

30 B. Coordinate with other work, including painting, electrical boxes and wiring work, as
31 necessary to interface installation of wiring devices with other work.

32 C. Install wiring devices only in electrical boxes, which are clean, free from excess building
33 materials, dirt and debris.

34 D. Install wiring devices after wiring work is completed.

- 1 E. Tighten connectors and terminals, including screws and bolts, in accordance with
2 equipment manufacturer's published torque tightening values for wiring devices. Where
3 manufacturer's torquing requirements are not indicated, tighten connectors and terminals
4 to comply with tightening torques specified in UL Standards 486A and B. Use properly
5 scaled torque indicating hand tool.
- 6 F. Unless noted otherwise on the Drawings, receptacles and jacks shall be mounted 18-
7 inches above finished floor or approximately 6-inches above countertops, work surfaces
8 or similar surfaces where applicable. Switches shall be mounted 48-inches above
9 finished floor, unless noted otherwise. For wet or damp unfinished areas receptacles
10 shall be mounted at 24-inches.
- 11 G. Boxes shall be independently supported by galvanized brackets, expansion bolts, toggle
12 bolts, or machine or wood screws as appropriate. Wooden plugs inserted in masonry or
13 concrete shall not be used as a base to secure boxes, nor shall welding or brazing be used
14 for attachment. Where installed outdoors or subject to corrosion, all supporting brackets
15 shall be 316 Stainless Steel.

16 3.02 GROUNDING

- 17 A. Provide equipment-grounding connections for wiring devices, unless otherwise indicated.
18 Tighten connections to comply with tightening torques specified in UL Standard 486A to
19 assure permanent and effective grounds.
- 20 B. All wiring devices shall be grounded per Code.
- 21 C. Isolated Ground Receptacles: Connect to isolated grounding conductor routed to
22 designated isolated equipment ground terminal of electrical system.

23 3.03 TESTING

- 24 A. Prior to energizing circuitry, test wiring for electrical continuity, and for short circuits.
25 Ensure proper polarity of connections is maintained. Subsequent to energization, test
26 wiring devices to demonstrate compliance with requirements.
- 27 B. Testing: Test wiring devices for proper polarity and ground continuity. Operate each
28 operable device at least 6 (six) times.
- 29 C. Test ground-fault circuit interrupter operation with both local and remote fault
30 simulations according to manufacturer recommendations.
- 31 D. Replace damaged or defective components.

32 **END OF SECTION**

- 1 E. NEMA Compliance: Comply with applicable requirements of NEMA Standards
2 Publication Number KS 1, "Enclosed Switches" and 250 "Enclosures for Electrical
3 Equipment" (1,000 volts maximum).
- 4 F. Listing and Labeling: provide disconnect switches specified in this Section that are listed
5 and labeled.
- 6 1. The Terms "Listed" and "Labeled." As defined in the "National Electrical Code",
7 Article 100.
- 8 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing
9 Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

10 **1.04 SHOP DRAWINGS AND SUBMITTALS**

- 11 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
12 to construction in accordance with the General Conditions and specifications Section
13 01300 "Submittals."
- 14 B. Data: Submit manufacturer's data on circuit and motor disconnect switches.
- 15 C. A copy of this specification section, with addendum updates included, and all referenced
16 and applicable sections, with addendum updates included, with each paragraph check-
17 marked to indicate specification compliance or marked to indicate requested deviations
18 from specification requirements. Check marks shall denote full compliance with a
19 paragraph as a whole.
- 20 D. If deviations from the specifications are indicated, and therefore requested by the
21 Contractor, each deviation shall be underlined and denoted by a number in the margin to
22 the right of the identified paragraph, referenced to a detailed written explanation of the
23 reasons for requesting the deviation.
- 24 E. The County shall be the final authority for determining acceptability of requested
25 deviations. The remaining portions of the paragraph not underlined will signify
26 compliance on the part of the Contractor with the specifications.
- 27 F. Failure to include a copy of the marked-up specification sections, along with
28 justification(s) for any requested deviations to the specification requirements, with the
29 submittal shall be sufficient cause for rejection of the entire submittal with no further
30 consideration.

31 **PART 2 - PRODUCTS**

32 **2.01 GENERAL**

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

1 2.02 ACCEPTABLE MANUFACTURERS

2 A. Manufacturer: Subject to compliance with requirements, provide circuit and motor
3 disconnects of one of the following for each type of switch (refer to Appendix D "List of
4 Approved Products."

5 2.03 DISCONNECTS

6 A. Disconnects shall be rated for the maximum available fault current available at the point
7 of connection. For 600V systems, an additional UL approved lockable, non-fused, safety
8 type switch utility service disconnect shall be installed ahead of meter.

9 B. Where pump motor disconnect and starter is not mounted within sight of pump wetwell,
10 where electrical equipment is mounted within a building or other enclosure, provide
11 additional NEMA 4X stainless steel 316 non-fused disconnect for each pump within sight
12 of pump location.

13 C. Enclosed, Non-fusible Switch: 600 Volts, heavy-duty, single throw safety switch, with
14 lockable handle. Quantity of poles and ampere rating shall be as required to meet the
15 application. Also, switches for motor applications shall be horsepower rated to meet or
16 exceed the connected motor load. Square D Class 3110, or equal.

17 D. Enclosure: As specified or required to meet environmental conditions of installed
18 location:

- 19 1. Dry Indoor Locations: NEMA 1
20 2. Outdoor Locations: NEMA 3R, 316 Stainless Steel
21 3. Wet, Damp or corrosive Locations: NEMA 4X , 316 Stainless Steel
22 4. Below Grade Locations: NEMA 4, 316 Stainless Steel
23 5. NEC Class 1 Hazardous Locations: NEMA 7 with applicable Group (A, B, C, D) rating.

24 E. Switches shall have handles lockable with two padlocks and shall have a dual cover
25 interlock.

26 F. Disconnect switches used on single phase, 3-wire or 3-phase, 4-wire applications shall
27 have a factory installed neutral assembly.

28 G. Disconnect switches shall have a field installed grounding lug.

29 2.04 FUSES

30 A. Enclosed, Fusible Switch: 600 Volts, heavy-duty, and single throw safety switch with
31 lockable handle and with clips to accommodate specified fuses. Fuse size shall be per
32 Contract Drawings and/or to match protected equipment manufacturers recommendation.
33 Quantity of poles and ampere rating shall be as required to meet the application. Also,
34 switches for motor applications shall be horsepower rated to meet or exceed the
35 connected motor load. Square D Class 3110, or equal. Provide fuses for equipment as
36 required and as recommended by switch manufacturer, of classes, types, and ratings
37 needed to fulfill electrical requirements for service indicated.

1 **PART 3 - EXECUTION**

2 3.01 **INSTALLATION OF CIRCUIT AND MOTOR DISCONNECT SWITCHES**

3 A. Install circuit and motor disconnect devices as indicated complying with manufacturer's
4 written instructions, applicable requirements of NFPA-70, NEMA and NECA's "Standard
5 of Installation," and in accordance with recognized industry practices.

6 B. Connect disconnect switches and components to wiring system and to ground as
7 indicated and instructed by manufacturer. Tighten electrical connectors and terminals
8 according to manufacturer's published torque-tightening values. Where manufacturer's
9 torque values are not indicated, use those specified in UL 486A and UL 486B.

10 C. Coordinate circuit and motor disconnect device installation work with electrical raceway
11 and cable work, as necessary for proper interface.

12 D. Install disconnect devices for use with motor driven appliances, and motors and
13 controllers within sight of controller position unless otherwise indicated.

14 3.02 **GROUNDING**

15 A. Provide equipment grounding connections, sufficiently tight to assure a permanent and
16 effective ground, for electrical disconnect switches per the National Electrical Code
17 (NEC).

18 3.03 **FIELD QUALITY CONTROL**

19 A. Subsequent to completion of installation of electrical disconnect switches, energize
20 circuitry and demonstrate capability and compliance with requirements. Correct
21 malfunction units at project site where possible, then retest to demonstrate compliance;
22 otherwise remove and replace with new units and retest.

23 **END OF SECTION**

1 **SECTION 16180**

2 **OVER CURRENT PROTECTIVE DEVICES**

3 **PART 1 - GENERAL**

4 1.01 RELATED DOCUMENTS

- 5 A. Drawings and general provisions of Contract, including General and Supplementary
6 Conditions and Division 1 Specification sections, apply to work of this Section.

7 1.02 DESCRIPTION OF WORK

- 8 A. Extent of over-current protective device work is indicated by drawings and schedules.

- 9 B. Work described in this Section includes furnishing all labor, materials, equipment, tools
10 and incidentals required for a complete installation of all electrical equipment and
11 systems with over-current protection All equipment shall be installed, adjusted, tested
12 and placed in operation in accordance with these Specifications, the manufacturer's
13 recommendations and as shown on the Drawings. Types of over-current protective
14 devices in this Section include the following:

- 15 1. Circuit Breakers
16 a. Molded Case

- 17 C. Refer to other Division 16 sections for cable/wire and connector work required in
18 conjunction with over-current protective devices; not work of this Section.

19 1.03 QUALITY ASSURANCE

- 20 A. Manufacturers: Firms shall have sufficient experience in the manufacture of over-current
21 protective devices, of types, sizes, and ratings required, for quality and successful
22 manufacture of over-current and protective devices for use in this Project.

- 23 B. Installer: Firms shall have sufficient experience to allow for quality and successful
24 installation of over-current and protective devices required for this Project.

- 25 C. NFPA-70 Compliance: Comply with NFPA-70 requirements as applicable to
26 construction and installation of over-current protective devices.

- 27 D. UL Compliance: Comply with applicable requirements of UL 489, "Molded Case Circuit
28 Breakers and Circuit Breaker Enclosures." Provide over-current protective devices which
29 are UL listed and labeled.

- 30 E. NEMA Compliance: Comply with applicable requirements of NEMA Standard
31 Publication Numbers AB 1, AB 2, and SG 3 pertaining to molded case and low voltage
32 power type circuit breakers.

- 1 F. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
2 1. The Terms "Listed and Labeled." As defined in the "National Electrical Code,"
3 Article 100.
4 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing
5 Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

6 1.04 SHOP DRAWINGS AND SUBMITTALS

- 7 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
8 to construction in accordance with the General Conditions and specifications Section
9 01300 "Submittals."
- 10 B. Product Data: Submit manufacturer's data on over-current protective devices, including
11 amperes, voltages, and current ratings, interrupting ratings, current limitations, internal
12 inductive and non-inductive loads, time current trip characteristic curves, and mounting
13 requirements.
- 14 C. A copy of this specification section with addendum updates included, and all referenced
15 and applicable sections with addendum updates included, with each paragraph check-
16 marked to indicate specification compliance or marked to indicate requested deviations
17 from specification requirements. Check marks shall denote full compliance with a
18 paragraph as a whole.
- 19 D. If deviations from the specifications are indicated, and therefore requested by the
20 Contractor, each deviation shall be underlined and denoted by a number in the margin to
21 the right of the identified paragraph, referenced to a detailed written explanation of the
22 reasons for requesting the deviation.
- 23 E. The County shall be the final authority for determining acceptability of requested
24 deviations. The remaining portions of the paragraph not underlined will signify
25 compliance on the part of the Contractor with the specifications.
- 26 F. Failure to include a copy of the marked-up specification sections along with
27 justification(s) for any requested deviations to the specification requirements with the
28 submittal, shall be sufficient cause for rejection of the entire submittal with no further
29 consideration.

30 **PART 2 - PRODUCTS**

31 2.01 GENERAL

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

1 2.02 ACCEPTABLE MANUFACTURERS

- 2 A. Manufacturers: Subject to compliance with requirements, provide products of one of the
3 following (for each type and rating of over-current protective device.)
4 1. Circuit Breakers: (See Appendix D "List of Approved Products".)

5 2.03 CIRCUIT BREAKERS

- 6 A. General: Except as otherwise indicated, provide circuit breakers and ancillary
7 components, of types, sizes, ratings and electrical characteristics indicated, which comply
8 with manufacturer's standard design, materials, components, and construction in
9 accordance with published product information and as required for a complete
10 installation.
- 11 B. Molded Case Circuit Breakers: Provide factory assembled, molded case circuit breakers
12 of frame size indicated. Provide breakers with permanent thermal and instantaneous
13 magnetic trips in each pole, and with fault current limiting protection, ampere rating as
14 indicated. Construct with over center, trip free, toggle type operating mechanisms with
15 quick make, quick break action and positive handle trip indication. Provide push to trip
16 button on cover for mechanical tripping circuit breakers. All latch surfaces shall be
17 ground and polished. All poles shall be so constructed that they open, close and trip
18 simultaneously. Circuit breakers must be completely enclosed in a high strength
19 polyester molded case. Ampere rating shall be clearly visible. Contacts shall be on non-
20 welding silver alloy. Arc extinction must be accomplished by means of arc chutes.
21 Construct breakers for mounting and operating in any physical position and operating in
22 an ambient temperature of 40°C. Provide breakers with mechanical screw type
23 removable connector lugs, AL/CU rated. Mount individual circuit breakers complying
24 with requirements for circuit breakers in this Section in enclosure required for the
25 location, unless otherwise indicated. Provide circuit breakers with handles that can be
26 locked in the OFF position. Interlock enclosure and circuit breaker to prevent opening
27 the cover with the circuit breaker in the ON position. Provide thermal magnetic circuit
28 breaker, unless otherwise shown, for one-pole and two pole breakers, breakers operating
29 at 240V or less, and 3 (three) pole branch circuit breakers operating at 480V.

30 **PART 3 - EXECUTION**

31 3.01 INSTALLATION OF OVER CURRENT PROTECTIVE DEVICES

- 32 A. Install over current protective devices as indicated, in accordance with manufacturer's
33 written instructions and with recognized industry practices to ensure that protective
34 devices comply with requirements. Comply with NFPA-70 and NEMA standards for
35 installation of over current protective devices.
- 36 B. Coordinate with other work, including electrical wiring work, as necessary to interface
37 installation of over current protective devices with other work.

1 C. Fasten circuit breakers without causing mechanical stresses, twisting or misalignment
2 being exerted by clamps, supports, or cabling.

3 D. Set field adjustable circuit breakers for trip settings as indicated, subsequent to
4 installation of units.

5 3.02 ADJUST AND CLEAN:

6 A. Inspect circuit breakers operating mechanisms for malfunctioning and, where necessary,
7 adjust units for free mechanical movement.

8 3.03 FIELD QUALITY CONTROL

9 A. Prior to energizing of over current protective devices, test devices for continuity of
10 circuitry and for short circuits. Correct malfunctions in units, and then demonstrate
11 compliance with requirements.
12

13 **END OF SECTION**

1 1.04 SHOP DRAWINGS AND SUBMITTALS

2 A. Submittals shall be submitted to the County/Professional for review and acceptance prior to
3 construction in accordance with the General Conditions and specifications Section 01300
4 "Submittal."

5 B. Product Data: Submit manufacturer's data on supporting devices including catalog cuts,
6 specifications, and installation instructions, for each type of support, anchor, sleeve and seal.

7 C. A copy of this specification section with addendum updates included, and all referenced and
8 applicable sections with addendum updates included, with each paragraph check-marked to
9 indicate specification compliance or marked to indicate requested deviations from specification
10 requirements. Check marks shall denote full compliance with a paragraph as a whole.

11 D. If deviations from the specifications are indicated, and therefore requested by the Contractor, each
12 deviation shall be underlined and denoted by a number in the margin to the right of the identified
13 paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation.

14 E. The County shall be the final authority for determining acceptability of requested
15 deviations. The remaining portions of the paragraph not underlined will signify
16 compliance on the part of the Contractor with the specifications.

17 F. Failure to include a copy of the marked-up specification sections, along with justification(s)
18 for any requested deviations to the specification requirements with the submittal shall be
19 sufficient cause for rejection of the entire submittal with no further consideration.

20 **PART 2 - PRODUCTS**

21 2.01 GENERAL

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

24 2.02 MANUFACTURED SUPPORTING DEVICES

25 A. General: Provide supporting devices which comply with manufacturer's standard
26 materials, design, and construction in accordance with published product information,
27 and as required for complete installation; and as herein specified. Where more than one
28 type of supporting device meets indicated requirement, selection is Installer's option.

29 B. Supports: Provide supporting devices of types, sizes and materials indicated; and having
30 the following construction features:

- 31 1. C Clamps: Stainless Steel: 1/2-inch rod size; approximately 70-pounds per 100-units.
32 2. I Beam Clamps: Stainless steel, 1-1/4-inch x 3/16-inch stock; 3/8-inch cross bolt;
33 flange width 2-inches; approximately 52-pounds per 100-units.
34 3. One-Hole Conduit Straps: For supporting 3/4-inch rigid metal conduit; stainless steel;
35 approximately 7-pounds per 100-units.

- 1 4. Hexagon Nuts: For 1/2-inch rod size; stainless steel; approximately 4-pounds per
- 2 100-units.
- 3 5. Threaded round Steel Rod: Stainless Steel; 1/2-inch dia.; approximately 67-pounds
- 4 per 100-feet.
- 5 6. Offset Conduit Clamps: For supporting rigid metal conduit; stainless steel.

- 6 C. Anchors: Provide anchors of types, sizes, and materials indicated, with the following
- 7 construction features:
- 8 1. Lead Expansion Anchors: 1/2-inch; approximately 38-pounds per 100-units.
- 9 2. Toggle Bolts: Springhead; stainless steel 3/16-inch by 4-inches; approximately 5-
- 10 pounds per 100-units.
- 11 3. Manufacturers: Subject to compliance with requirements, provide anchors of one of
- 12 the following:
- 13 a. Ideal Industries, Inc.
- 14 b. Joslyn Mfg. and Supply Co.
- 15 c. McGraw Edison Co.
- 16 d. Star Expansion Co.
- 17 e. U.S. Expansion Bolt Co.

- 18 D. Sleeves and Seals: Provide sleeves and seals of types, sizes and materials indicated, with
- 19 the following construction features:
- 20 1. U Channel Strut Systems: Provide U channel strut system for supporting electrical
- 21 equipment, 12-gauge stainless steel, of types and sizes indicated; construct with 9/16-
- 22 inch dia. holes, 8-inch on center on top surface, and with fittings which mate and
- 23 match with U channel.
- 24 2. Manufacturers: Subject to compliance with requirements, provide channel systems of
- 25 one of the following:
- 26 a. Allied Tube and Conduit Corp.
- 27 b. B Line Systems, Inc.
- 28 c. Greenfield Mfg. Co., Inc.
- 29 d. Midland Ross Corp.
- 30 e. OZ/Gedney Div.; General Signal Corp.
- 31 f. Power Strut Div.; Van Huffel Tube Corp.
- 32 g. Unistrut Div.; GTE Products Corp.

33 **PART 3 - EXECUTION**

34 3.01 **INSTALLATION OF SUPPORTING DEVICES**

- 35 A. Coordinate with other electrical work, including raceway and wiring work, as necessary
- 36 to interface installation of supporting devices with other work.
- 37

38 **END OF SECTION**

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- 1 D. NEMA Compliance: Comply with applicable requirements of NEMA Standard
2 Publication Numbers WC 1 and WC 2 pertaining to identification of power and control
3 conductors.
- 4 E. Listing and Labeling: provide disconnect switches specified in this Section that are listed
5 and labeled.
 - 6 1. The Terms "Listed" and "Labeled." As defined in the National Electrical Code,
7 Article 100.
 - 8 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing
9 Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

10 1.04 SHOP DRAWINGS AND SUBMITTALS

- 11 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
12 to construction in accordance with the General Conditions and specifications Section
13 01300 "Submittals."
- 14 B. Product Data: Submit manufacturer's data on electrical identification materials and
15 products.
- 16 C. Samples: Submit samples of each color, lettering style and other graphic representation
17 required for each identification material or system.
- 18 D. A copy of this specification section with addendum updates included, and all referenced
19 and applicable sections with addendum updates included, with each paragraph check-
20 marked to indicate specification compliance or marked to indicate requested deviations
21 from specification requirements. Check marks shall denote full compliance with a
22 paragraph as a whole.
- 23 E. If deviations from the specifications are indicated, and therefore requested by the
24 Contractor, each deviation shall be underlined and denoted by a number in the margin to
25 the right of the identified paragraph, referenced to a detailed written explanation of the
26 reasons for requesting the deviation.
- 27 F. The County shall be the final authority for determining acceptability of requested
28 deviations. The remaining portions of the paragraph not underlined will signify
29 compliance on the part of the Contractor with the specifications.
- 30 G. Failure to include a copy of the marked-up specification sections, along with
31 justification(s) for any requested deviations to the specification requirements, with the
32 submittal shall be sufficient cause for rejection of the entire submittal with no further
33 consideration.

