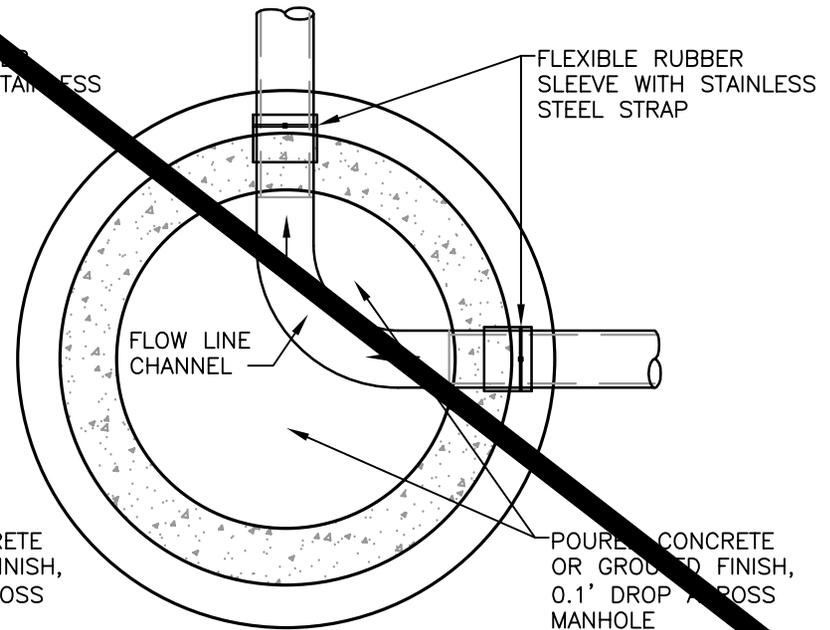
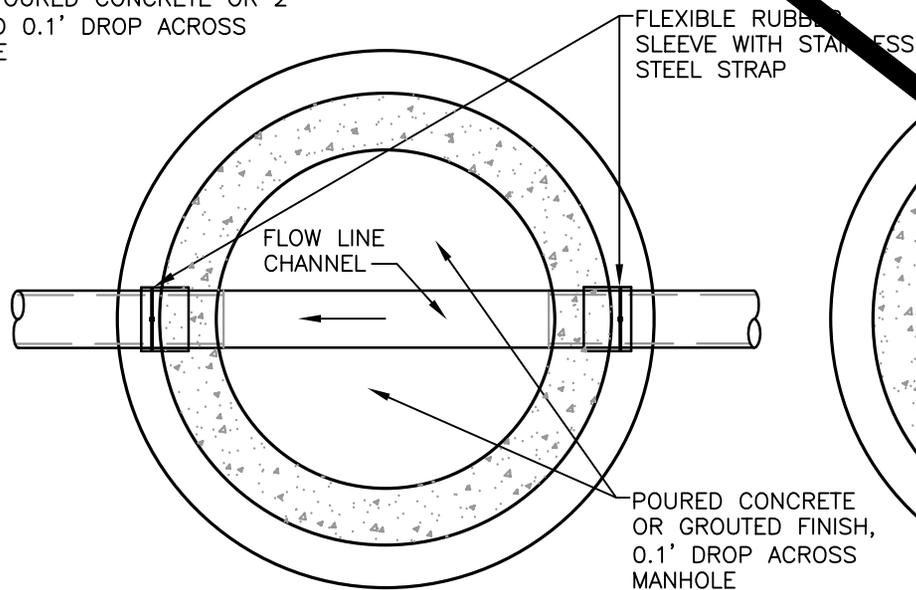


A-A

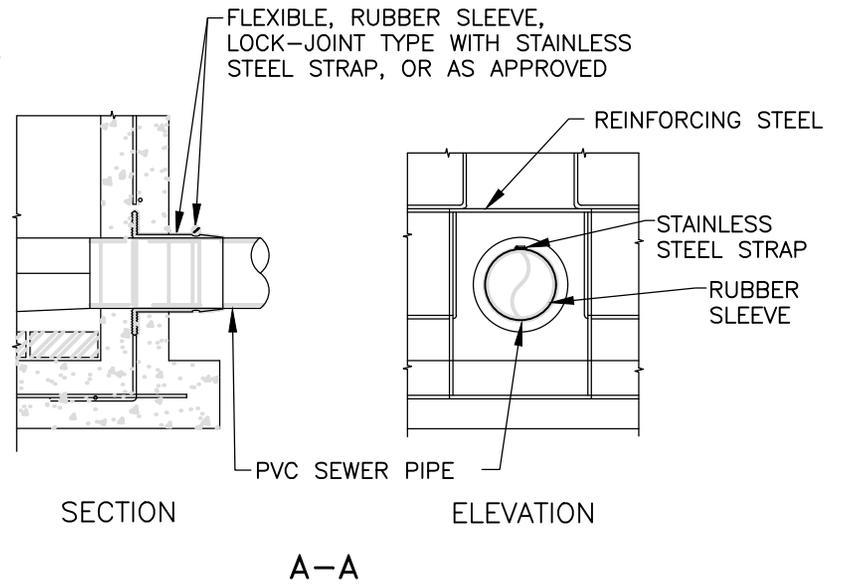
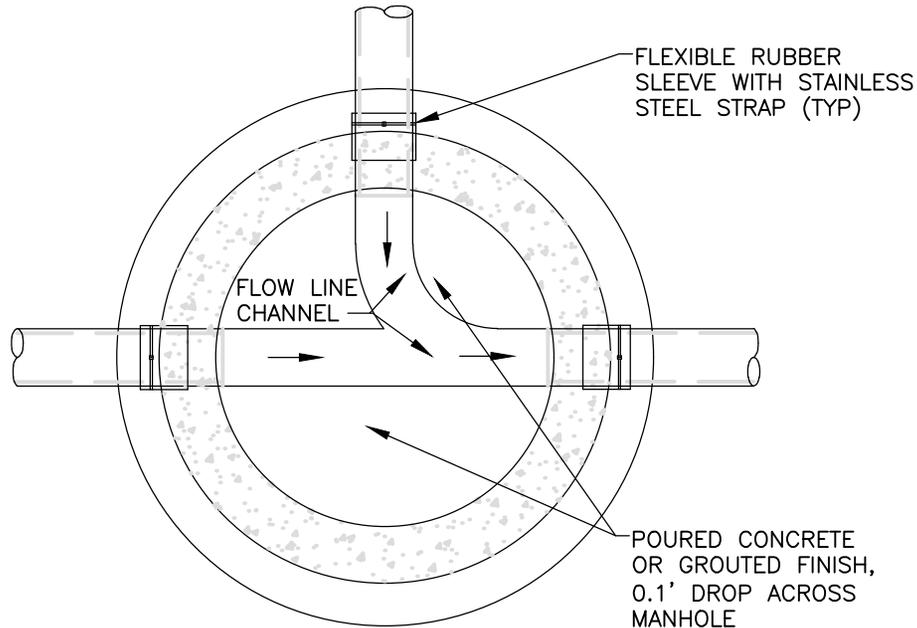
FLOW LINE CHANNELS SHALL BE CLAY BRICK HAVING A MINIMUM OF 2" POURED CONCRETE OR 2" GROUTED 0.1' DROP ACROSS MANHOLE