1 **PART 2 - PRODUCTS**

2 2.01 GENERAL

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

5 2.02 ACCEPTABLE MANUFACTURERS

6 A. Manufacturers: Subject to compliance with requirements, provide electrical identification
7 products of one of the following (for each type marker):

- 8 1. Alarm Supply Co., Inc.
- 9 2. American Labelmark Co., Labelmaster Subsidiary
- 10 3. Brady, W.H. Co.
- 11 4. Calpico Inc.
- 12 5. Carlton Industries, Inc.
- 13 6. Champion American, Inc.
- 14 7. Cole Flex Corp.
- 15 8. Direct Safety Co.
- 16 9. George Ingraham Corp.
- 17 10. Griffolyn Co.
- 18 11. Ideal Industries, Inc.
- 19 12. LEM Products, Inc.
- 20 13. Markal Co.
- 21 14. National Band and Tag Co.
- 22 15. Panduit Corp.
- 23 16. Seton Name Plate Co.
- 24 17. Standard Signs, Inc.
- 25 18. Tesa Corp.

26 2.03 ELECTRICAL IDENTIFICATION MATERIALS

27 A. General: Except as otherwise indicated provide manufacturer's standard product of
28 categories and types required for each application. Where more than single type is
29 specified for an application, selection is Installer's option, but provides single selection
30 for each application.

31 B. Color Coded Plastic Tape

- 32 1. General: Provide manufacturer's standard self-adhesive vinyl tape not less than 3-mil
33 thick by 1-1/2-inches wide.

34 C. Cable/Conductor Identification Bands

- 35 1. General: Provide manufacturer's standard vinyl cloth self adhesive cable/conductor
36 markers of wrap around type, either pre-numbered plastic coated type, or write on
37 type with clear plastic self adhesive cover flap; numbered to show circuit
38 identification.

1 D. Baked Enamel Danger Signs

- 2 1. General: Provide manufacturer's standard "DANGER" signs of baked enamel finish
3 on 20-gauge steel, of standard red, black, and white graphics; 14-inches by 10-inches
4 size except where 10-inches by 7-inches is the largest size which can be applied
5 where needed, and except where larger size is needed for adequate vision; with
6 recognized standard explanation wording, e.g., HIGH VOLTAGE, KEEP AWAY,
7 BURIED CABLE, DO NOT TOUCH SWITCH.

8 E. Engraved Plastic Laminate Signs

- 9 1. General: Provide engraving stock melamine plastic laminate lamicoïd-type engraved
10 nameplates, complying with FS L P 387, in sizes and thickness indicated, engraved
11 with engraver's standard letter style of sizes and wording indicated, black face and
12 white core plies (letter color) except as otherwise indicated, punched for mechanical
13 fastening except where adhesive mounting is necessary because of substrate.
14 2. Thickness: 1/8-inch except as otherwise indicated.
15 3. Fasteners: Self-tapping stainless steel screws, except contact type permanent adhesive
16 where screws cannot or should not penetrate substrate.

17 2.04 LETTERING AND GRAPHICS

- 18 A. General: Coordinate names, abbreviations and other designations used in electrical
19 identification work with corresponding designations shown, specified or scheduled.
20 Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as
21 recommended by manufacturer or as required for proper identification and
22 operation/maintenance of electrical system and equipment. Comply with ANSI A13.1
23 pertaining to minimum sizes for letters and numbers.

24 **PART 3 - EXECUTION**

25 3.01 APPLICATION AND INSTALLATION

26 A. General Installation Requirements

- 27 1. Install electrical identification products as indicated, in accordance with
28 manufacturer's written instructions, and requirements of NFPA-70.
29 2. Coordination: Where identification is to be applied to surfaces which require finish,
30 install identification after completion of painting.
31 3. Regulations: Comply with governing regulations and requests of governing
32 authorities for identification of electrical work.

33 B. Conduit Identification

- 34 1. General: Where electrical conduit is exposed in spaces with exposed mechanical
35 piping which is identified by color-coded method, apply color-coded identification on
36 electrical conduit in manner similar to piping identification. Except as otherwise
37 indicated use white as coded color for conduit.

- 1 C. Cable/Conductor Identification
2 1. General: Apply cable/conductor identification, including voltage, phase and feeder
3 number, on each cable/conductor in each box/enclosure/cabinet where wires of more
4 than one circuit or communication/signal system are present, except where another
5 form of identification (such as color-coded conductors) is provided. Match
6 identification with marking system used in panel boards, shop drawings, contract
7 documents, and similar previously established identification for project's electrical
8 work.
9 2. Color-Code Conductors: Secondary service, feeder, and branch circuit conductors
10 throughout the secondary electrical system.
11 3. 208/120 Volt System: As follows:
12 a. Phase A: Black
13 b. Phase B: Red
14 c. Phase C: Blue
15 d. Neutral: White
16 e. Ground: Green
17 f. 480/277 Volt System: As follows:
18 g. Phase A: Brown
19 h. Phase B: Orange
20 i. Phase C: Yellow
21 j. Neutral: Gray
22 k. Ground: Green

- 23 D. Operational Identification and Warnings
24 1. General: Wherever reasonably required to ensure safe and efficient operation and
25 maintenance of electrical systems, and electrically connected mechanical systems and
26 general systems and equipment, including prevention of misuse of electrical facilities
27 by unauthorized personnel, install self adhesive plastic signs or similar equivalent
28 identification, instruction or warnings on switches, outlets, and other controls, devices
29 and covers of electrical enclosures. Where detailed instructions or explanations are
30 needed, provide plasticized tags with clearly written messages adequate for intended
31 purposes.

- 32 E. Danger Signs
33 1. General: In addition to installation of danger signs required by governing regulations
34 and authorities, install appropriate danger signs at locations indicated and at locations
35 subsequently identified by Installer of electrical work as constituting similar dangers
36 for persons in or about project.
37 2. High Voltage: Install danger signs wherever it is possible under any circumstances,
38 for persons to come into contact with electrical power of voltages higher than 110 120
39 volts.

- 1 F. Equipment/Systems Identification
2 1. General: Install engraved plastic laminate signs on each major unit of electrical
3 equipment in building; including central or master unit of each electrical system
4 including communication/ control/signal systems, unless unit is specified with its own
5 self-explanatory identification or signal system. Except as otherwise indicated,
6 provide single line of text, 1/2-inch high lettering on 1-1/2-inch high sign (2-inches
7 high where 2 lines are required), white lettering in black field. Provide text matching
8 terminology and numbering of the Contract documents and Shop Drawings. Provide
9 signs for each unit of the following categories of electrical work:
10 a. Electrical cabinets and enclosures
11 b. Access panel/doors to electrical facilities
12 c. Disconnect devices
13
14 G. Install signs at locations indicated or, where not otherwise indicated, at location for best
15 convenience of viewing without interference with operation and maintenance of
16 equipment. Secure to substrate with fasteners, except use adhesive where fasteners
17 should not or cannot penetrate substrate.

18 **END OF SECTION**

- 1 3. UL 1449: Transient Voltage Surge Suppressors, revised Edition, July 2, 1997
- 2 F. Provide service entrance equipment, and accessories which are UL listed and labeled, and
3 marked "SUITABLE FOR USE AS SERVICE EQUIPMENT."
- 4 G. IEEE Compliance: Comply with applicable requirements of IEEE Standard 241
5 pertaining to service entrances.
- 6 H. Listing and Labeling: provide disconnect switches specified in this Section that are listed
7 and labeled.
- 8 1. The Terms "Listed" and "Labeled." As defined in the National Electrical Code,
9 Article 100.
- 10 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing
11 Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

12 1.04 SHOP DRAWINGS AND SUBMITTALS

- 13 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
14 to construction in accordance with the General Conditions and specifications Section
15 01300 "Submittals."
- 16 B. Product Data: Submit manufacturer's data on service entrance equipment and accessories.
- 17 C. Shop Drawings: Submit dimensioned layouts of service entrance equipment, including
18 spatial relationship to proximate electrical equipment.
- 19 D. A copy of this specification section with addendum updates included, and all referenced
20 and applicable sections with addendum updates included, with each paragraph check-
21 marked to indicate specification compliance or marked to indicate requested deviations
22 from specification requirements. Check marks shall denote full compliance with a
23 paragraph as a whole.
- 24 E. If deviations from the specifications are indicated, and therefore requested by the
25 Contractor, each deviation shall be underlined and denoted by a number in the margin to
26 the right of the identified paragraph, referenced to a detailed written explanation of the
27 reasons for requesting the deviation.
- 28 F. The County shall be the final authority for determining acceptability of requested
29 deviations. The remaining portions of the paragraph not underlined will signify
30 compliance on the part of the Contractor with the specifications.
- 31 G. Failure to include a copy of the marked-up specification sections, along with
32 justification(s) for any requested deviations to the specification requirements with the
33 submittal shall be sufficient cause for rejection of the entire submittal with no further
34 consideration.

1 **PART 2 - PRODUCTS**

2 2.01 GENERAL

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

5 2.02 SERVICE ENTRANCE EQUIPMENT

6 A. General: Provide service entrance equipment and accessories; of types, sizes, ratings, and
7 electrical characteristics indicated, which comply with manufacturer's standard materials,
8 design and construction in accordance with published product information, and as
9 required for complete installation; and as herein specified.

10 B. Over Current Protection Devices

11 1. General: Provide over current protective devices complying with Section 16180
12 "Over Current Protective Devices."

13 C. Cable/Wire

14 1. General: Provide cable/wire complying with Section 16120 "Wires and Cables."

15 D. Raceways

16 1. General: Provide raceways complying with Section 16110 "Raceways."

17 E. Surge Protection Devices (SP's)

18 1. Provide surge protection device in accordance with the following requirements:

19 a. Comply with UL 1449 and 1283, current Edition and IEEE 62.41, 62.45.

20 b. Units shall be listed and labeled as meeting requirements of UL 1449 current
21 Edition. The unit shall meet "Testing Requirements" of IEEE 62.41 and 62.45.

22 c. Provide SPD redundant modules providing with phase to phase, phase to neutral
23 phase to ground and neutral to ground protection as applicable for service voltage.

24 d. Provide front panel alarm and test switch and redundant LED indicators to
25 indicate alarm and/or normal operating conditions.

26 e. Provide SPD with AC tracking filter with EMI/RKI filtering up to - 50dB from
27 100K Hz to 100 MHz.

28 f. UL suppression voltage rating (240/480 volt rating).

29

30	L-N	L-G	N-G	L-L
31	400/800	400/800	400	800

32

33 g. SPD unit to match station available voltage and phase.

34 h. Minimum Amperes per Mode Suppression 80,000. For Master Stations (4 or
35 more pumps) or where level control of pump station is provided using Variable
36 Frequency Drives (VFD's,) provide minimum Amperes per Mode Suppression of
37 150,000.

38 i. Comply with MIL Standard 220A Method of Insertion Loss Measurement

- 1 j. NFPA-70 (NEC), National Electrical Code – Surge Protective Device Installation
- 2 Practice and Grounding
- 3 k. ANSI/IEEE C62.41 and C62.45,
- 4 l. UL 67 and UL 891
- 5 m. Provide optional NEMA 4X enclosure and internal fusing/overload protection.
- 6 Plastic NEMA 4X enclosures are acceptable for Surge Protection Devices in lieu
- 7 of Stainless Steel.
- 8 2. Warranty: Minimum 10-year unlimited module replacement.
- 9 3. Approved products: (See Appendix D "List of Approved Products")

10 2.03 SERVICE ENTRANCE ACCESSORIES

- 11 A. Wall and Floor Seals: Provide wall and floor seals complying with Section 16190
- 12 "Supporting Devices" in accordance with the following listing:
- 13 1. Wall and Floor Seals

14 **PART 3 - EXECUTION**

15 3.01 INSTALLATION OF SERVICE ENTRANCE EQUIPMENT

- 16 A. Install service entrance equipment as indicated, in accordance with equipment
- 17 manufacturer's written instructions, and with recognized industry practices, to ensure that
- 18 service entrance equipment fulfills requirements. Comply with applicable installation
- 19 requirements of NFPA-70 and NEMA standards.
- 20 B. Coordinate with other electrical work, including utility company wiring, as necessary to
- 21 interface installation of service entrance equipment work with other work.

22 3.02 GROUNDING

- 23 A. Provide equipment bonding and grounding connectors, sufficiently tight to assure a permanent
- 24 and effective ground, for service entrance equipment and wiring/cablings as indicated.

25 3.03 SURGE PROTECTION DEVICE (SPD)

- 26 A. Install Surge Protection Device so leads are maintained at minimum length and minimum
- 27 number of bends.
- 28 B. Install Surge Protection Device on the load side of the main disconnect using split bolt
- 29 connectors.
- 30 C. All Surge Protection Devices (SPD's) shall be UL approved or NRTL approved to UL
- 31 standards, and installed per respective power company requirements and manufacturer's
- 32 specifications.
- 33 D. Surge Protection Device shall be attached to the load side of the station main disconnect
- 34 and be mounted in a separate NEMA 4X enclosure.

1 3.04 ADJUST AND CLEAN

2 A. Adjust operating mechanisms for free mechanical movement.

3 B. Touch up scratched or marred enclosure surfaces to match original finishes.

4 3.05 FIELD QUALITY CONTROL

5 A. Upon completion of installation of service entrance equipment and electrical circuitry,
6 energize circuitry and demonstrate capability and compliance with requirements. Where
7 possible, correct malfunctioning units at site, then retest to demonstrate compliance;
8 otherwise, remove and replace with new units, and retest.
9

10 **END OF SECTION**

1

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1 **SECTION 16450**

2 **GROUNDING**

3 **PART 1 - GENERAL**

4 1.01 RELATED DOCUMENTS

- 5 A. Drawings and general provisions of Contract, including General and Supplementary
6 Conditions and Division 1 Specification sections, apply to work of this Section.

7 1.02 DESCRIPTION OF WORK

- 8 A. Extent of grounding work is indicated by drawings and schedules. This Section specifies
9 the system for grounding electrical distribution and utilization equipment cabinets, motor
10 frames, manholes, instrumentation, metal surfaces of process/mechanical equipment that
11 contain energized electrical components, metal structures and buildings, outdoor metal
12 enclosures, fences and gates. This Section also includes grounding of electrical systems
13 and equipment and basic requirements for grounding for protection of life, equipment,
14 circuits, and systems. Grounding requirements specified in this Section may be
15 supplemented in other Sections of these Specifications.

- 16 B. Work described in this Section includes furnishing all labor, materials, equipment, tools
17 and incidentals required for a complete installation of grounding system. All work shall
18 be installed, adjusted and tested in accordance with these Specifications, the
19 manufacturer's recommendations and as shown on the Drawings. Types of grounding
20 specified in this Section include the following:

- 21 1. Solid Grounding

- 22 C. Applications of grounding work in this Section include the following:

- 23 1. Underground metal water piping
24 2. Grounding electrodes
25 3. Grounding rods
26 4. Service equipment
27 5. Enclosures
28 6. Equipment
29 7. Fences and gates

30 1.03 QUALITY ASSURANCE

- 31 A. Manufacturers: Firms shall have sufficient experience in the manufacture of electrical
32 connectors, terminals and fittings, of types and ratings required, and ancillary grounding
33 materials, including stranded cables, copper braid and bus, ground rods and plate
34 electrodes, for manufacture of grounding equipment for use in this Project.

- 1 B. Installer: Firms shall have sufficient experience to allow for quality and successful
2 installation of grounding equipment for this Project.
- 3 C. NFPA-70 Compliance: Comply with NFPA-70 requirements as applicable to materials
4 and installation of electrical grounding systems, associated equipment and wiring.
5 Provide grounding products which are UL listed and labeled.
- 6 D. UL Compliance: Comply with applicable requirements of UL Standards Numbers 467
7 and 869 pertaining to electrical grounding and bonding.
- 8 E. IEEE Compliance: Comply with applicable requirements of IEEE Standard 81, 142 and
9 241 pertaining to electrical grounding.
- 10 F. NETA Compliance: Comply with the International Electrical Testing Association, Inc.
11 Acceptance Testing Specifications.
- 12 G. Testing Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL)
13 as defined in OSHA Regulation 1910.7, or a full member company of the international
14 Electrical Testing Association (NETA).
15 1. Testing Agency Field Supervision: Use persons currently certified by NETA or the
16 National Institute for Certification in Engineering Technologies to supervise on-site
17 testing specified in Part 3.
- 18 H. Comply with NFPA 70.
- 19 I. Comply with UL 467.
- 20 J. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
21 1. The Terms "Listed" and "Labeled." As defined in the National Electrical Code,
22 Article 100.
23 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing
24 Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- 25 K. See also Section 16010 Part 1 for listing of applicable reference standards.

26 1.04 SHOP DRAWINGS AND SUBMITTALS

- 27 A. Submittals shall be submitted to the County/Professional for review and acceptance prior
28 to construction in accordance with the General Conditions and specifications Section
29 01300 "Submittals."
- 30 B. Product Data: Submit manufacturer's data on grounding systems and accessories.
- 31 C. A copy of this specification section with addendum updates included, and all referenced
32 and applicable sections with addendum updates included, with each paragraph check-
33 marked to indicate specification compliance or marked to indicate requested deviations
34 from specification requirements. Check marks shall denote full compliance with a
35 paragraph as a whole.

- 1 D. If deviations from the specifications are indicated, and therefore requested by the
2 Contractor, each deviation shall be underlined and denoted by a number in the margin to
3 the right of the identified paragraph, referenced to a detailed written explanation of the
4 reasons for requesting the deviation.
- 5 E. The County shall be the final authority for determining acceptability of requested
6 deviations. The remaining portions of the paragraph not underlined will signify
7 compliance on the part of the Contractor with the specifications.
- 8 F. Failure to include a copy of the marked-up specification sections along with
9 justification(s) for any requested deviations to the specification requirements, with the
10 submittal shall be sufficient cause for rejection of the entire submittal with no further
11 consideration.

12 **PART 2 - PRODUCTS**

13 2.01 GENERAL

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

16 2.02 ACCEPTABLE MANUFACTURERS

- 17 A. Manufacturers: Subject to compliance with requirements, provide grounding products of
18 one of the following:
- 19 1. Apache Grounding; Nashville Wire Products
 - 20 2. Chance: A. B. Chance Co.
 - 21 3. B-Line Systems, Inc.
 - 22 4. Burndy Corp.
 - 23 5. Crouse-Hinds Co.
 - 24 6. Electrical Components Div.; Grould, Inc.
 - 25 7. Galvan Industries, Inc.
 - 26 8. General Electric Supply Co.
 - 27 9. Hastings Fiber Glass Products, Inc.
 - 28 10. Heary Brothers Lightning Protection Co.
 - 29 11. Kearney
 - 30 12. Ideal Industries, Inc.
 - 31 13. Lightning Master Corp.
 - 32 14. Lyncole XIT Grounding.
 - 33 15. O-Z/Gedney Co.
 - 34 16. Raco, Inc.
 - 35 17. Thomas and Betts Corp.

1 2.03 GROUNDING SYSTEMS

2 A. Materials and Components

- 3 1. General: Except as otherwise indicated, provide electrical grounding systems
4 indicated; with assembly of materials, including, but not limited to, cables/wires,
5 connectors, terminals (solderless lugs), grounding rods/electrodes, and plate
6 electrodes, bonding jumper braid, surge arrestors, and additional accessories needed
7 for complete installation. Where more than one type unit meets indicated
8 requirements, selection is Installer's option. Where materials or components are not
9 indicated, provide products complying with NFPA-70, UL, IEEE, and established
10 industry standards for applications indicated.
- 11 2. Governing Requirements: Where types, sizes, ratings, and quantities indicated are in
12 excess of National Electrical Code (NEC) requirements, the more stringent
13 requirement and the greater size, rating, and quantity indications shown shall be
14 adhered.
- 15 3. A counterpoise cable grounding system installed a minimum of 30-inches below
16 grade, shall be installed with connections to at least the following equipment:
- 17 a. Wetwell cover
 - 18 b. Valve vault cover
 - 19 c. Control panels
 - 20 d. Generator
 - 21 e. Electrical system grounding electrode conductor
 - 22 f. Main disconnect switch
 - 23 g. Fence
 - 24 h. Emergency bypass piping and station back flow preventer and water spigot to be
25 bonded
 - 26 i. Exception: Ground connection to fencing is not required for PVC coated chain
27 link fence framing, concrete block wall, or wood fencing.
- 28 4. Provide raceways, and electrical boxes and fittings complying with accordance with
29 the following listing:
- 30 a. PVC conduit
 - 31 b. PVC conduit fittings
 - 32 c. Liquid-tight flexible metal conduit
 - 33 d. Liquid-tight flexible metal conduit fittings
 - 34 e. Rigid aluminum conduit
 - 35 f. Rigid aluminum conduit fittings

36 B. Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding
37 connections matching power supply wiring materials and sized according to NFPA-70.

38 C. Ground Rods: Steel with copper welded exterior, 3/4-inch dia. x 10-feet.

39 D. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-
40 shrinkable insulating tubing, welding materials, bonding straps, as recommended by
41 accessories manufacturers for type services indicated.

42 E. Comply with Division 16 Section 16120 "Wires and Cables." Conform the NEC Table 8,
43 except as otherwise indicated, for conductor properties, including stranding.

- 1 F. Equipment Grounding Conductors: Insulated copper with green color insulation.
- 2 G. Grounding-Electrode Conductors: Stranded copper cable.
- 3 H. Underground Conductors: Bare and stranded copper.
- 4 I. Bare Copper Conductors: Conform to the following:
- 5 1. Solid Conductors: ASTM B3
- 6 2. Assembly of Stranded conductors: ASTM B8
- 7 J. Ground cable shall be soft-drawn, bare annealed copper, concentric stranded, as specified.
- 8 K. The minimum sizes shall be as follows, where American Wire Gauge (AWG) cable sizes
- 9 are not shown or specified:
- | | | |
|----|-------------------------|----------------|
| 10 | 5 and 15 kV switchgear | 2/0 or 4/0 AWG |
| 11 | 5 kV motor starters | 2/0 or 4/0 AWG |
| 12 | 15 kV-5 kV transformers | 2/0 or 4/0 AWG |
| 13 | 5 kV-480V transformers | 2/0 or 4/0 AWG |
| 14 | 480V switchgear | 2/0 or 4/0 AWG |
| 15 | 480V switchboards | 2/0 or 4/0 AWG |
| 16 | 480V MCC and | 2/0 or 4/0 AWG |
| 17 | Cable tray | 2/0 or 4/0 AWG |
| 18 | Large motors 250 hp & > | 2/0 or 4/0 AWG |
| 19 | Lighting & Power panels | 2 AWG |
| 20 | Exposed metal cabinets | 2 AWG |
| 21 | Electrical equipment | 2 AWG |
| 22 | Buildings and enclosure | 2 AWG |
| 23 | Fences and gates | 2 AWG |
| 24 | Motors 25 hp to 250 hp | 2 AWG |
| 25 | Motors 1 hp to 25 hp | 6 AWG |
- 26 L. Grounding Bus: Bare, annealed copper bars of rectangular cross section.
- 27 M. Braided Bonding Jumpers: Copper tape, braided Number 3/0 AWG bare copper wire,
- 28 terminated with copper ferrules.
- 29 N. Bonding straps: Soft copper, 0.05-inch (1-mm) thick and 2-inches (50-mm) wide, except
- 30 as indicated.
- 31 O. Compression connections shall be irreversible, cast copper, high conductivity as
- 32 manufactured by Thomas and Betts, or equal.
- 33 P. Bolted connectors shall be Burndy, O. Z. Gedney, or equal heavy-duty type.

- 1 Q. Exothermic welding products shall be Erico's Cadweld Plus system with electronic
2 ignition device and moisture resistant weld metal cup for the required mold, or equal.
3 Connectors shall be provided in kit form and selected per manufacturer's written
4 instructions for specific types, sizes, and combination of conductors and connected items.
- 5 R. Provide concrete test well with cover and connect the ground grid extension using a
6 removable connector.
- 7 S. Copper equipment ground bars shall be Erico Eritech EGB Series or equal, sized as
8 required for the installation.

9 **PART 3 - EXECUTION**

10 3.01 APPLICATION AND TESTING

- 11 A. Contractor shall test ground rod to obtain a ground resistance value of less than 5 ohms.
- 12 B. Maximum distance between counterpoise ground rods shall be 100-feet. Provide
13 additional ground rods as required.
- 14 C. Counterpoise shall be installed a minimum of 30-inches below grade.
- 15 D. Tests: Before making connections to the ground electrode, measure the resistance of the
16 electrode to ground using a ground resistance tester specifically designed for ground
17 resistance testing. Perform the test not less than 2-days after the most recent rainfall, and in
18 the afternoon after any ground condensation (dew) has evaporated. If a resistance less than
19 the performance requirements is not obtained, provide a ground rod driven 6-inches below
20 grade spaced 10-feet away from the ground well and connect to ground test well with
21 Number 2/0 tinned stranded copper wire and repeat the test. If the performance requirements
22 are still not obtained, inform the County for resolution. Testing results by a certified testing
23 agency using fall of potential testing as described by NETA (International Electrical Testing
24 Association).
- 25 E. Provide a certified copy of the grounding test report to the County.
- 26 F. Equipment grounding Conductors: Comply with NEC Article 250 for types, sizes, and
27 quantities of equipment grounding conductors, except where specific types, larger sizes,
28 or more conductors than required by NEC are indicated.
 - 29 1. Install equipment grounding conductor with circuit conductors for the items below in
30 addition to those required by Code:
 - 31 a. Feeders and branch circuits
 - 32 b. Lighting circuits
 - 33 c. Receptacle circuits
 - 34 d. Single-phase motor or appliance branch circuits
 - 35 e. Three-phase motor or appliance branch circuits
 - 36 f. Flexible raceway runs

- 1 2. Metallic Raceways: Raceways, conduits and cable trays, etc. shall be made electrically
2 continuous, and shall be bonded/grounded to earth. Utilize bonding/grounding wires,
3 jumpers, clamps, etc. as necessary to meet requirements of NEC.
- 4 3. Non-metallic Raceways: Install a grounding conductor in non-metallic raceways
5 unless they are designated for telephone or data cables.
- 6 4. Air-Duct Equipment Circuits: Install a grounding conductor to duct mounted
7 electrical devices operating at 120 V and above, including air cleaners and heaters.
8 Bond conductor to each unit and to air duct.
- 9 5. Water Heater, Heat-Tracing, and Anti-frost Heater Circuits: Install a separate grounding
10 conductor to each electric water heater, heat-tracing assembly, and anti-frost heating
11 cable. Bond conductor to heater units, piping, connected equipment, and components.

- 12 G. Signal and Communication Systems: For telephone, alarm, voice and data, and other
13 communication systems, provide a Number 4 AWG minimum insulated grounding
14 conductor from grounding-electrode system to each service location, backboard, terminal
15 cabinet, wiring closet, and central equipment location.
 - 16 1. Service and Central equipment Locations and wiring Closets: Terminate grounding
17 conductor on a 1/4 by 2 by 12-inch (6 by 50 by 300-mm) grounding.
 - 18 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

- 19 H. Separately Derived Systems: Where NEC requires grounding, ground according to NEC.

- 20 I. Metal Poles Supporting Lighting Fixtures: Ground pole to a grounding electrode in
21 addition to separate equipment grounding conductor run with supply branch circuit.

- 22 J. General: Ground electrical systems and equipment according to NEC requirements,
23 except where Drawings or Specifications exceed NEC requirements.

- 24 K. Grounding Electrode System: Where available on the premises, at each building or
25 structure served, a metal underground water pipe, the metal frame of the building or
26 structure, concrete encased electrodes, any ground ring encircling the building or structure
27 and all made electrodes (ground rods, etc.) shall be bonded together to form the grounding
28 electrode system. The main bonding jumper and the grounding electrode conductor shall
29 be installed and sized per NEC except where larger sizes than required by NEC are
30 indicated.

- 31 L. Grounding Rods: A minimum of two (2) ground rods shall be installed where the ground
32 rod serves as the grounding electrode per NEC. Locate a minimum of 1-rod length from
33 each other and at least the same distance from any other grounding electrode.
 - 34 1. Drive until tops are 2-inches (50-mm) below finished floor or final grade, except as
35 otherwise indicated.
 - 36 2. Interconnect with grounding-electrode conductors except at test wells and as
37 otherwise indicated. Use exothermic welds or irreversible compression connections.
38 Make these connections without damaging copper coating or exposing steel.

- 39 M. Grounding Conductors: Route along the shortest and straightest paths possible, except as
40 otherwise indicated. Avoid obstructing access or placing conductors where they may be
41 subjected to strain, impact, or damage.

- 1 N. Grounding conductors, insulated and color coded green, shall be provided in all low
2 voltage feeder and sub-feeder and branch circuit conduit runs, except low voltage service
3 entrance conduit runs which contain a grounded neutral. These grounding conductors
4 shall be connected to all metallic conduits by means of approved grounding bushings at
5 all conduit terminations at the supply end of all feeders.
- 6 O. General: Make connections so possibility of galvanic action or electrolysis is minimized.
7 Select connectors, connection hardware, conductors, and connection methods so metals
8 in direct contact will be galvanically compatible.
- 9 1. Use electroplated or tin-coated materials to assure high conductivity and to make
10 contact points closer in order of galvanic series.
11 2. Make connections with clean, bare metal at points of contact.
12 3. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
13 4. Make aluminum-to-galvanized steel with tin-plated copper jumpers and mechanical clamps.
14 5. Coat and seal connections having dissimilar metals with inert material to prevent
15 future penetration of moisture to contact surfaces.
- 16 P. Exothermic-Welded Connections: Use for connections to structural steel and for underground
17 connections, except those at test wells. Comply with manufacturer written instructions.
18 Welds that are puffed up or that show convex surfaces indicating improper cleaning are not
19 acceptable. Irreversible compression connections may be acceptable as an alternate method.
- 20 Q. Equipment Grounding-Wire Terminations: For Number 8 AWG and larger, use pressure-
21 type grounding lugs. Number 10 AWG and smaller grounding conductors may be
22 terminated with winged pressure-type connectors.
- 23 R. Non-contact metal Raceway Terminations: Where metallic raceways terminate at metal
24 housings without mechanical and electrical connection to housing, terminate each conduit
25 with a grounding bushing. Connect grounding bushings with a bare grounding conductor
26 to grounding bus or terminal in housing. Bond electrically non-continuous conduits at
27 both entrances and exits with the grounding conductors, except as otherwise indicated.
- 28 S. Connections at Test Wells: Use compression-type connectors on conductors and make
29 bolted and clamped-type connections between conductors and grounding rods.
- 30 T. Tighten screws and bolts for grounding and bonding connectors and terminals according
31 to manufacturer's published torque-tightening values. Where these requirements are not
32 available, use those specified in UL 486A and UL 486B.
- 33 U. Compression-Type Connections: Use hydraulic compression tools to provide correct
34 circumferential pressure for compression connectors. Use tools and dies recommended by
35 manufacturer of connectors. Provide embossing die code or other standard method to make a
36 visible indication that a connector has been adequately compressed on grounding conductor.
37

38 **END OF SECTION**

APPENDIX A

NOT INCLUDED

GEO TECHNICAL REPORT

APPENDIX B

ORANGE COUNTY UTILITIES

FORMS

Digital Data Submission

Pressure Test

Pump Station Start-up

Right of Entry Form for work on private property

Risk Management June 02

Water Main Disinfection Certification

APPENDIX B

FORMS

Digital Data Submission

February 11, 2011

This form is to be utilized for the submittal of digital data in accordance with the requirements outlined in Chapter 2111, "Project Documents and Submittals".

Date of Submittal: _____

Project Number: _____

Project Name: _____

Project Manager: _____

Consulting Firm: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Email: _____

Type of Submittal: Construction Plans Record Drawings

File Format: _____

APPENDIX B

FORMS

Pressure Test

February 11, 2011

Project Name: _____							<input type="checkbox"/> Force Main <input type="checkbox"/> Reclaimed Main <input type="checkbox"/> Water Main		Allowable Loss – 2 Hours $L = \frac{SD(P)}{148,000} \times \frac{1}{2}$ 148,000 <i>See Note Below</i>					
Constructed by: _____														
DATE	LINE SEGMENT	STATION		LENGTH	N	D	START		END		LOSS (gal)		Pass /Fail STATUS	
		From	To				Time	PSI	Time	PSI	Allow	Actual		
COUNTY Inspector's Name:						Signature:						Date:		
Tester's Name:						Signature:						Date:		
Comments:														

Note: L - Allowable leakage in gallons per hour.
 S - Length of pipe tested, in feet.
 D - Nominal diameter of the pipe in inches.
 P - Average test pressure during leakage test in pounds per square inch gauge.

APPENDIX B

FORMS

Pump Station Start-Up

February 11, 2011

Prior to the pump station start-up, the CONTRACTOR shall submit this completed form to the COUNTY and the following shall have been successfully met.

- A walk through letter of acceptance; and
- All wire checks, video inspections and valve locates
- Video inspections completed;
- FDEP Water Clearance received;
- FDEP placard for fuel tank if applicable; and
- Completed "Pump Station Start-Up" form (Appendix B).

Transfer of utility bills after final acceptance shall be requested by submitting the final utility power billing statement to Utilities Water Reclamation Operations Processing Center located at 8100 Presidents Drive, Suite A, or fax to 407-836-6819.

GENERAL INFORMATION

Inspection Date: _____ Final Acceptance Date: _____
 Station Name: _____ PS # _____ FILE # _____
 Address: _____ Subdivision: _____
 Power Company: _____ Meter Number: _____
 Water Company: _____ Meter Number: _____

PRESENT AT START-UP

Contractor Name: _____ Phone Number: _____
 Consulting Engineer: _____ Phone Number: _____
 Pump Manufacturer Rep: _____ Phone Number: _____
 Orange County
 Utilities Inspector: _____ Phone Number: _____
 Orange County Utilities
 Transmission Reps: _____

ELECTRICAL EQUIPMENT

Control Panel Enclosure Mfg. _____ Control Panel Built By _____
 Control Panel SN: _____ Date of Manufacture: _____
 Main Service Voltage: _____ Amperage: _____
 Main Disconnect Breaker Model #: _____ Amperage: _____
 Control Panel Main Breaker Model #: _____ Amperage: _____
 Emergency Circuit Breaker Model #: _____ Amperage: _____
 Pump Breaker Model #: _____ Amperage: _____

APPENDIX B

FORMS

Pump Station Start-Up

February 11, 2011

ELECTRICAL EQUIPMENT *(Continued)*

Control Breaker Model # _____ Amperage: _____
SPD Type: _____ Model: _____ Receipt Received Yes No
Transformer Model: _____ Primary: _____ Secondary: _____ KVA: _____
Transformer Model: _____ Primary: _____ Secondary: _____ KVA: _____
Alternator Name: _____ Model: _____
Phase Monitor Name: _____ Model: _____
Alarm Horn Manufacturer: _____ Model: _____
Hour Meter Manufacturer: _____ Model: _____
Starter Name: _____ Starter Size: _____ Heater Size: _____
Starter Coil Part Number: _____
Pump Voltage: _____ Phase: _____ Pump F.L.A.: _____ Pump HP.: _____
Pressure Transducer Manufacturer: _____ Model: _____

PUMP EQUIPMENT

Pump Manufacturer: _____ Model #: _____
Impeller Size: _____ Number: _____
Pump #1 Serial #: _____ Pump #2 Serial #: _____
Pump #3 Serial #: _____ Pump #4 Serial #: _____
Pump #5 Serial #: _____ Pump #6 Serial #: _____

FLOAT BALLS

Float Ball Manufacturer: _____ Float Ball Type: _____
Off Level Depth: _____ Lead Start Depth: _____
Lag 1 Start Depth: _____ Lag 2 Start Depth: _____
Lag 3 Start Depth: _____ High Level Depth: _____

MECHANICAL

Valve Vault Cover Mfg: _____ Valve Vault Cover Size _____
Wet Well Cover Manufacturer: _____ Wet Well Cover Size: _____
Wet Well Diameter: _____ Wet Well Depth: _____ Guide Rail Size: _____
Base Elbow Size: _____ Riser Pipe Material _____ Riser Pipe Size: _____
Plug Valve Manufacturer: _____

APPENDIX B

FORMS

Pump Station Start-Up

February 11, 2011

MECHANICAL (Continued)

Plug Valve Size: _____ Plug Valve Lay Length _____
Check Valve Manufacturer: _____
Check Valve Size: _____ Check Valve Type: _____
Check Valve Lay Length: _____ Pipe Size Entering Wet-Well: _____
Oil Filled Gauges: Yes No Gauge Manufacturer: _____
Emergency Pump Out Size: _____ Female Cam-Lock Yes No

GENERATOR

Generator Receptacle Mfg. _____ Model: _____
Transfer Switch Mfg. : _____ Model: _____
Fuel Tank Manufacturer: _____ Fuel Tank Capacity: _____
Fuel Tank Model: _____ Fuel Tank SN: _____
Generator Manufacturer: _____ KVA _____ KW _____
Generator Model Number: _____
Generator Serial Number: _____
Engine Manufacturer: _____ Year of Manufacture: _____
Engine Model Number: _____
Engine Serial #: _____

BACKFLOW

Backflow Manufacturer: _____ Size: _____ Model #: _____

FLOW METER

Flow Meter Manufacturer: _____ Flow Meter Model #: _____

BIOFILTER

Biofilter Manufacturer: _____ Biofilter Model: _____
Biofilter Media: _____
Name of Approved Nutrient: _____
Blower Motor Manufacturer: _____
Blower Motor Model: _____ Blower Motor SN: _____
Blower Motor Belt Size: _____ Number of Belts: _____
Blower Horsepower: _____ Blower Voltage: _____

APPENDIX B

FORMS

Pump Station Start-Up

February 11, 2011

For COUNTY Use Only

DESIGN CRITERIA

Point 1 GPM: _____ At TDH: _____
 Point 2 GPM: _____ At TDH: _____
 Point 3 GPM: _____ At TDH: _____

PUMPING CAPACITY AT STARTUP						
	Pump # 1	Pump # 2	Pump # 3	Pump # 4	Pump # 5	Pump # 6
GPM at Startup:						
TDH at Startup:						
PSI at Startup:						

ELECTRICAL DATA AT STARTUP						
	PHASE A:		PHASE B:		PHASE C:	
Pump # 1 Amps at Startup						
Pump # 2 Amps at Startup						
Pump # 3 Amps at Startup						
Pump # 4 Amps at Startup						
Pump # 5 Amps at Startup						
Pump # 6 Amps at Startup						
Pump Megs Phase to Ground	Pump # 1:		Pump # 2:		Pump # 3:	
	Pump # 4:		Pump # 5:		Pump # 6:	
Incoming Service Voltage	A to GND:		B to GND:		C to GND:	
	A to B:		A to C:		B to C:	

APPENDIX B

FORMS

Pump Station Start-Up

February 11, 2011

CONTROL PANEL SPARE PARTS TRANSMITTAL

Project Name: _____

Project Number: _____

Quantity	Spec. Section	Manufacturer	Part Number	Part Description
1 set				Indicator pilot lamps of each type and voltage
1 ea				One-hundred percent replacement on lens caps, all colors
1 ea				Phase Monitor
1 ea				Alternator
1 ea				Time delay per starter
1 set				24-volt 8-pin relay
1 set				Fuses (as applicable)
1 set				Overload heaters per starter
1 ea				Elapsed Time Meter per pump
2 ea				Float Balls

Comments:

Delivered by: _____ Date: _____
Contractor

Witnessed by: _____ Date: _____
Construction Observation

Received by: _____ Date: _____
Water Reclamation Division

APPENDIX B

FORMS

Pump Station Start-Up

February 11, 2011

GENERATOR SPARE PARTS TRANSMITTAL

Project Name: _____

Project Number: _____

Quantity	Spec. Section	Manufacturer	Part Number	Part Description
2 ea				Air filter elements
2 ea				Fuel filter elements
3 ea				Complete replacement sets of fuses of each different size and type
1 set				Indicator pilot lamps of each type and voltage
1 ea				Jacket Water Heater
1 ea				One spill kit containing proper quantities and sizes of spill booms, pads, pillows, etc to control spills

Comments:

Delivered by: _____ Date: _____
Contractor

Witnessed by: _____ Date: _____
Construction Observation

Received by: _____ Date: _____
Water Reclamation Division

APPENDIX B

FORMS

Pump Station Start-Up

February 11, 2011

PUMP SPARE PARTS TRANSMITTAL

Project Name: _____

Project Number: _____

Quantity	Spec. Section	Manufacturer	Part Number	Part Description
1 ea				Upper bearing
1 ea				Lower bearing
1 set				Upper and lower shaft seals
1 set				O-Rings or gaskets required for replacement of bearings and seals
1 set				Impeller wear ring or bottom wear plate
1 ea				Shaft sleeve (if applicable)
1 ea				Cable cap for each pump (if applicable)
1 set				Allen sockets
1 ea				Impeller pullers

Comments:

Delivered by: _____ Date: _____

Contractor

Witnessed by: _____ Date: _____

Construction Observation

Received by: _____ Date: _____

Water Reclamation Division

APPENDIX B

FORMS

Pump Station Start-Up

February 11, 2011

BIOFILTER SPARE PARTS TRANSMITTAL

Project Name: _____

Project Number: _____

Quantity	Spec. Section	Manufacturer	Part Number	Part Description
				Belts (One set of each type)
				Pillar block bearings if applicable.
				Spare PLC as applicable with location software preinstalled.
				Fuses (Three sets of each type)
				Couplings (One set if applicable)
				Pilot Lights (One set of each type)
				Lens Caps (Complete replacement for all types)
				Spare Hydrogen Sulfide Sensing Element
				Any specialty tools for normal operation and maintenance
				Sufficient amount of required supplemental nutrients for continued operations to last through monitoring and service period.

Comments: _____

Delivered by: _____ Date: _____
 Contractor

Witnessed by: _____ Date: _____
 Construction Observation

Received by: _____ Date: _____
 Water Reclamation Division

**LICENSE AGREEMENT FOR CONTRACTOR TO ENTER UPON LANDS TO
CONNECT RESIDENCES TO PUBLIC SEWER SYSTEM**

_____, (Licensor/Property Owner) hereby grants to _____, (Contractor/Contractor's Plumbing Subcontractor), a licensed plumbing contractor (hereinafter called Plumbing Contractor), the license and privilege to enter on the property described below, for the purposes of connecting the residential or commercial unit to the public wastewater system being installed by the Orange County Utilities Department (County) in public rights-of-way pursuant to the Delhi Street – West Orlando 1st Addition Retrofit Improvement Project.

- 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 the Plumbing Contractor may utilize the services of a subcontractor to connect the residence to the public 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 to enter upon the described property for the purposes set forth in paragraph "A" above.
- C. This license shall be a term of two hundred and ten (210) 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 Plumbing Contractor will include installation of new gravity sewer 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 connection located in the right of way.

- G. The Property Owner granting the License acknowledges that the utilities constructed by the Plumbing Contractor on private property beyond the County point of connection are owned and shall be maintained by the Property Owner.
- H. Utilities constructed by the Plumbing Contractor and owned by the Property Owner will have a warranty period of three hundred and sixty five (365) days from the date of Project final completion.

DONE AND EXECUTED AND EFFECTIVE this _____ day of _____, 2004.

LICENSOR:

WITNESSES:

By: _____
 Print Name: _____
 Title: _____

By: _____
 Print Name: _____
 Title: _____

By: _____
 Print Name: _____
 Title: _____

AS TO LICENSOR:

STATE OF: _____
 COUNTY OF: _____

The foregoing instrument was acknowledged before me this _____, 2004
 (date)

by _____ as _____ .
 (name) (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

Risk Management Division Information Sheet

Date: _____

To: _____

From: Susan Martin, Sr. Risk Management Analyst

Re: _____ Project
Builders' Risk/Property Insurance

In order to arrange the builders' risk insurance as required by contract, please provide the following information on the above referenced facility as soon as possible:

New facility or renovation of existing? _____

Address (Street address, City, Zip) _____

Type of Construction (see attached codes) _____

Type of Occupancy (e.g., office, warehouse) _____

Number of Floors _____

Square Footage _____

Date construction started _____

(excluding site work)

Date construction completed (est.) _____

Name of General Contractor _____

Completed value (Hard Cost) _____

(Exclude value of land, site work, underground property, landscaping.)

Does facility have: sprinklers? Yes _____ No _____

fire alarm? Yes _____ No _____

burglar alarm? Yes _____ No _____

Security (describe)? _____

Boiler & Machinery checklist. Does facility have: Yes / No

Steam Boilers: _____

Hot Water boilers: _____

Air conditioning/heating units: _____

Pumps, motors, generators, compressors _____

Describe below:

For your convenience, you may jot down the answers on this form and fax it to me at 836-8350. Thanks very much.

Completed by: _____

Date: _____

Phone: _____

APPENDIX B

FORMS

Water Main Disinfection Certification

February 11, 2011

This form is required to schedule and document the disinfection of newly installed water mains to AWWA C-651 – latest revision. The CONTRACTOR shall complete the top portion of this form to document the subject water main, disinfection method and amount of chlorine applied. The UTILITIES inspector will document the residuals at each sample point on the bottom portion of this form.

Date Requested: _____
 CONTRACTOR's Name: _____
 Project Name: _____
 Project Number: _____
 Location: _____ Plan Sheet No.(s): _____
 Starting Location: _____ Ending Location: _____
 Line Length: _____ Line Size: _____
 Pipe Material: _____ Type of Joint(s): _____
 Gallons to Fill Pipe: _____ Pounds of Chlorine Applied: _____
 Method of Disinfection Used: _____
 CONTRACTOR's Signature: _____ Date: _____

For COUNTY Use Only

Certification Information

Start Time: _____ Start PSI: _____
 Stop Time: _____ Stop PSI: _____

<i>Sample Point Number</i>	<i>Sample Point Location</i>	<i>Initial Chlorine Reading, Minimum 25 ppm Required</i>	<i>24 Hr Chlorine Reading, Minimum 10 ppm Required</i>

Lab Test Results

Passed: _____ Failed: _____ Incomplete: _____

Comments:

Inspector's Signature: _____ Date: _____

APPENDIX C

ORANGE COUNTY UTILITIES

PERMITS OBTAINED BY COUNTY



**FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION**
CENTRAL DISTRICT
3319 MAGUIRE BOULEVARD, SUITE 232
ORLANDO, FLORIDA 32803-3767

RICK SCOTT
GOVERNOR

CARLOS LOPEZ-CANTERA
LT. GOVERNOR

JONATHAN P. STEVERSON
SECRETARY

April 23, 2015

Brent R. White, Project Engineer
Reiss Engineering, Inc.
1016 Spring Villas Point
Winter Springs, FL 32708
brwhite@reisseng.com

Orange County - DW
Multiple Lift Station Maintenance Work
Permit Determination
Orange County Utilities - SPCD-DW-15-4035

Dear Mr. White:

This is to acknowledge receipt of your April 6, 2015, email, regarding the planned maintenance of three lift stations for Orange County Utilities. Base on the information provided, the proposed actions are a repair operation using like for like and as such this Department does not require a permit for the work.

The three lift stations are PS 3391 in the North Orlando Industrial Park, PS 3265 in the Oak Meadow area, and PS 3676 along Dressage Drive in Country Run.

This letter is to provide the formal follow-up as requested to the informal determination performed on April 6, 2015. Should you wish to discuss the above comments, please feel free to contact Gene Elliott at (407)897-4151.

Sincerely,

For: Christianne C. Ferraro, P.E.
Administrator
Water Permitting

CCF/ee/cs

cc: Douglas E. Hettrich douglas.hettrich@ocfl.net

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	

APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

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		

APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

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	

APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

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
	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	
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	

APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

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	

APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

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		
			NA	NA	NA	NA	5600 or 5800 (FLG)	4" & up		
Val-Matic	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		

APPENDIX D

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		
		Biorem	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 Srvc 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		

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 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 E

ORANGE COUNTY UTILITIES

BOUNDARY SURVEY(S)

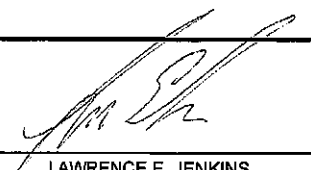
Wednesday, April 01, 2015 11:40:53 AM DRAWING: \\IERS181\FS1\Projects\IER\09074\200-09074-12002\CAD\Survey\Dwg\LS-3391-LetterSize-Survey-DO-NOT-USE\V-XP-PS-3391-LetterSize .DWG

LEGAL DESCRIPTION:

TRACT "B", LIFT STATION, ORLANDO NORTH INDUSTRIAL PARK SUBDIVISION, ACCORDING TO THE PLAT THEREOF AS RECORDED IN PLAT BOOK 18, PAGE 64 OF THE PUBLIC RECORDS OF ORANGE COUNTY, FLORIDA.

NOTES:

1. THE HORIZONTAL SURVEY DATA SHOWN IS BASED ON CONTROL POINTS ESTABLISHED BY THE ORANGE COUNTY GISPROGRAM HAVING A LOCAL GROUND COORDINATE SYSTEM BASED ON THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983 (1990) AND BASED ON GIS 0104 EE WHITE CONTROL POINT, BEING A BRASS DISK SET IN A CONCRETE MONUMENT AND HAVING A PUBLISHED COORDINATE OF LAT: 28°31'21.89069", LONG: 81°30'01.21118".
2. THERE MAY BE EASEMENTS AND RESTRICTIONS OF RECORDS AND/OR PRIVATE AGREEMENTS NOT FURNISHED TO THIS SURVEYOR THAT MAY AFFECT PROPERTY RIGHTS AND/OR LAND USE RIGHTS OF THE LANDS SHOWN HEREON.
3. NO UNDERGROUND INSTALLATIONS, FOUNDATION FOOTINGS OR IMPROVEMENTS HAVE BEEN LOCATED EXCEPT AS NOTED.
4. THIS SURVEY WAS PERFORMED IN ACCORDANCE WITH THE MINIMUM TECHNICAL STANDARDS FOR SURVEYS AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS, CHAPTER 5J-17, FLORIDA ADMINISTRATIVE CODE.
5. BY GRAPHIC PLOTTING ONLY, THIS PROPERTY IS LOCATED IN ZONE(S) "X" OF THE FLOOD INSURANCE RATE MAP, COMMUNITY PANEL NO. 120178 0140 F, WHICH BEARS AN EFFECTIVE DATE OF 9/25/2009 AND IS NOT IN A SPECIAL FLOOD HAZARD AREA.
6. THIS FIELD SURVEY WAS PERFORMED ON AUGUST 9, 2012.



LAWRENCE E. JENKINS
PROFESSIONAL
SURVEYOR AND MAPPER
FLORIDA REGISTRATION #5364
TETRA TECH - LB #26



www.tetrattech.com

201 EAST PINE STREET, SUITE 1000
ORLANDO, FL 32801
PHONE: 407.839.3955 FAX: 407.839.3790

BOUNDARY SURVEY
PUMP STATION #3391
ORLANDO NORTH INDUSTRIAL PARK

ORANGE COUNTY
2103 SPRINT BLVD. APOPKA, FL 32703

Project No.: 200-09074-14001

Date: 08/09/2012

Designed By: N/A

SHEET 1 OF 5

V-101

Wednesday, April 01, 2015 11:40:55 AM DRAWING: \\IERS181\FS1\Projects\NER\09074\200-09074-12002\CAD\Survey\Dwg\LS-3391-LetterSize-Survey-DO-NOT-USE\IV-XP-PS-3391-LetterSize .DWG

LEGEND

- ◆ BM BENCHMARK
- ⊙ ND NAIL & DISK
- △ TP TRAVERSE POINT
- F FOUND IRON (TYPE)
- S SET IRON (TYPE)
- F FOUND MONUMENT (TYPE)
- S SET MONUMENT (TYPE)
- ⊕ SC SECTION CORNER
- CO CLEANOUT
- DECIDUOUS TREE
- ⚡ ELECTRIC TRANSFORMER
- ★ EVERGREEN TREE
- ⊕ FIRE HYDRANT
- ★ FLAG (AS SHOWN)
- ⊕ GUY ANCHOR
- ⚡ LIGHT POLE
- Ⓜ MB MAIL BOX
- ★ PALM TREE
- P POST
- ⊕ SATELLITE DISH
- ⊕ SPIGOT
- ★ SPRINKLER HEAD
- ⊕ TRAFFIC SIGN
- UTILITY MARKER (AS SHOWN)
- UTILITY MANHOLE (AS SHOWN)
- UTILITY METER (AS SHOWN)
- UTILITY RISER (AS SHOWN)
- ⊗ UTILITY VALVE (AS SHOWN)
- ⊕ UTILITY POLE (AS SHOWN)
- WELL

ABBREVIATIONS

- | | | | |
|------|------------------------------|------|---------------------------|
| ANT | ANTENNA | MW | MONITORING WELL |
| BM | BENCHMARK | ND | NAIL & DISK |
| BFP | BACKFLOW PREVENTER | NL | NAIL |
| (C) | CALCULATED | OE | OVERHEAD UTILITY LINES |
| CO | CLEANOUT | OR | OFFICIAL RECORDS |
| CONC | CONCRETE | P | POST |
| CM | CONCRETE MONUMENT | (P) | PER PLAT |
| CMP | CORRUGATED METAL PIPE | PB | PLAT BOOK |
| CPP | CORRUGATED PLASTIC PIPE | PG | PAGE |
| (D) | AS DESCRIBED | PK | PK NAIL |
| DIP | DUCTILE IRON PIPE | RCP | REINFORCED CONC PIPE |
| DH | DRILL HOLE | RR | RAILROAD |
| EB | ELECTRIC RISER | RW | RECLAIMED WATER |
| ELEC | ELECTRIC | S | SET |
| EM | ELECTRIC METER | SC | SECTION CORNER |
| ET | ELECTRIC TRANSFORMER | SH | SPRINKLER HEAD |
| F | FOUND | SPIG | WATER SPIGOT |
| FDC | FIRE DEPT CONNECTION | SS | SANITARY SEWER |
| FF | FINISHED FLOOR | SD | STORM DRAIN |
| FH | FIRE HYDRANT | SV | SANITARY SEWER VALVE |
| FO | FIBER OPTIC | TB | TELEPHONE RISER |
| G | GAS | TEL | TELEPHONE |
| GM | GAS METER | TP | TRAVERSE POINT |
| GV | GAS VALVE | TSC | TRAFFIC SIGNAL CONTROL |
| INV | INVERT | TSP | TRAFFIC SIGNAL POLE |
| IP | IRON PIPE | TV | CABLE TELEVISION |
| IR | IRON ROD | UE | UNDERGROUND UTILITY LINES |
| IRRV | IRRIGATION VALVE | W | WATER |
| JBL | JURISDICTIONAL BOUNDARY LINE | WM | WATER METER |
| (M) | MEASURED | WW | WATER VALVE |
| MB | MAILBOX | XC | X CUT |
| MH | MANHOLE | | |



TETRA TECH

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BOUNDARY & SURVEY
PUMP STATION #3391
ORLANDO NORTH INDUSTRIAL PARK
ORANGE COUNTY
2103 SPRINT BLVD. APOPKA, FL 32703

Project No.: 200-09074-14001

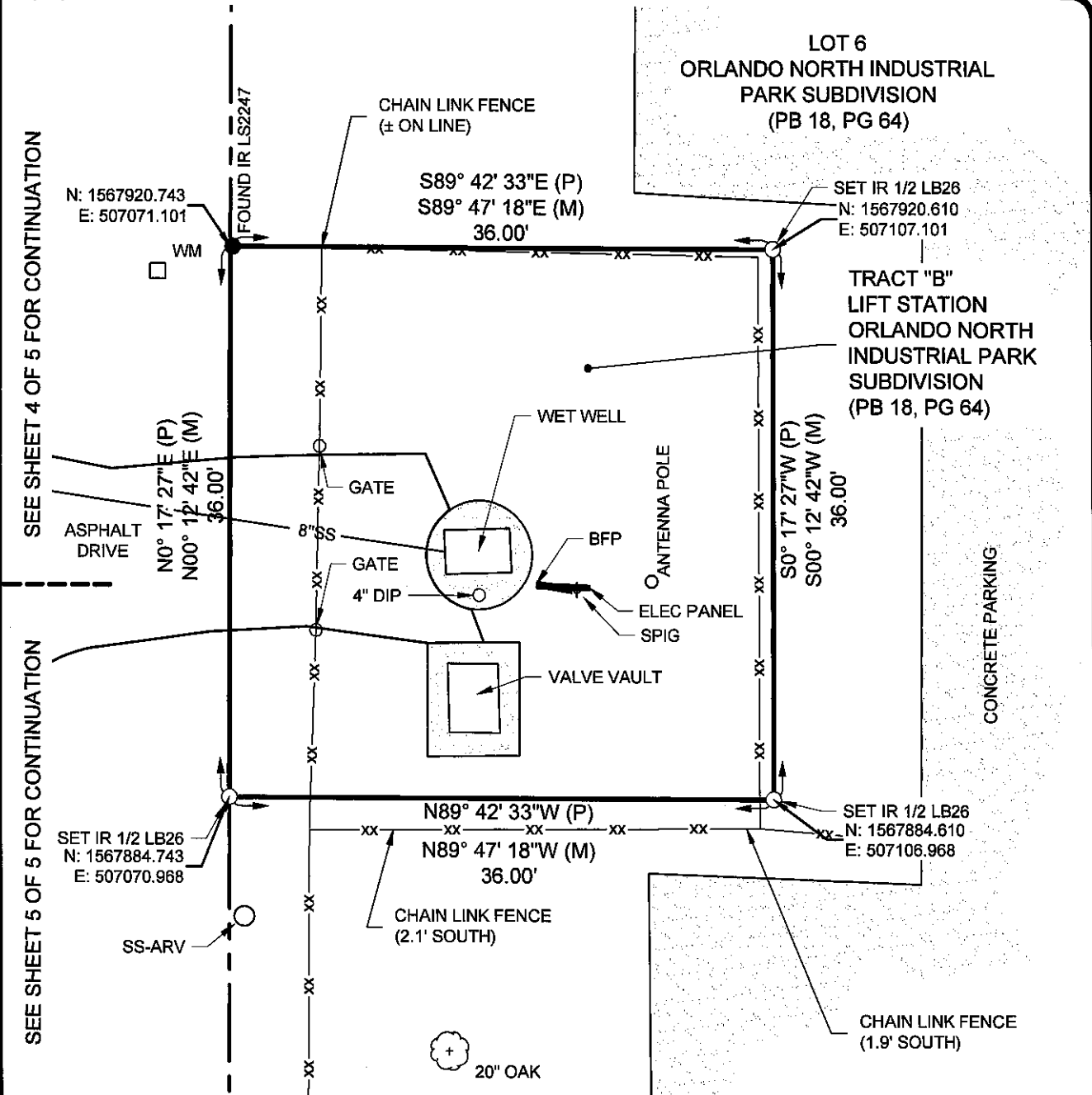
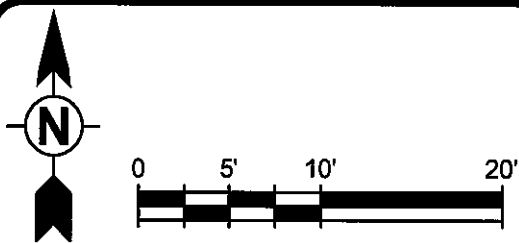
Date: 08/09/2012

Designed By: N/A

SHEET 2 OF 5

V-101

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SEE SHEET 4 OF 5 FOR CONTINUATION

SEE SHEET 5 OF 5 FOR CONTINUATION



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BOUNDARY SURVEY
PUMP STATION #3391
ORLANDO NORTH INDUSTRIAL PARK
ORANGE COUNTY
2103 SPRINT BLVD. APOPKA, FL 32703

Project No.: 200-09074-14001

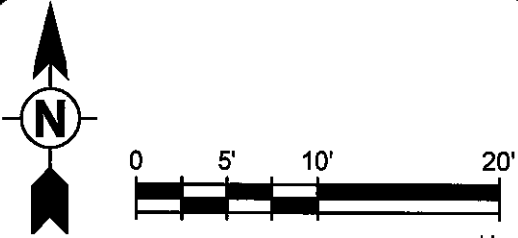
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Designed By: N/A

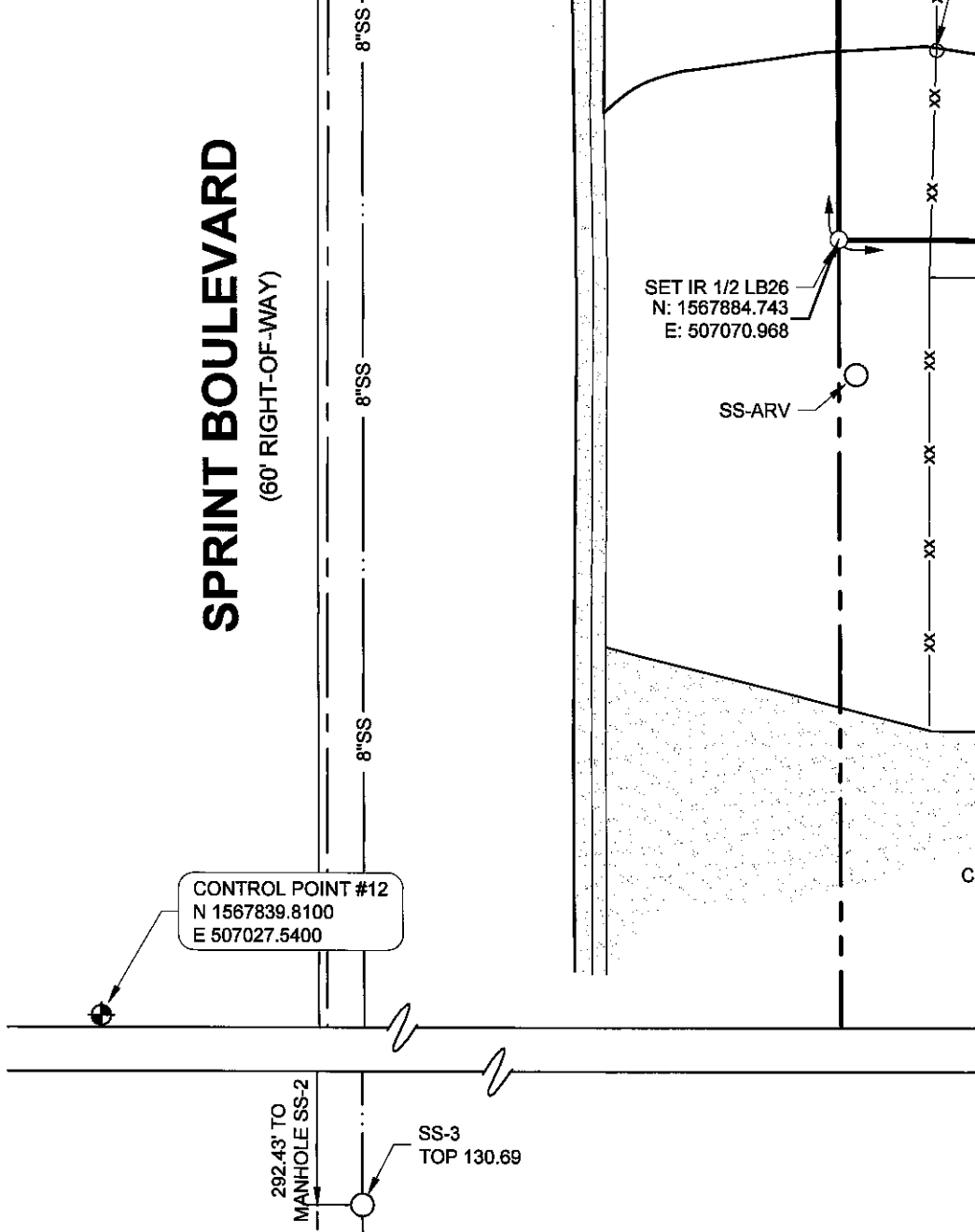
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SPRINT BOULEVARD
(60' RIGHT-OF-WAY)



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BOUNDARY SURVEY
PUMP STATION #3391
ORLANDO NORTH INDUSTRIAL PARK
ORANGE COUNTY
2103 SPRINT BLVD. APOPKA, FL 32703

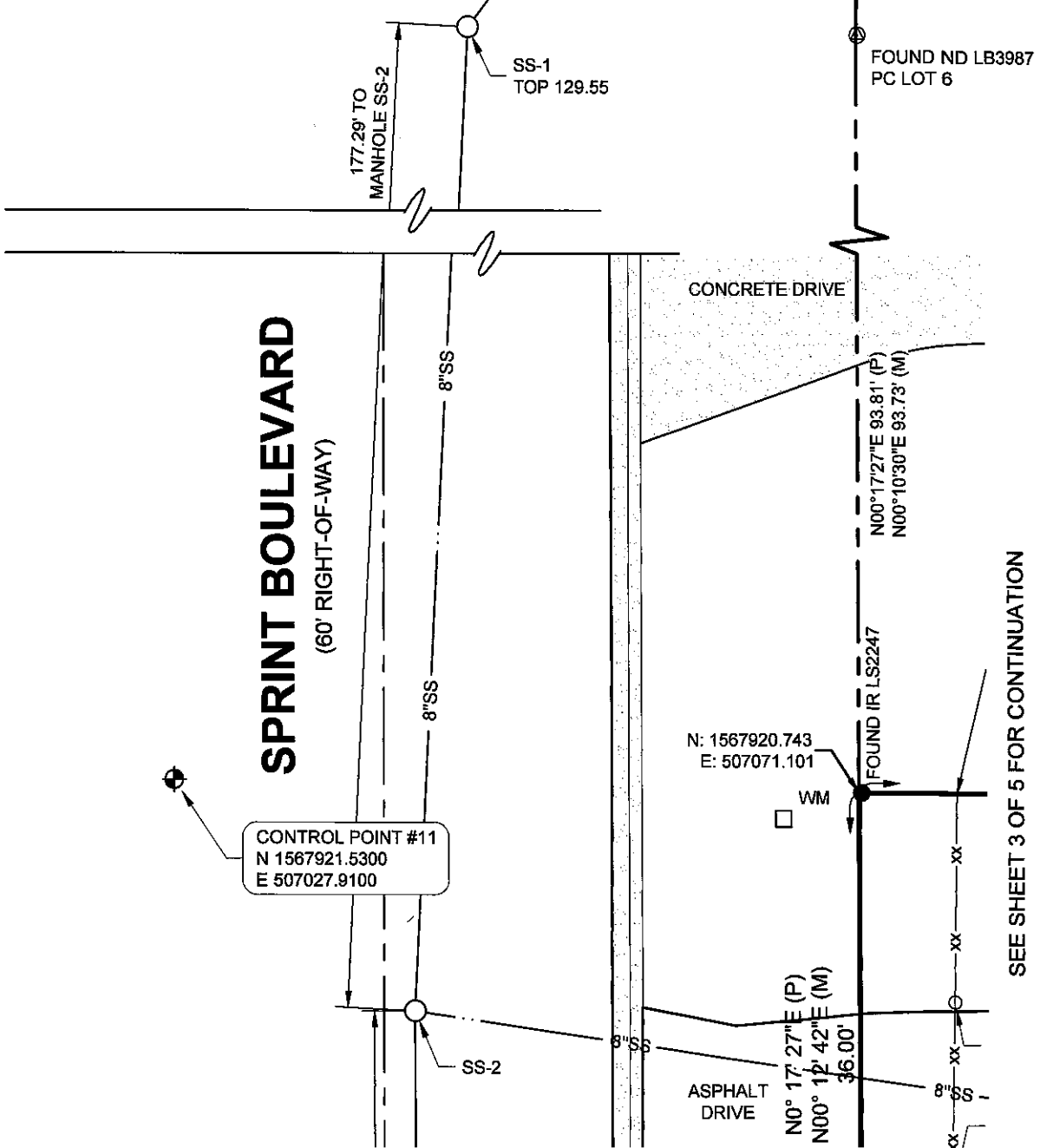
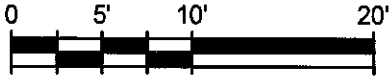
Project No.: 200-09074-14001

Date: 08/09/2012

Designed By: N/A

SHEET 4 OF 5
V-101

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BOUNDARY & TOPOGRAPHIC SURVEY
PUMP STATION #3391
ORLANDO NORTH INDUSTRIAL PARK

ORANGE COUNTY
2103 SPRINT BLVD. APOPKA, FL 32703

Project No.: 200-09074-14001

Date: 08/09/2012

Designed By: N/A

SHEET 5 OF 5

V-101

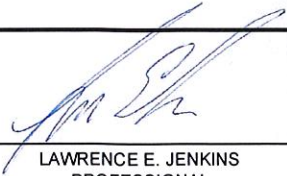
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LEGAL DESCRIPTION (WRITTEN BY SURVEYOR)

A PORTION OF UTILITY EASEMENT LYING WITHIN TRACT "B", STORMWATER MANAGEMENT AREA, COUNTRY RUN UNIT 2, ACCORDING TO THE PLAT THEREOF AS RECORDED IN PLAT BOOK 30, PAGE 114 OF THE PUBLIC RECORDS OF ORANGE COUNTY, FLORIDA, MORE PARTICULARLY DESCRIBED AS:

BEGIN AT THE NORTHEASTERLY CORNER OF TRACT "A", LIFT STATION, COUNTRY RUN UNIT 2, ACCORDING TO THE PLAT THEREOF AS RECORDED IN PLAT BOOK 30, PAGE 114 OF THE PUBLIC RECORDS OF ORANGE COUNTY, FLORIDA; THENCE RUN S63°13'30"E ALONG THE NORTHEASTERLY LINE OF SAID TRACT "B", A DISTANCE OF 10.00 FEET; THENCE RUN S26°46'30"W A DISTANCE OF 35.00 FEET; THENCE RUN N63°13'30"W A DISTANCE OF 41.86 FEET TO THE EASTERLY RIGHT OF WAY LINE OF DRESSAGE DRIVE AND A NON TANGENT POINT OF INTERSECTION ON A CURVE TO THE LEFT HAVING A RADIUS OF 330.00 FEET AND A CENTRAL ANGLE OF 00°52'21", A CHORD BEARING OF N32°25'38"E, A CHORD LENGTH OF 5.02 FEET, THENCE RUN NORTHEASTERLY ALONG THE ARC OF SAID CURVE FOR A DISTANCE OF 5.02 FEET TO THE WESTERLY CORNER OF SAID TRACT "A"; THENCE RUN S63°13'30"E, ALONG THE SOUTHERLY LINE OF SAID TRACT "A", A DISTANCE OF 31.37 FEET TO THE SOUTH CORNER OF SAID TRACT "A"; THENCE RUN N26°46'30"E ALONG THE EASTERLY LINE OF SAID TRACT "A" A DISTANCE OF 30.00 FEET TO THE POINT OF BEGINNING.

CONTAINING 508.04 SQUARE FEET OR 0.012 ACRES.



LAWRENCE E. JENKINS
PROFESSIONAL
SURVEYOR AND MAPPER
FLORIDA REGISTRATION #5364
TETRA TECH - LB #26



TETRA TECH

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BOUNDARY SURVEY
PUMP STATION #3676
COUNTRY RUN UNIT 2

ORANGE COUNTY
DRESSAGE DRIVE, ORLANDO, FL

Project No.: 200-09074-14001

Date: AUGUST 8, 2012
Revision Date: 02-27-15

Designed By: NB / LEJ

SHEET 1 OF 6

V-101

Wednesday, April 01, 2015 11:31:19 AM DRAWING: \\NERS181\F51\Projects\IER\09074\200-09074-12002\CAD\Survey\DWG\LS-3676-LetterSize-Survey-DWG\LS-3676-LetterSize .DWG

1. SURVEYOR'S REPORT / NOTES:
2. THE HORIZONTAL SURVEY DATA SHOWN IS BASED ON CONTROL POINTS ESTABLISHED BY THE ORANGE COUNTY GIS PROGRAM HAVING A LOCAL GROUND COORDINATE SYSTEM BASED ON THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983 (1990) AND BASED ON GIS 0104 EE WHITE CONTROL POINT, BEING A BRASS DISK SET IN A CONCRETE MONUMENT AND HAVING A PUBLISHED COORDINATE OF LAT: 28°31'21.89069", LONG: 81°30'01.21118".
3. THERE MAY BE EASEMENTS AND RESTRICTIONS OF RECORDS AND/OR PRIVATE AGREEMENTS NOT FURNISHED TO THIS SURVEYOR THAT MAY AFFECT PROPERTY RIGHTS AND/OR LAND USE RIGHTS OF THE LANDS SHOWN HEREON.
4. NO UNDERGROUND INSTALLATIONS, FOUNDATION FOOTINGS OR IMPROVEMENTS HAVE BEEN LOCATED EXCEPT AS NOTED.
5. THIS SURVEY WAS PERFORMED IN ACCORDANCE WITH THE MINIMUM TECHNICAL STANDARDS FOR SURVEYS AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS, CHAPTER 5J-17, FLORIDA ADMINISTRATIVE CODE.
6. BASED ON THE NATIONAL FLOOD INSURANCE PROGRAM "FIRM" MAP COMMUNITY - PANEL NUMBER 120179 0230 F DATED 9/25/2009 THE ABOVE DESCRIBED PROPERTY IS LOCATED IN ZONES "X" AND "AE".
7. THIS FIELD SURVEY WAS PERFORMED ON AUGUST 8, 2012.
8. THIS SURVEY WAS MADE WITHOUT THE BENEFIT OF A TITLE COMMITMENT.
9. COPIES OF THE SURVEYS, PLATS, AND INFORMATION REFERENCED EITHER BELOW OR ON THE ATTACHED PLAT, WERE OBTAINED FROM FILES AND INFORMATION AT THE FOLLOWING OFFICES:
ORANGE COUNTY PROPERTY APPRAISERS WEB SITE - PLAT INFORMATION
ORANGE COUNTY COMPTROLLER WEB SITE - OFFICIAL RECORDS SITE
ORANGE COUNTY SURVEY DEPT. - SURVEY CONTROL POINTS.
ORANGE COUNTY RIGHT-OF-WAY DEPT. - RIGHT-OF-WAY MAPS
ORANGE COUNTY REAL ESTATE MANAGEMENT - TITLE REPORT
10. ALL CONTROLLING MONUMENTATION FOR RIGHT-OF-WAYS, CENTERLINES AND BENCHMARKS WAS RECOVERED AND ITS IDENTIFICATION IS SHOWN ON THE SURVEY.
11. THE RELATIVE POSITIONAL ACCURACY OF THE LINES AND CORNERS OF THIS SURVEY DUE TO MEASUREMENTS IS WITHIN THE SPECIFICATIONS FOR SUBURBAN SURVEY, WHICH IS A MAXIMUM OF: 1 FOOT IN 10,000 FEET.
12. JURISDICTIONAL WETLAND BOUNDARIES WERE NOT PART OF THIS SCOPE AND WERE NOT DETERMINED BY THIS SURVEYOR.
13. THERE ARE NO ENCROACHMENTS ON THE ADJOINING PROPERTY, STREETS OR ALLEYS BY ANY OF SAID BUILDINGS, STRUCTURES AND IMPROVEMENTS, OTHER THAN AS SHOWN ON THE SURVEY.

SURVEY EQUIPMENT/SOFTWARE:
 TOPCON HIPER II RTK/STATIC GPS
 TOPCON GTS-9000A ROBOTIC TOTAL STATION
 TOPCON GPT 8203A ROBOTIC TOTAL STATION
 TOPCON MAGNET
 AUTOCAD CIVIL 3D 2012

LAWRENCE E. JENKINS
 PROFESSIONAL
 SURVEYOR AND MAPPER
 FLORIDA REGISTRATION #5364
 TETRA TECH - LB #26

Project No.: 200-09074-14001
 Date: AUGUST 8, 2012
 Revision Date: 02-27-15
 Designed By: NB / LEJ

SHEET 2 OF 6

V-101



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BOUNDARY SURVEY
 PUMP STATION #3676
 COUNTRY RUN UNIT 2
 ORANGE COUNTY
 DRESSAGE DRIVE, ORLANDO, FL

LEGEND

-  BM BENCHMARK
-  ND NAIL & DISK
-  TP TRAVERSE POINT
-  F FOUND IRON (TYPE)
-  S SET IRON (TYPE)
-  F FOUND MONUMENT (TYPE)
-  S SET MONUMENT (TYPE)
-  SC SECTION CORNER
-  CO CLEANOUT
-  DECIDUOUS TREE
-  ELECTRIC TRANSFORMER
-  EVERGREEN TREE
-  FIRE HYDRANT
-  FLAG (AS SHOWN)
-  GUY ANCHOR
-  LIGHT POLE
-  MB MAIL BOX
-  PALM TREE
-  P POST
-  SATELLITE DISH
-  SPIGOT
-  SPRINKLER HEAD
-  TRAFFIC SIGN
-  UTILITY MARKER (AS SHOWN)
-  UTILITY MANHOLE (AS SHOWN)
-  UTILITY METER (AS SHOWN)
-  UTILITY RISER (AS SHOWN)
-  UTILITY VALVE (AS SHOWN)
-  UTILITY POLE (AS SHOWN)
-  WELL

ABBREVIATIONS

- | | | | |
|-------|------------------------------|------|---------------------------|
| ANT | ANTENNA | (M) | MEASURED |
| BM | BENCHMARK | MB | MAILBOX |
| BFP | BACKFLOW PREVENTER | MH | MANHOLE |
| (C) | CALCULATED | MW | MONITORING WELL |
| CO | CLEANOUT | ND | NAIL & DISK |
| CONC | CONCRETE | NL | NAIL |
| CLF | CHAIN LINK FENCE | OE | OVERHEAD UTILITY LINES |
| CM | CONCRETE MONUMENT | OR | OFFICIAL RECORDS |
| CMP | CORRUGATED METAL PIPE | P | POST |
| CPP | CORRUGATED PLASTIC PIPE | (P) | PER PLAT |
| (D) | AS DESCRIBED | PB | PLAT BOOK |
| DIP | DUCTILE IRON PIPE | PG | PAGE |
| DH | DRILL HOLE | PK | PK NAIL |
| EB | ELECTRIC RISER | RCP | REINFORCED CONC PIPE |
| ELEC | ELECTRIC | RR | RAILROAD |
| EM | ELECTRIC METER | RW | RECLAIMED WATER |
| ET | ELECTRIC TRANSFORMER | S | SET |
| EP | EDGE OF PAVEMENT | SC | SECTION CORNER |
| ESMT | EASEMENT | SH | SPRINKLER HEAD |
| F | FOUND | SPIG | WATER SPIGOT |
| FDC | FIRE DEPT CONNECTION | SS | SANITARY SEWER |
| FF | FINISHED FLOOR | SD | STORM DRAIN |
| FH | FIRE HYDRANT | SV | SANITARY SEWER VALVE |
| FO | FIBER OPTIC | TB | TELEPHONE RISER |
| G | GAS | TEL | TELEPHONE |
| GM | GAS METER | TP | TRAVERSE POINT |
| GV | GAS VALVE | TSC | TRAFFIC SIGNAL CONTROL |
| INV | INVERT | TSP | TRAFFIC SIGNAL POLE |
| IP | IRON PIPE | TV | CABLE TELEVISION |
| IR | IRON ROD | UE | UNDERGROUND UTILITY LINES |
| IRRIV | IRRIGATION VALVE | W | WATER |
| JBL | JURISDICTIONAL BOUNDARY LINE | WM | WATER METER |
| | | WW | WATER VALVE |
| | | XC | X CUT |



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BOUNDARY SURVEY
PUMP STATION #3676
COUNTRY RUN UNIT 2

ORANGE COUNTY
DRESSAGE DRIVE, ORLANDO, FL

Project No.: 200-09074-14001

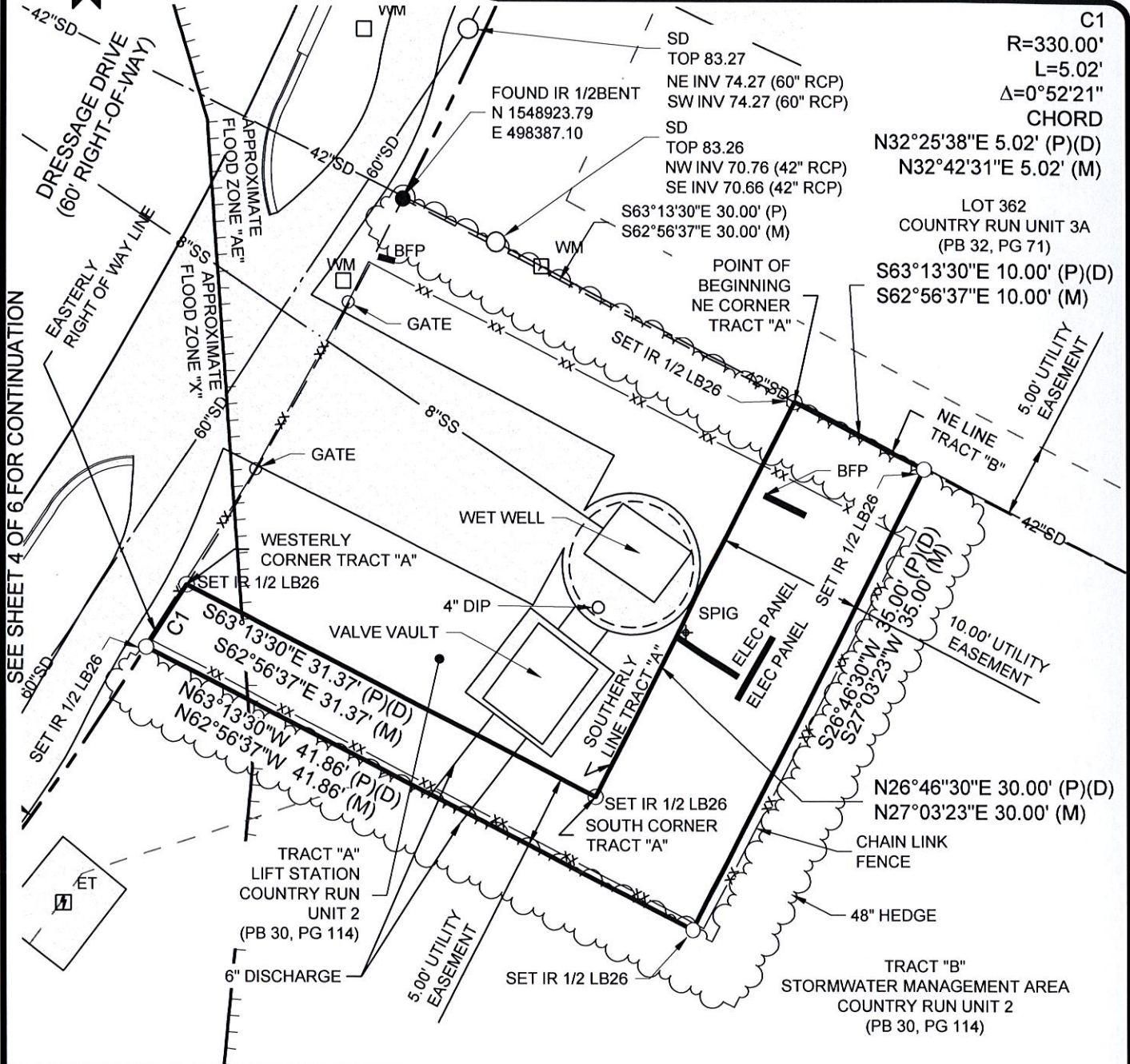
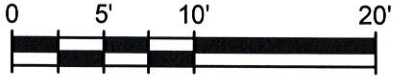
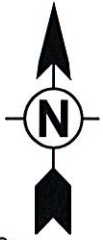
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SEE SHEET 4 OF 6 FOR CONTINUATION

C1
 R=330.00'
 L=5.02'
 $\Delta=0^{\circ}52'21''$
 CHORD
 N32°25'38"E 5.02' (P)(D)
 N32°42'31"E 5.02' (M)
 LOT 362
 COUNTRY RUN UNIT 3A
 (PB 32, PG 71)
 S63°13'30"E 10.00' (P)(D)
 S62°56'37"E 10.00' (M)



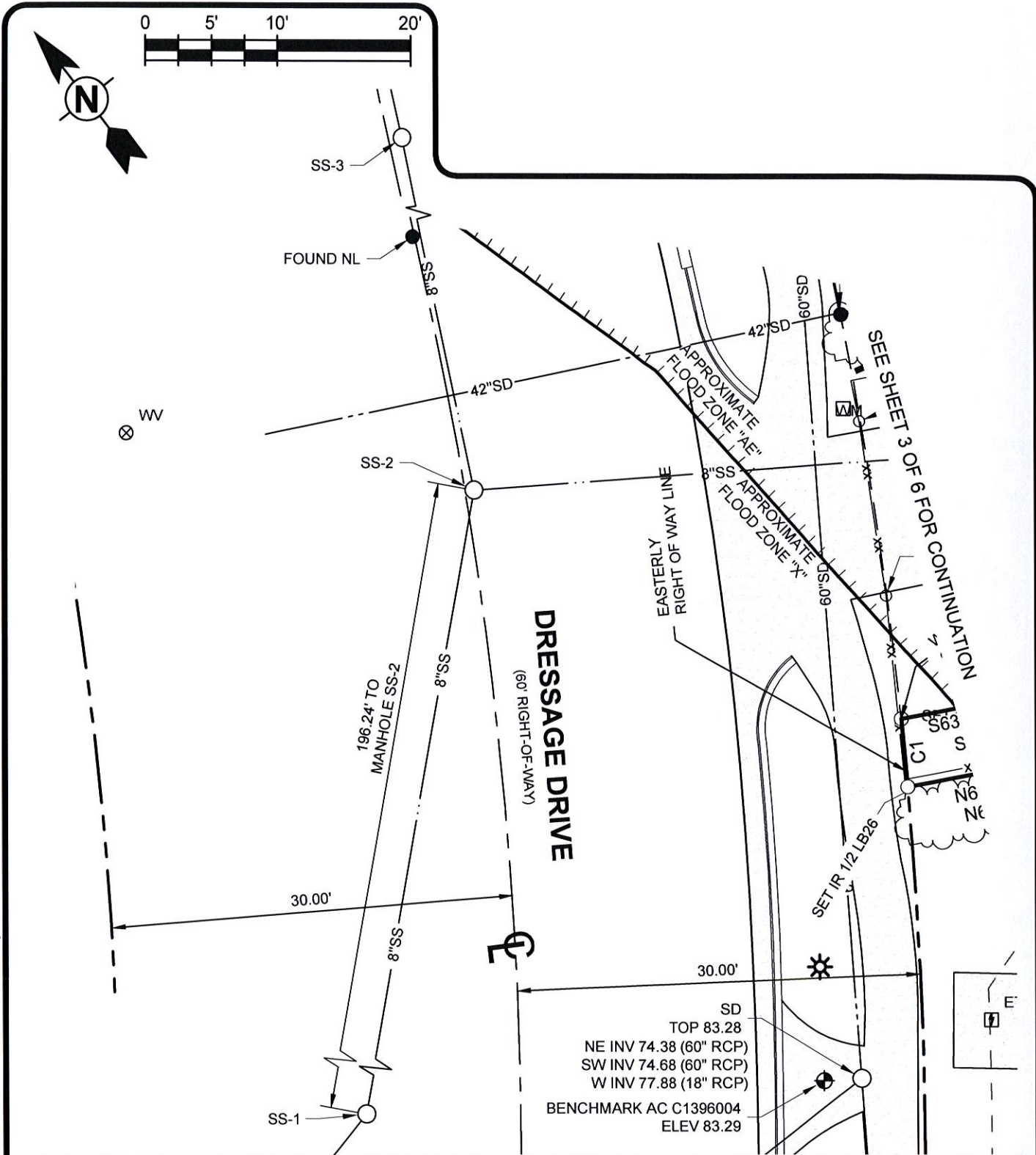
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BOUNDARY SURVEY
 PUMP STATION #3676
 COUNTRY RUN UNIT 2
 ORANGE COUNTY
 DRESSAGE DRIVE, ORLANDO, FL

Project No.: 200-09074-14001
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SHEET 4 OF 6
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BOUNDARY SURVEY
 PUMP STATION #3676
 COUNTRY RUN UNIT 2
 ORANGE COUNTY
 DRESSAGE DRIVE, ORLANDO, FL

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Mapcheck 1: PS-3676

Closure Summary

Precision, 1 part in: 24553.94'
 Error distance: 0.01'
 Error direction: S18.013092E (dms)
 Area: 507.82 Sq. Ft.
 Square area: 507.824
 Perimeter: 153.25'

Point of Beginning

Easting: 498413.8170'
 Northing: 1548910.1466'

Side 1: Line

Direction: S62.563700E (dms)
 Angle: [-062.5637 (dms)]
 Deflection angle: [117.0323 (dms)]
 Distance: 10.00'
 Easting: 498422.7226'
 Northing: 1548905.5979'

Side 2: Line

Direction: S27.032300W (dms)
 Angle: [-090.0000 (dms)]
 Deflection angle: [090.0000 (dms)]
 Distance: 35.00'
 Easting: 498406.8022'
 Northing: 1548874.4283'

Side 3: Line

Direction: N62.563700W (dms)
 Angle: [-090.0000 (dms)]
 Deflection angle: [090.0000 (dms)]
 Distance: 41.86'
 Easting: 498369.5234'
 Northing: 1548893.4691'

Side 4: Curve

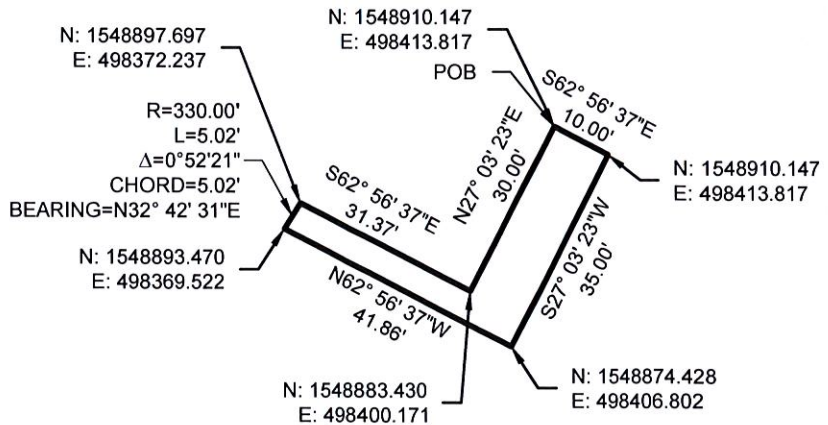
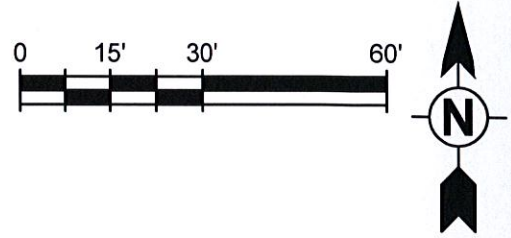
Curve direction: Clockwise
 Radius: [329.66']
 Arc length: 5.02'
 Delta angle: 000.5221 (dms)
 Tangent: [2.51']
 Chord direction: N32.423100E (dms)
 Chord angle: [-084.2052 (dms)]
 Deflection angle: [095.3908 (dms)]
 Chord distance: 5.02'
 Easting: 498372.2361'
 Northing: 1548897.6930'

Side 5: Line

Direction: S62.563700E (dms)
 Angle: [-096.0518 (dms)]
 Deflection angle: [083.5442 (dms)]
 Distance: 31.37'
 Easting: 498400.1729'
 Northing: 1548883.4239'

Side 6: Line

Direction: N27.032300E (dms)
 Angle: [090.0000 (dms)]
 Deflection angle: [-090.0000 (dms)]
 Distance: 30.00'
 Easting: 498413.8189'
 Northing: 1548910.1406'



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MAPCHECK
 PUMP STATION #3676
 COUNTRY RUN UNIT 2

ORANGE COUNTY
 DRESSAGE DRIVE, ORLANDO, FL

Project No.: 200-09074-14001

Date: AUGUST 8, 2012
 Revision Date: 02-27-15

Designed By: NB / LEJ

SHEET 6 OF 6

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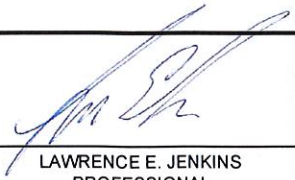
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LEGAL DESCRIPTION (WRITTEN BY SURVEYOR)

A PORTION OF THE SW 1/4 OF THE NE 1/4 OF SECTION 26, TOWNSHIP 22 SOUTH, RANGE 28 EAST, ORANGE COUNTY, FLORIDA AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCE AT THE NORTHWEST CORNER OF THE PLAT OF OAK MEADOWS, UNIT THREE AS RECORDED IN PLAT BOOK 8, PAGE 147 OF THE PUBLIC RECORDS OF ORANGE COUNTY, FLORIDA, SAID POINT ALSO BEING ON THE WESTERLY RIGHT OF WAY LINE OF DORSCHER ROAD; THENCE N00°02'35" E. (BEARINGS BASED ON AFORESAID PLAT) ALONG SAID WESTERLY RIGHT OF WAY LINE OF DORSCHER ROAD AS RECORDED IN OFFICIAL RECORDS BOOK 2622, PAGE 1802 OF THE AFORESAID PUBLIC RECORDS FOR 210.56 FEET TO A POINT OF CURVATURE OF A CURVE TO THE RIGHT HAVING A RADIUS OF 640.00 FEET AND A CENTRAL ANGLE OF 48°47'04", A CHORD BEARING OF N24°26'07"E A CHORD LENGTH OF 528.62 FEET, THENCE RUN NORTHEASTERLY ALONG THE ARC OF SAID CURVE AND ALONG SAID WESTERLY RIGHT OF WAY LINE FOR A DISTANCE OF 544.93 FEET TO THE POINT OF BEGINNING; THENCE N39°31'02"W FOR 32.75 FEET; THENCE N50°28'58"E FOR 30.00 FEET; THENCE S39°31'02"E FOR 32.49 FEET TO THE SAID WESTERLY RIGHT OF WAY LINE OF DORSCHER ROAD; THENCE S50°30'00"W ALONG SAID WESTERLY RIGHT OF WAY LINE FOR 5.00 FEET TO THE NORTHEAST CORNER OF THE SANITARY SEWER EASEMENT RECORDED IN OFFICIAL RECORDS BOOK 3148, PAGE 2397 OF THE PUBLIC RECORDS OF ORANGE COUNTY, FLORIDA; THENCE N39°31'02"W ALONG THE NORTHERN LINE OF SAID SANITARY SEWER EASEMENT FOR 27.49 FEET; THENCE S50°28'58"W ALONG THE WESTERN LINE OF SAID SANITARY SEWER EASEMENT FOR 20.00 FEET; THENCE S39°31'02"E ALONG THE SOUTHERN LINE OF SAID SANITARY SEWER EASEMENT FOR 27.63 FEET TO SAID WESTERLY RIGHT OF WAY LINE AND A NON TANGENT INTERSECTION ON A CURVE TO THE LEFT HAVING A RADIUS OF 640.00 FEET AND A CENTRAL ANGLE OF 00°26'52", A CHORD BEARING OF S49°03'05"W A CHORD LENGTH OF 5.00 FEET, THENCE RUN SOUTHWESTERLY ALONG THE ARC OF SAID CURVE FOR A DISTANCE OF 5.00 FEET TO THE POINT OF BEGINNING.

CONTAINING 425.9 SQUARE FEET OR 0.01 ACRES MORE OR LESS.


LAWRENCE E. JENKINS
PROFESSIONAL
SURVEYOR AND MAPPER
FLORIDA REGISTRATION #5364
TETRA TECH - LB #26



TETRA TECH

www.tetratech.com

201 EAST PINE STREET, SUITE 1000
ORLANDO, FL 32801
PHONE: 407.839.3955 FAX: 407.839.3790

BOUNDARY SURVEY
PUMP STATION #3265
OAK MEADOWS

ORANGE COUNTY
280 DORSCHER RD, ORLANDO, FL

Project No.: 200-09074-14001

Date: AUGUST 6, 2012
Revision Date: 02-27-15

Designed By: NB / LEJ

SHEET 1 OF 6

V-101

Wednesday, April 01, 2015 11:31:36 AM DRAWING: \\ERS181FS1\Projects\IER\09074\200-09074-12002\CAD\Survey\Dwg\LS-3265-LetterSize-Survey-DO-NOT-USE\XP-SURVEY-LS-3265-LetterSize .DWG

SURVEYOR'S REPORT / NOTES:

1. THE HORIZONTAL SURVEY DATA SHOWN IS BASED ON CONTROL POINTS ESTABLISHED BY THE ORANGE COUNTY GIS PROGRAM HAVING A LOCAL GROUND COORDINATE SYSTEM BASED ON THE FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE, NORTH AMERICAN DATUM 1983 (1990) AND BASED ON GIS 0104 EE WHITE CONTROL POINT, BEING A BRASS DISK SET IN A CONCRETE MONUMENT AND HAVING A PUBLISHED COORDINATE OF LAT: 28°31'21.89069", LONG: 81°30'01.21118".
2. LEGAL DESCRIPTION BEARINGS ARE BASED ON THE PARENT PARCEL LEGAL DESCRIPTION AS RECORDED IN OFFICIAL RECORDS BOOK 2442, PAGE 679 OF THE PUBLIC RECORDS OF ORANGE COUNTY, FLORIDA. MEASURED BEARINGS ARE BASED ON FLORIDA STATE PLANE COORDINATE SYSTEM, EAST ZONE.
3. THERE MAY BE EASEMENTS AND RESTRICTIONS OF RECORDS AND/OR PRIVATE AGREEMENTS NOT FURNISHED TO THIS SURVEYOR THAT MAY AFFECT PROPERTY RIGHTS AND/OR LAND USE RIGHTS OF THE LANDS SHOWN HEREON.
4. NO UNDERGROUND INSTALLATIONS, FOUNDATION FOOTINGS OR IMPROVEMENTS HAVE BEEN LOCATED EXCEPT AS NOTED.
5. THIS SURVEY WAS PERFORMED IN ACCORDANCE WITH THE MINIMUM TECHNICAL STANDARDS FOR SURVEYS AS SET FORTH BY THE FLORIDA BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS, CHAPTER 5J-17, FLORIDA ADMINISTRATIVE CODE.
6. BASED ON THE NATIONAL FLOOD INSURANCE PROGRAM "FIRM" MAP COMMUNITY - PANEL NUMBER 120179 0240 F DATED 9/25/2009 THE ABOVE DESCRIBED PROPERTY IS LOCATED IN ZONE "X".
7. THIS FIELD SURVEY WAS PERFORMED ON SEPTEMBER 6, 2012.
8. TITLE SEARCH PREPARED BY FIRST AMERICAN TITLE INSURANCE COMPANY, FILE NO. 2037-3152160/14.00062, DATED: APRIL 8, 2014.
9. COPIES OF THE SURVEYS, PLATS, AND INFORMATION REFERENCED EITHER BELOW OR ON THE ATTACHED PLAT, WERE OBTAINED FROM FILES AND INFORMATION AT THE FOLLOWING OFFICES:
ORANGE COUNTY PROPERTY APPRAISERS WEB SITE - PLAT INFORMATION
ORANGE COUNTY COMPTROLLER WEB SITE - OFFICIAL RECORDS SITE
ORANGE COUNTY SURVEY DEPT. - SURVEY CONTROL POINTS
ORANGE COUNTY RIGHT-OF-WAY DEPT. - RIGHT-OF-WAY MAPS
ORANGE COUNTY REAL ESTATE MANAGEMENT - TITLE REPORT
10. ALL CONTROLLING MONUMENTATION FOR RIGHT-OF-WAYS, CENTERLINES AND BENCHMARKS WAS RECOVERED AND ITS IDENTIFICATION IS SHOWN ON THE SURVEY.
11. THE RELATIVE POSITIONAL ACCURACY OF THE LINES AND CORNERS OF THIS SURVEY DUE TO MEASUREMENTS IS WITHIN THE SPECIFICATIONS FOR SUBURBAN SURVEY, WHICH IS A MAXIMUM OF: 1 FOOT IN 10,000 FEET.
12. JURISDICTIONAL WETLAND BOUNDARIES WERE NOT PART OF THIS SCOPE AND WERE NOT DETERMINED BY THIS SURVEYOR.
13. THERE ARE NO ENCROACHMENTS ON THE ADJOINING PROPERTY, STREETS OR ALLEYS BY ANY OF SAID BUILDINGS, STRUCTURES AND IMPROVEMENTS, OTHER THAN AS SHOWN ON THE SURVEY.
14. SURVEY EQUIPMENT/SOFTWARE:
TOPCON HIPER II RTK/STATIC GPS
TOPCON GTS-9000A ROBOTIC TOTAL STATION
TOPCON GPT 8203A ROBOTIC TOTAL STATION
TOPCON MAGNET
AUTOCAD CIVIL 3D 2012

LAWRENCE E. JENKINS
PROFESSIONAL
SURVEYOR AND MAPPER
FLORIDA REGISTRATION #5364
TETRA TECH - LB #26

Project No.: 200-09074-14001
Date: AUGUST 6, 2012
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SHEET 2 OF 6
V-101



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ORLANDO, FL 32801
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BOUNDARY SURVEY
PUMP STATION #3265
OAK MEADOWS
ORANGE COUNTY
280 DORSCHER RD, ORLANDO, FL

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LEGEND

- ◆ BM BENCHMARK
- ⊙ ND NAIL & DISK
- △ TP TRAVERSE POINT
- F FOUND IRON (TYPE)
- S SET IRON (TYPE)
- F FOUND MONUMENT (TYPE)
- S SET MONUMENT (TYPE)
- ⊕ SC SECTION CORNER
- CO CLEANOUT
- ☁ DECIDUOUS TREE
- ⚡ ELECTRIC TRANSFORMER
- ★ EVERGREEN TREE
- ⦿ FIRE HYDRANT
- ✦ FLAG (AS SHOWN)
- ⊙ GUY ANCHOR
- ☀ LIGHT POLE
- Ⓜ MB MAIL BOX
- 🌴 PALM TREE
- ⊙ P POST
- 📡 SATELLITE DISH
- ⊕ SPIGOT
- ☀ SPRINKLER HEAD
- ⊐ TRAFFIC SIGN
- UTILITY MARKER (AS SHOWN)
- UTILITY MANHOLE (AS SHOWN)
- UTILITY METER (AS SHOWN)
- ▣ UTILITY RISER (AS SHOWN)
- ⊗ UTILITY VALVE (AS SHOWN)
- ⊕ UTILITY POLE (AS SHOWN)

ABBREVIATIONS

- | | | | |
|------|------------------------------|------|---------------------------|
| ANT | ANTENNA | (M) | MEASURED |
| BM | BENCHMARK | MB | MAILBOX |
| BFP | BACKFLOW PREVENTER | MH | MANHOLE |
| (C) | CALCULATED | MW | MONITORING WELL |
| CO | CLEANOUT | ND | NAIL & DISK |
| CONC | CONCRETE | NL | NAIL |
| CLF | CHAIN LINK FENCE | OE | OVERHEAD UTILITY LINES |
| CM | CONCRETE MONUMENT | OR | OFFICIAL RECORDS |
| CMP | CORRUGATED METAL PIPE | P | POST |
| CPP | CORRUGATED PLASTIC PIPE | (P) | PER PLAT |
| (D) | AS DESCRIBED | PB | PLAT BOOK |
| DIP | DUCTILE IRON PIPE | PG | PAGE |
| DH | DRILL HOLE | PK | PK NAIL |
| EB | ELECTRIC RISER | RCP | REINFORCED CONC PIPE |
| ELEC | ELECTRIC | RR | RAILROAD |
| EM | ELECTRIC METER | RW | RECLAIMED WATER |
| ET | ELECTRIC TRANSFORMER | S | SET |
| EP | EDGE OF PAVEMENT | SC | SECTION CORNER |
| ESMT | EASEMENT | SH | SPRINKLER HEAD |
| F | FOUND | SPIG | WATER SPIGOT |
| FDC | FIRE DEPT CONNECTION | SS | SANITARY SEWER |
| FF | FINISHED FLOOR | SD | STORM DRAIN |
| FH | FIRE HYDRANT | SV | SANITARY SEWER VALVE |
| FO | FIBER OPTIC | TB | TELEPHONE RISER |
| G | GAS | TEL | TELEPHONE |
| GM | GAS METER | TP | TRAVERSE POINT |
| GV | GAS VALVE | TSC | TRAFFIC SIGNAL CONTROL |
| INV | INVERT | TSP | TRAFFIC SIGNAL POLE |
| IP | IRON PIPE | TV | CABLE TELEVISION |
| IR | IRON ROD | UE | UNDERGROUND UTILITY LINES |
| IRRV | IRRIGATION VALVE | W | WATER |
| JBL | JURISDICTIONAL BOUNDARY LINE | WM | WATER METER |
| | | WW | WATER VALVE |
| | | XC | X CUT |

SANITARY SEWER MANHOLES

Manhole	Top(FT)	DIR	SIZE	DIST*	Inv.(FT)	DIR	SIZE	DIST*	Inv.(FT)	DIR	SIZE	DIST*	Inv.(FT)
SS-1	88.20	N	8" PVC	6.30	81.90	S	8" PVC	6.25	81.95				
SS-2	87.51	NE	8" PVC	6.75	80.76	SW	8" PVC	6.75	80.76	NW	8" PVC	6.80	80.71
SS-3	87.09	N	8" PVC	5.40	81.69	SW	8" PVC	5.45	81.64				
WET WELL	88.93	SE	8" PVC	8.40	80.53	BOTTOM		14.65	74.28				
VALVE VAULT	88.95	BOTTOM		5.20	83.75								

* DISTANCE FROM TOP OF STRUCTURE TO INVERT OF PIPE



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BOUNDARY SURVEY
PUMP STATION #3265
OAK MEADOWS

ORANGE COUNTY
280 DORSCHER RD, ORLANDO, FL

Project No.: 200-09074-14001

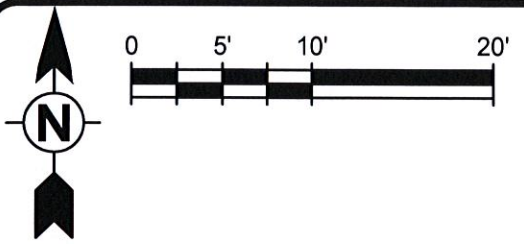
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Revision Date: 02-27-15

Designed By: NB / LEJ

SHEET 3 OF 6

V-101

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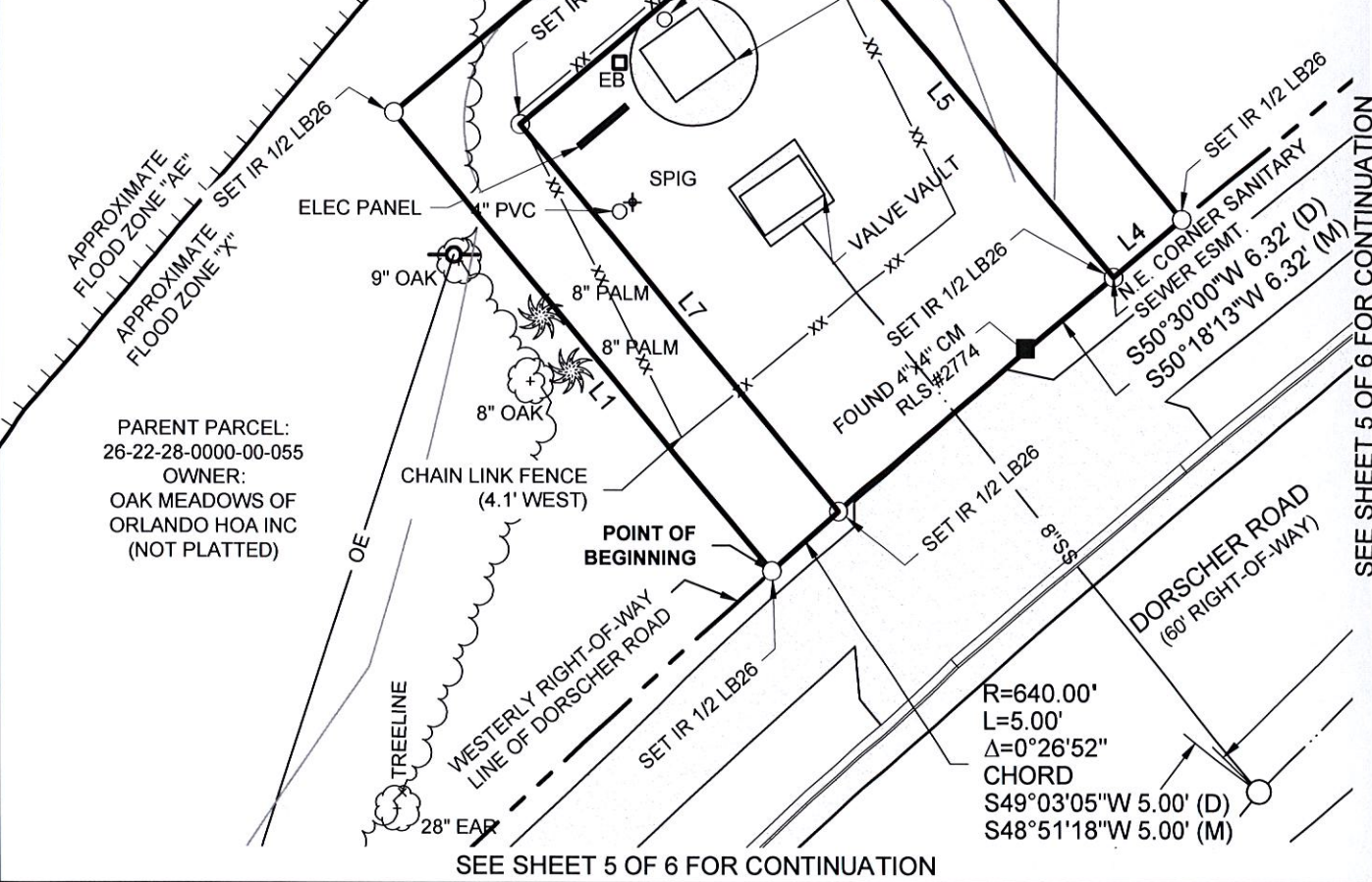


- L1 N39°31'02"W 32.75' (D)
N39°42'49"W 32.75' (M)
- L2 N50°28'58"E 30.00' (D)
N50°17'11"E 30.00' (M)
- L3 S39°31'02"E 32.49' (D)
S39°42'49"E 32.49' (M)
- L4 S50°30'00"W 5.00' (D)
S50°18'13"W 5.00' (M)
- L5 N39°31'02"W 27.49' (D)
N39°42'49"W 27.49' (M)
- L6 S50°28'58"W 20.00' (D)
S50°17'11"W 20.00' (M)
- L7 S39°31'02"E 27.63' (D)
S39°42'49"E 27.63' (M)

CHAIN LINK FENCE
(0.5' NORTH)

SANITARY SEWER
EASEMENT
(OR 3148, PG 2397)

PARENT PARCEL:
26-22-28-0000-00-055
OWNER:
OAK MEADOWS OF
ORLANDO HOA INC
(NOT PLATTED)



PARENT PARCEL:
26-22-28-0000-00-055
OWNER:
OAK MEADOWS OF
ORLANDO HOA INC
(NOT PLATTED)

SEE SHEET 5 OF 6 FOR CONTINUATION

SEE SHEET 5 OF 6 FOR CONTINUATION



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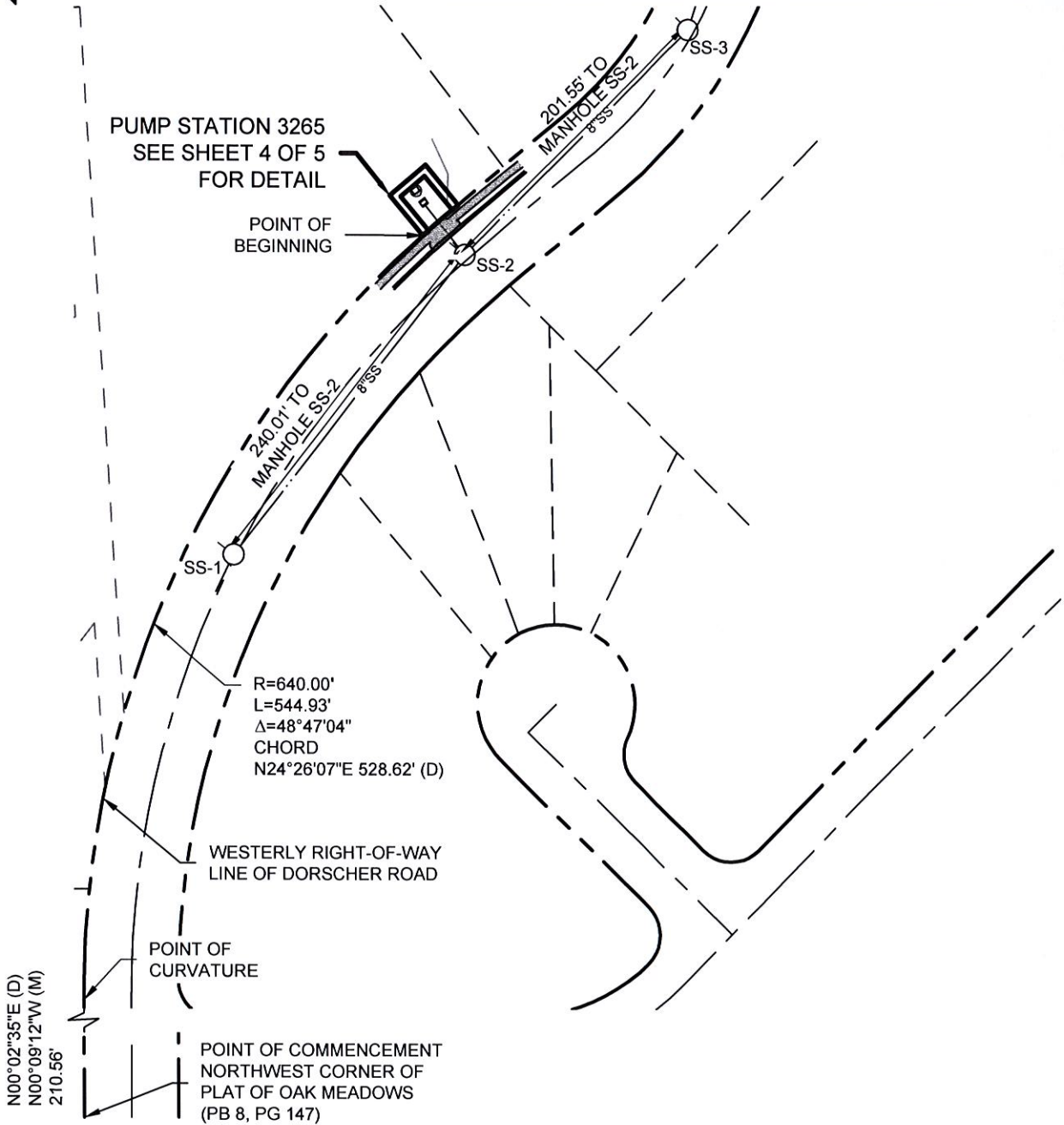
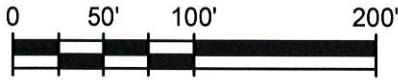
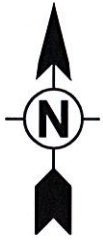
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BOUNDARY SURVEY
PUMP STATION #3265
OAK MEADOWS
ORANGE COUNTY
280 DORSCHER RD, ORLANDO, FL

Project No.: 200-09074-14001	
Date:	AUGUST 6, 2012
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SHEET 4 OF 6	
V-101	

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BOUNDARY SURVEY
PUMP STATION #3265
OAK MEADOWS

ORANGE COUNTY
280 DORSCHER RD, ORLANDO, FL

Project No.: 200-09074-14001

Date: AUGUST 6, 2012

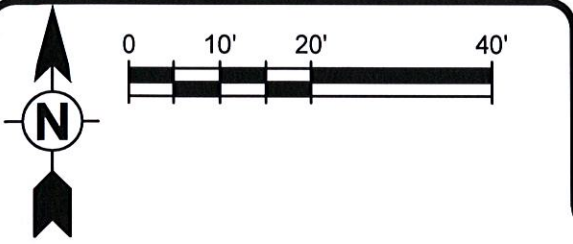
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SHEET 5 OF 5

V-101

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Mapcheck 1: PS-3265

Closure Summary

Precision, 1 part in: 48254.86'
 Error distance: 0.00'
 Error direction: S64.232450E (dms)
 Area: 425.89 Sq. Ft.
 Square area: 425.887
 Perimeter: 180.36'

Point of Beginning

Easting: 501088.4947'
 Northing: 1531426.3525'

Side 1: Line

Direction: N39.424900W (dms)
 Angle: [140.1711 (dms)]
 Deflection angle: [-039.4249 (dms)]
 Distance: 32.75'
 Easting: 501067.5691'
 Northing: 1531451.5454'

Side 2: Line

Direction: N50.171100E (dms)
 Angle: [-090.0000 (dms)]
 Deflection angle: [090.0000 (dms)]
 Distance: 30.00'
 Easting: 501090.6465'
 Northing: 1531470.7139'

Side 3: Line

Direction: S39.424900E (dms)
 Angle: [-090.0000 (dms)]
 Deflection angle: [090.0000 (dms)]
 Distance: 32.49'
 Easting: 501111.4060'
 Northing: 1531445.7210'

Side 4: Line

Direction: S50.181300W (dms)
 Angle: [-089.5858 (dms)]
 Deflection angle: [090.0102 (dms)]
 Distance: 5.00'
 Easting: 501107.5588'
 Northing: 1531442.5275'

Side 5: Line

Direction: N39.424900W (dms)
 Angle: [-090.0102 (dms)]
 Deflection angle: [089.5858 (dms)]
 Distance: 27.49'
 Easting: 501089.9941'
 Northing: 1531463.6741'

Side 6: Line

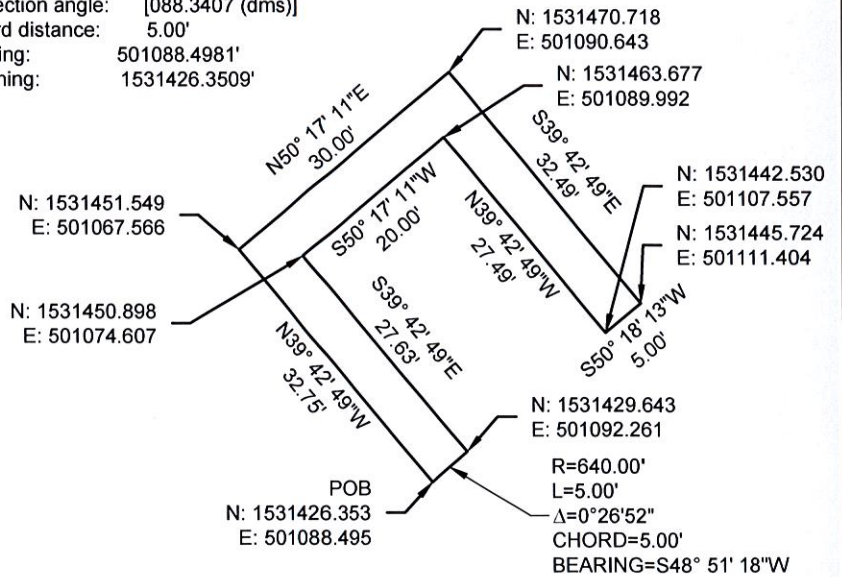
Direction: S50.171100W (dms)
 Angle: [090.0000 (dms)]
 Deflection angle: [-090.0000 (dms)]
 Distance: 20.00'
 Easting: 501074.6091'
 Northing: 1531450.8951'

Side 7: Line

Direction: S39.424900E (dms)
 Angle: [090.0000 (dms)]
 Deflection angle: [-090.0000 (dms)]
 Distance: 27.63'
 Easting: 501092.2633'
 Northing: 1531429.6407'

Side 8: Curve

Curve direction: Clockwise
 Radius: [639.78']
 Arc length: 5.00'
 Delta angle: 000.2652 (dms)
 Tangent: [2.50']
 Chord direction: S48.511800W (dms)
 Chord angle: [-091.2553 (dms)]
 Deflection angle: [088.3407 (dms)]
 Chord distance: 5.00'
 Easting: 501088.4981'
 Northing: 1531426.3509'



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MAPCHECK
 PUMP STATION #3265
 OAK MEADOWS

ORANGE COUNTY
 280 DORSCHER RD, ORLANDO, FL

Project No.: 200-09074-14001

Date: AUGUST 6, 2012
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SHEET 6 OF 6

V-101

APPENDIX F

[NOT INCLUDED](#)

ORANGE COUNTY UTILITIES

**STRUCTURAL ENGINEERING REPORT
(SHEET PILING)**

APPENDIX G

ORANGE COUNTY UTILITIES

DEWATERING DISCHARGE OFF-SITE

- **Orange County Environmental Protection Division Work Instruction**
- **Generic Permit for the Discharge of Produced Ground Water From any Non-Contaminated Site Activity**
- **FDEP Notice of New Method for Mercury Testing**
- **Memo – EPA - Analytical Methods for Mercury in NPDES Permits**



Department of Environmental Protection

Notice of New Method for Mercury Testing

New Method for Mercury Testing Has Been Approved

In accordance with Rule 62-620.610, Florida Administrative Code (F.A.C.), all sampling and monitoring data, required to be reported to the Department, shall be collected and analyzed in accordance with Rule 62-4.246, Chapters 62-160 and 62-601, F.A.C., and 40 CFR 136, as appropriate. Effective August 25, 2003, Chapter 62-620, F.A.C., was revised to adopt, and incorporate by reference, various sections of Title 40 of the Code of Federal Regulations revised as of July 1, 2003, including the revised 40 CFR 136. The revised 40 CFR 136 includes a new method for low-level mercury analysis, EPA Method 1631(Revision E), Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry (Method 1631E).

Who is Required to Use Method 1631E?

Applicants for a wastewater facility permit and wastewater facility permittees are now required to use the low-level mercury Method 1631E when reporting results associated with water quality standards (WQSs) below 0.2 micrograms per liter (ug/L). The following facilities are now required to use Method 1631E for all **effluent samples**:

- Facilities discharging to Class I and Class II surface waters, including wetlands.
- Facilities discharging to Class III Marine or Fresh surface waters, including wetlands.
- Facilities with Water Quality Based Effluent Limits (WQBELs), or any other limit for mercury specified in a permit, below 0.2 ug/L.

This includes effluent samples collected for any of the following requirements:

- Monitoring specified in Section I, *Reclaimed Water and Effluent Limitations and Monitoring*, section of permits.
- Monitoring performed under Section 3.A. of *Wastewater Permit Application Form 2A For Domestic Wastewater Facilities*; Part VII.C. of *Application to Discharge Process Wastewater from New or Existing Industrial Wastewater Facilities to Surface Water - Form 2CS*; or Part V.C. of *Application to Discharge Process Wastewater from New or Existing Industrial Wastewater Facilities to Ground Water - Form 2CG*.
- Priority pollutant scans performed in accordance with pretreatment program annual report requirements.
- Monitoring performed for the development or re-evaluation of local discharge limitations.
- Monitoring required in Table 4 of the Generic Permit for Discharges from Petroleum Contaminated Sites and Table 1 of the Generic Permit for the Discharge of Produced Ground Water from any Non-Contaminated Site Activity.

The low-level mercury method provides, for the first time, the ability to assess compliance with mercury water quality standards (WQSs) below 0.2 ug/L. Your permit requires that surface water discharges shall be analyzed using a sufficiently sensitive method in accordance with 40 CFR 136. *Wastewater Permit Application Forms 2A, 2CS, and 2CG* require effluent testing be conducted using methods that are able to detect pollutants at levels adequate to meet WQSs and to provide reasonable assurance that the WQSs will not be violated in the future.

Additionally, in order to develop technically and legally defensible local discharge limitations for domestic wastewater facilities that have pretreatment programs, Method 1631E must be used to provide data that clearly establishes the basis for any calculated mercury limitations. Note, regarding local discharge limitations, the requirement to use Method 1631E may be expanded to other locations in the collection and treatment system on a case-by-case basis depending on the initial results from effluent analysis using Method 1631E.

Mercury Laboratory Analysis

Method 1631E has a minimum level of quantitation of 0.0005 ug/L, or 0.5 nanograms per liter (ng/L), which is 400-times more sensitive than Method 245.1 ("Manual Cold Vapor Technique"). Due to the sensitivity of Method 1631E, the results are typically measured in parts per trillion (ng/L) rather than in parts per billion (µg/L). The Department is currently evaluating Method 1631E to determine target method detection limits (MDLs) and target practical quantification limits (PQLs). Until target MDLs and PQLs are incorporated into Rule 62-4.246(4), the laboratory analysis is expected to achieve MDLs close to, or below, 1 ng/L. All laboratory analysis must be done by a NELAP accredited laboratory with current certification by Florida Department of Health for Method 1631E.

Mercury Clean Sampling Techniques

Clean sample handling techniques should be used when collecting samples for low-level mercury analysis to preclude false positives arising from sample collection, handling, or analysis. Sample collection methods should be consistent with *DEP-SOP-001/01: FS 8200 Clean Sampling For Ultratrace Metals in Surface Waters* and *EPA Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels* (EPA-821-R-96-011). Because FS 8200 and Method 1669 are performance-based procedures, sample collection personnel may modify these procedures or eliminate steps if the modification does not lead to unacceptable contamination of samples or blanks. Any modifications should be thoroughly evaluated and demonstrated to be effective before field samples are collected. This may be accomplished through documentation of uncontaminated samples, equipment blanks and/or other quality control samples.

Note, discrete and composite samplers have been found to contaminate samples with mercury at the ng/L level. Therefore, grab samples are permissible when using Method 1631E. However, grab samples must be representative of the wastewater discharge and a field blank should be collected along with the sample.

In order for a permittee to justify a claim that any reported mercury is due to outside contamination, a blank must have been collected. For this reason, permittees should consider collecting at least one blank at each site for each day a sample is collected. If more than one sample is collected in a day, at least one blank for each 10 samples collected on that day should also be collected. The blank may either be an equipment blank or a field blank. Once a permittee demonstrates the ability to collect samples from a given site using an established procedure that prevents contamination, the permittee may choose to decrease the number of blanks being taken. Specific definitions and procedures for collecting blanks are found in DEP SOP FQ 1000.

Field blanks should be collected only if no equipment other than the sample container is used to collect samples. If the sampling procedure involves the use of additional equipment, such as a peristaltic pump and pump tubing, equipment blanks should be collected. All blanks are subject to the same preservation, digestion, and analysis protocols as regular samples and should have a concentration at least five times lower than the sample concentration. The permittee may not subtract field blank concentrations when reporting sample results.

Sample-collection, preservation, and shipping requirements should be discussed with contract laboratories to ensure the requirements of Method 1631E are met.

Additional Assistance and Information

For additional information on Method 1631:
www.epa.gov/waterscience/methods/1631.html

Please refer questions concerning sample collection to:
Silky Labic: 850-245-8066
Silky.Labic@dep.state.fl.us

Additional information concerning NELAP certified laboratories can be obtained from:
Department of Health Bureau of Laboratories
P.O. Box 210 Jacksonville, FL 32231
(904) 791-1599 (voice)(904) 791-1591 (fax)
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STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL PROTECTION

GENERIC PERMIT

FOR THE

DISCHARGE OF PRODUCED GROUND WATER

FROM ANY NON-CONTAMINATED SITE ACTIVITY

Generic Permit for the Discharge of Produced Ground Water from any Non-Contaminated Site Activity

(1) The facility is authorized to discharge produced ground water from any non-contaminated site activity which discharges by a point source to surface waters of the State, as defined in Chapter 62-620, F.A.C., only if the reported values for the parameters listed in Table 1 do not exceed any of the listed screening values. Before discharge of produced ground water can occur from such sites, analytical tests on samples of the proposed untreated discharge water shall be performed to determine if contamination exists.

(2) Minimum reporting requirements for all produced ground water dischargers. The effluent shall be sampled before the commencement of discharge, again within thirty (30) days after commencement of discharge, and then once every six (6) months for the life of the project to maintain continued coverage under this generic permit. Samples taken in compliance with the provisions of this permit shall be taken prior to actual discharge or mixing with the receiving waters. The effluent shall be sampled for the parameters listed in Table 1.

Table 1

Parameter	Screening Values for Discharges into:	
	Fresh Waters	Coastal Waters
Total Organic Carbon (TOC)	10.0 mg/l	10.0 mg/l
pH, standard units	6.0-8.5	6.5-8.5
Total Recoverable Mercury	0.012 µg/l	0.025 µg/l
Total Recoverable Cadmium	9.3 µg/l	9.3 µg/l
Total Recoverable Copper	2.9 µg/l	2.9 µg/l
Total Recoverable Lead	0.03 mg/l	5.6 µg/l
Total Recoverable Zinc	86.0 µg/l	86.0 µg/l
Total Recoverable Chromium (Hex.)	11.0 µg/l	50.0 µg/l
Benzene	1.0 µg/l	1.0 µg/l
Naphthalene	100.0 µg/l	100.0 µg/l

(3) If any of the analytical test results exceed the screening values listed in Table 1, except TOC, the discharge is not authorized by this permit.

(a) For initial TOC values that exceed the screening values listed in Table 1, which may be caused by naturally-occurring, high molecular weight organic compounds, the permittee may request to be exempted from the TOC requirement. To request this exemption, the permittee shall submit additional information with a Notice of Intent (NOI),

described below, which describes the method used to determine that these compounds are naturally occurring. The Department shall grant the exemption if the permittee affirmatively demonstrates that the TOC values are caused by naturally-occurring, high molecular weight organic compounds.

(b) The NOI shall be submitted to the appropriate Department district office thirty (30) days prior to discharge, and contain the following information:

1. the name and address of the person that the permit coverage will be issued to;
2. the name and address of the facility, including county location;
3. any applicable individual wastewater permit number(s);
4. a map showing the facility and discharge location (including latitude and longitude);
5. the name of the receiving water; and
6. the additional information required by paragraph (3)(a) of this permit.

(c) Discharge shall not commence until notification of coverage is received from the Department.

(4) For fresh waters and coastal waters, the pH of the effluent shall not be lowered to less than 6.0 units for fresh waters, or less than 6.5 units for coastal waters, or raised above 8.5 units, unless the permittee submits natural background data confirming a natural background pH outside of this range. If natural background of the receiving water is determined to be less than 6.0 units for fresh waters, or less than 6.5 units in coastal waters, the pH shall not vary below natural background or vary more than one (1) unit above natural background for fresh and coastal waters. If natural background of the receiving water is determined to be higher than 8.5 units, the pH shall not vary above natural background or vary more than one (1) unit below natural background of fresh and coastal waters. The permittee shall include the natural background pH of the receiving waters with the results of the analyses required under paragraph (2) of this permit. For purposes of this section only, fresh waters are those having a chloride concentration of less than 1500 mg/l, and coastal waters are those having a chloride concentration equal to or greater than 1500 mg/l.

(5) In accordance with Rule 62-302.500(1)(a-c), F.A.C., the discharge shall at all times be free from floating solids, visible foam, turbidity, or visible oil in such amounts as to form nuisances on surface waters.

(6) If contamination exists, as indicated by the results of the analytical tests required by paragraph (2), the discharge cannot be covered by this generic permit. The facility shall apply for an individual wastewater permit at least ninety (90) days prior to the date discharge to surface waters of the State is expected, or, if applicable, the facility may seek coverage under any other applicable Department generic permit. No discharge is permissible without an effective permit.

(7) If the analytical tests required by paragraph (2) reveal that no contamination exists from any source, the facility can begin discharge immediately and is covered by this permit without having to submit an NOI request for coverage to the Department. A short summary of the proposed activity and copy of the analytical tests shall be sent to the applicable Department district office within one (1) week after discharge begins. These analytical tests shall be kept on site during discharge and made available to the Department if requested. Additionally, no Discharge Monitoring Report forms are required to be submitted to the Department.

(8) All of the general conditions listed in Rule 62-621.250, F.A.C., are applicable to this generic permit.

(9) There are no annual fees associated with the use of this generic permit.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
WATER

signed: August 23, 2007

MEMORANDUM

SUBJECT: Analytical Methods for Mercury in National Pollutant Discharge Elimination System (NPDES) Permits

FROM: James A. Hanlon, Director
Office of Wastewater Management

TO: Water Division Directors, Regions 1 - 10

The purpose of this memorandum is to inform you of EPA's March 12, 2007, approval of Method 245.7 for measurement of mercury and modified versions of approved analytical methods for mercury as well as the impact of their approval on the NPDES permitting process. While several different methods are currently approved under 40 CFR Part 136 for the analysis of mercury, some of these methods have much greater sensitivities and lower quantitation levels than others. This memorandum clarifies and explains that, in light of existing regulatory requirements for NPDES permitting,¹ only the most sensitive methods such as Methods 1631E and 245.7 are appropriate in most instances for use in deciding whether to set a permit limitation for mercury and for sampling and analysis of mercury pursuant to the monitoring requirements within a permit.

BACKGROUND

Section 301 of the Clean Water Act (CWA) requires NPDES permits to include effluent limitations that are as stringent as necessary to meet water quality standards. Thus, under the Act and EPA regulations, each permit must include, as necessary, requirements in addition to or more stringent than technology-based effluent limitations established under section 301 of the CWA in order to achieve water quality standards. 40 C.F.R. § 122.44(d)(1). The regulations require limitations to control all pollutants that the NPDES program director determines are or may be discharged at a level that "will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard," including both narrative and

¹ This memorandum is based on existing legal requirements and authorities. It does not impose any new, legally binding requirements on EPA, states, or the regulated community.

numeric criteria, 40 C.F.R. § 122.44(d)(1)(i). If the program director determines that a discharge has the reasonable potential to cause or contribute to such an excursion, the permit must contain water quality-based effluent limitations for the pollutant, 40 C.F.R. § 122.44(d)(1)(iii). Thus, a prospective permittee may need to measure various pollutants in its effluent at two stages: first, at the permit application stage so that the program director can determine whether “reasonable potential” exists and establish appropriate permit limits; and second, where a permit limit has been established, to meet the monitoring requirements within the permit. The following discussion explains which analytical methods permit applicants and permittees should use to make these measurements when mercury is the pollutant at issue.

Approved Analytical Methods

Measurements included on NPDES permit applications and on reports required to be submitted under the permit must generally be made using analytical methods approved by EPA under 40 CFR Part 136. See 40 CFR 136.1, 136.4, 136.5, 122.21(g)(7), and 122.41(j). For mercury, there are three methods commonly used in the NPDES program that EPA has approved under Part 136: Method 245.1, Method 245.2, and Method 1631E. Methods 245.1 and 245.2 were approved by EPA in 1974 and can achieve measurement of mercury down to 200 parts per trillion (ppt). Additionally, EPA approved Method 1631 Revision E in 2002. Method 1631E has a quantitation level of 0.5 ppt, making it 400 times more sensitive than Methods 245.1 and 245.2. In fact, the sensitivity of Methods 245.1 and 245.2 are well above the water quality criteria now adopted in most states (as well as the criteria included by EPA in the Final Water Quality Guidance for the Great Lakes System) for the protection of aquatic life and human health, which generally fall in the range of 1 to 50 ppt.² In contrast, Method 1631E, with a quantitation level of 0.5 ppt, does support the measurement of mercury at these low levels.

In addition to Methods 245.1, 245.2, and 1631E listed above, EPA approved Method 245.7 as well as modified versions of other EPA-approved methods on March 12, 2007. See 72 FR 11200. Method 245.7 has a quantitation level of 5.0 ppt, making it 40 times more sensitive than Methods 245.1 and 245.2. Additionally, modified versions of EPA-approved methods may also be used for the measurement of mercury. Methods approved under Part 136, such as 245.1 and 245.2, may be modified to achieve lower quantitation levels than can be achieved by the method as written.³ Modifications to an EPA-approved method for mercury that meet the method

² Many states have adopted mercury water quality criteria of 12 ppt for protection of aquatic life and 50 ppt for the protection of human health, and for discharges to the Great Lakes Basin, the applicable water quality criteria for mercury are 1.3 ppt for the protection of wildlife and 1.8 ppt for the protection of human health. In 2001, EPA issued new recommended water quality criteria guidance for the protection of human health. This new guidance recommends adoption of a methylmercury water quality criterion of 0.3 milligrams of methylmercury per kilogram (mg/kg) in fish tissue. EPA is currently developing implementation guidance to assist states in implementing the criterion, and *Draft Guidance for Implementing the January 2001 Methylmercury Water Quality Criterion* (EPA-823-B-04-001) was released for public comment in August 2006.

³ Examples of such modification may include changes in the sample preparation digestion procedures such as the use of reagents similar in properties to ones used in the approved method, changes in the equipment operating parameters such as the use of an alternate more sensitive wavelength, adjusting the sample volume to optimize method performance, and changes in the calibration ranges (provided that the modified range covers any relevant regulatory limit).

performance requirements of Part 136.6 are considered to be approved methods and require no further EPA approval. See 72 FR 11239-40 (March 12, 2007). For analytical method modifications that do not fall within the flexibility of Part 136.6, the modified methods may be approved under the alternate test procedure program as defined by Parts 136.4 and 136.5.

ACTIONS RESULTING FROM THE MARCH 12, 2007, RULEMAKING

To implement the March 12, 2007, rule, the Office of Wastewater Management (OWM) provides the following guidance:

Monitoring Data Submitted as Part of NPDES Permit Applications

As noted, most states have adopted water quality criteria for the protection of aquatic life and human health that fall in the range of 1 to 50 ppt, and Methods 245.1 and 245.2, as written, do not detect or quantify mercury in this range. A "did not detect" result using Method 245.1 or Method 245.2 would show only that mercury levels are below 200 ppt but would not establish that they are at or below the applicable water quality criterion. Therefore, when a permit writer receives a permit application reporting mercury data analyzed with Method 245.1 or Method 245.2 as "did not detect" results, the permit writer in reality may lack the information needed to make a "reasonable potential" determination. In contrast, Method 1631E is able to detect and quantify mercury concentrations at these low levels.

EPA therefore expects, in general, that all facilities with the potential to discharge mercury will provide with their NPDES permit applications monitoring data for mercury using Method 1631E or another sufficiently sensitive EPA-approved method. For purposes of permit applications, a method for mercury is "sufficiently sensitive" when (1) its method quantitation level is at or below the level of the applicable water quality criterion for mercury or (2) its method quantitation level is above the applicable water quality criterion, but the amount of mercury in a facility's discharge is high enough that the method detects and quantifies the level of mercury in the discharge.⁴ Accordingly, EPA strongly recommends that the permitting authority determine that a permit application that lacks effluent data analyzed with a sufficiently sensitive EPA-approved method such as Method 1631E is incomplete unless and until the facility supplements the original application with data analyzed with such a method. See 40 CFR 122.21(e) (a permit application is determined to be complete at the discretion of the permitting authority) and 40 CFR 122.21(g)(13) (the applicant shall provide to the Director, upon request, such other information as the Director may reasonably require to assess the discharge). Such data would allow the permitting authority to characterize the effluent to determine whether the discharge causes, has the reasonable potential to cause, or contributes to an excursion of state water quality standards for mercury and would consequently allow the permitting authority to determine whether a water quality-based effluent limit for mercury is necessary in the permit.

⁴ To illustrate the latter, if the water quality criterion for mercury in a particular state is 2.0 ppt, Method 245.7 (with a quantitation level of 5.0 ppt) would be sufficiently sensitive where it reveals that the level of mercury in a facility's discharge is 5.0 ppt or greater. In contrast, Method 245.7 would not be sufficiently sensitive if it resulted in a level of non-detect for that discharge because it could not be known whether mercury existed in the discharge at a level between 2.0 and 5.0 (less than the quantitation level but exceeding the water quality criterion).

Monitoring Requirements in Permits

Where a permit authority establishes a permit limit for mercury, it also needs to consider specifying an analytical method that the permittee must use to monitor for mercury during the term of the permit. Methods 245.1 and 245.2, as written, are not likely to be sensitive enough to detect or quantify the concentration of mercury in the discharge at a level that matches the limitation for mercury in the permit. EPA therefore expects the permitting authority to require the use of a sufficiently sensitive EPA-approved method for monitoring under the permit in order to ensure that the sampling and measurements required are "representative of the monitored activity" (as required by 40 CFR 122.41(j)(1)). For purposes of monitoring under a permit, a method for mercury is "sufficiently sensitive" when (1) its method quantitation level is at or below the level of the mercury limit established in the permit or (2) its method quantitation level is above the mercury limit in the permit, but the amount of mercury in a facility's discharge is high enough that the method detects and quantifies the level of mercury in the discharge.⁵

EPA Permit Review and Objection to State Issued Permits

For NPDES-authorized states, EPA regions are expected to review state permits and should strongly consider objecting to permits that are issued based on analytical data collected and analyzed using an EPA-approved method that is not sufficiently sensitive or that do not require use of a sufficiently sensitive EPA-approved method for monitoring when the permit includes a limit for mercury. OWM is expecting to undertake a permit quality review of a small representative number of permits with respect to mercury limitations and other conditions.

If you have questions concerning the content of this memorandum, please contact Linda Boornazian, Director of the Water Permits Division, at 202-564-0221 or have your staff contact Marcus Zobrist of the State and Regional Branch at 202-564-8311 or zobrist.marcus@epa.gov.

cc: NPDES Branch Chiefs Regions 1 - 10

⁵ See footnote 4.

**ORANGE COUNTY ENVIRONMENTAL PROTECTION DIVISION
WORK INSTRUCTION**

Title: Dewatering Permitting and Approvals Work Instruction
Number: EPD-WI-2000-04

Effective Date: 10/04/2011 Revision: 1
Renewal Date: 10/04/2014 Revision Date: 10/04/2011
Approved By: Elizabeth R. Johnson, Environmental Programs Administrator

Purpose: The purpose of this work instruction is to provide guidance regarding the approvals required to initiate construction related dewatering in unincorporated Orange County

I. Procedure

County Offices:

Orange County Public Works

For proposed dewatering discharges to the Orange County Municipal Separate Storm Sewer System (MS4), contact Orange County Development Engineering prior to commencement of dewatering. OC Public Works Contact: Miguel Tamayo, 407-836-7914.

Orange County Utilities (OCU)

If the groundwater discharge testing indicates groundwater quality parameter exceedences, the discharge may be allowed to enter into the Orange County sanitary system. Coordinate with OCU. If OCU can accept the discharge, a County Industrial Wastewater Discharge Permit (IWD) will be required. Per Florida Department of Environmental Protection (FDEP), no FDEP dewatering permitting is required if an IWD is received.

Contact: Susanna Littell, OCU/Water Reclamation, 407-254-7710 (Industrial Wastewater Discharge Permits)

Contact: Laura Woodbury, P.E., OCU/Development Engineering, 407-254-9928.

Rules/Permits:

- Chapter 37 Article XX. Addresses industrial waste pretreatment and permitting.
- Industrial Wastewater Discharge (IWD) Permit. Required prior to discharge to the wastewater system.
- OCU Development Engineering Connection Requirements. OCU Development Engineering reviews and approves plans for groundwater dewatering and remediation projects when discharge will be to the OCU sanitary sewer system.

EPD-WI-2000-04	Effective Date: 10/04/2011
The only official copy of this document is on the EPD intranet.	Page 1 of 3

**ORANGE COUNTY ENVIRONMENTAL PROTECTION DIVISION
WORK INSTRUCTION**

State Agencies:

Florida Department of Environmental Protection (FDEP)

For dewatering that is discharged offsite, sampling/analytical work is required prior to dewatering to determine if the proposed activity can be permitted under one of the generic dewatering permits.

FDEP Contacts: Ali Kazi, 407-897-4149; Randall Cunningham, 407-897-4152.

Rules/Permits:

- Generic Permit for Discharges from Petroleum Contaminated Sites (62-621.300(1)).
- Generic Permit for the Discharge of Produced Groundwater from any Non-Contaminated Site Activity (62-621.300(2)).
- Permit for all Other Contaminated Sites (62-04; 62-302; 62-620 & 62-660).

Water Management Districts:

St. Johns River Water Management District

Contact: Richard Kimmel, 407-659-4849.

Rules/Permits:

- No permit ("No Notice").
- Noticed General Permit for Short-term Construction Dewatering.
- Individual and Standard General Consumptive Use Permit.

South Florida Water Management District

Contact: Mario Cabana, 407-858-6100, ext. 3816.

Rules/Permits:

- "No-Notice" Short-Term Dewatering Permits.
- Dewatering General Water Use Permits.
- Long-term Dewatering Individual Permits.

For dewatering activities located in the City of Orlando contact Lisa Lotti at 407-246-2037.

II. Scope

This procedure applies to construction sites within unincorporated Orange County.

Definitions:

Off-site: For the purposes of this Work Instruction, off-site means property not under control of the owner/applicant or (discharging to) the municipal separate storm sewer system or waters of the County.

EPD-WI-2000-04	Effective Date: 10/04/2011
The only official copy of this document is on the EPD intranet.	Page 2 of 3

**ORANGE COUNTY ENVIRONMENTAL PROTECTION DIVISION
WORK INSTRUCTION**

Related Documents:

Florida Department of Environmental Protection's Construction Generic Permit

History of Revisions:

Revision No.	Revision Date	Summary of Revisions
0	06/06/2011	Original
1	10/04/2011	Update contact information