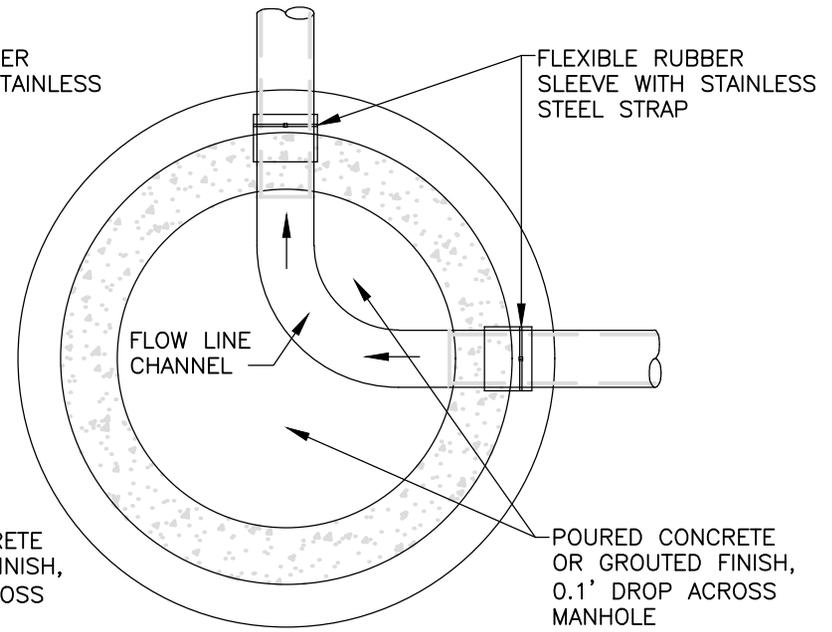
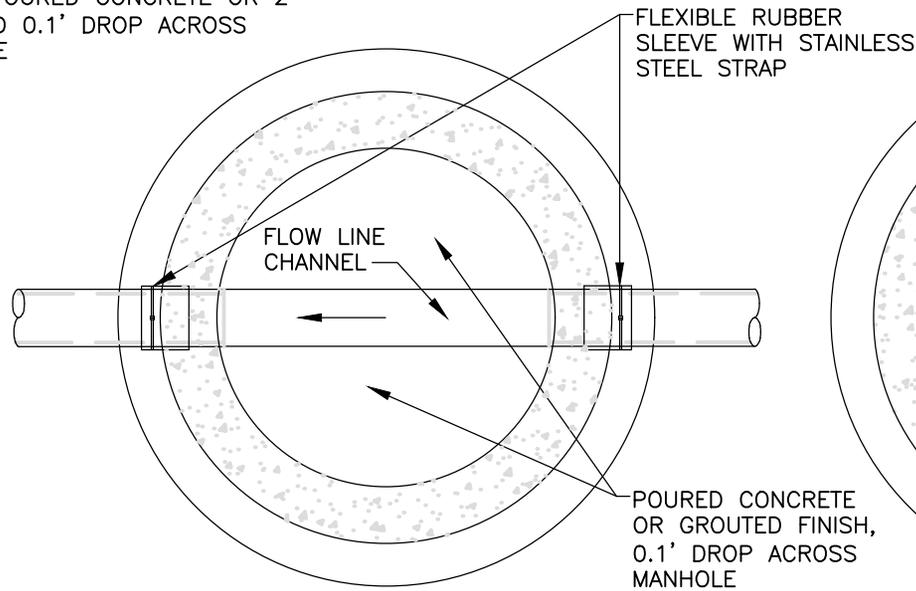
TYPICAL FLOW LINE CHANNELS DETAIL
NTS

REVISED: APRIL 2006

WW-15



FLOW LINE CHANNELS SHALL BE CLAY BRICK HAVING A MINIMUM OF 2" POURED CONCRETE OR 2" GROUTED 0.1' DROP ACROSS MANHOLE



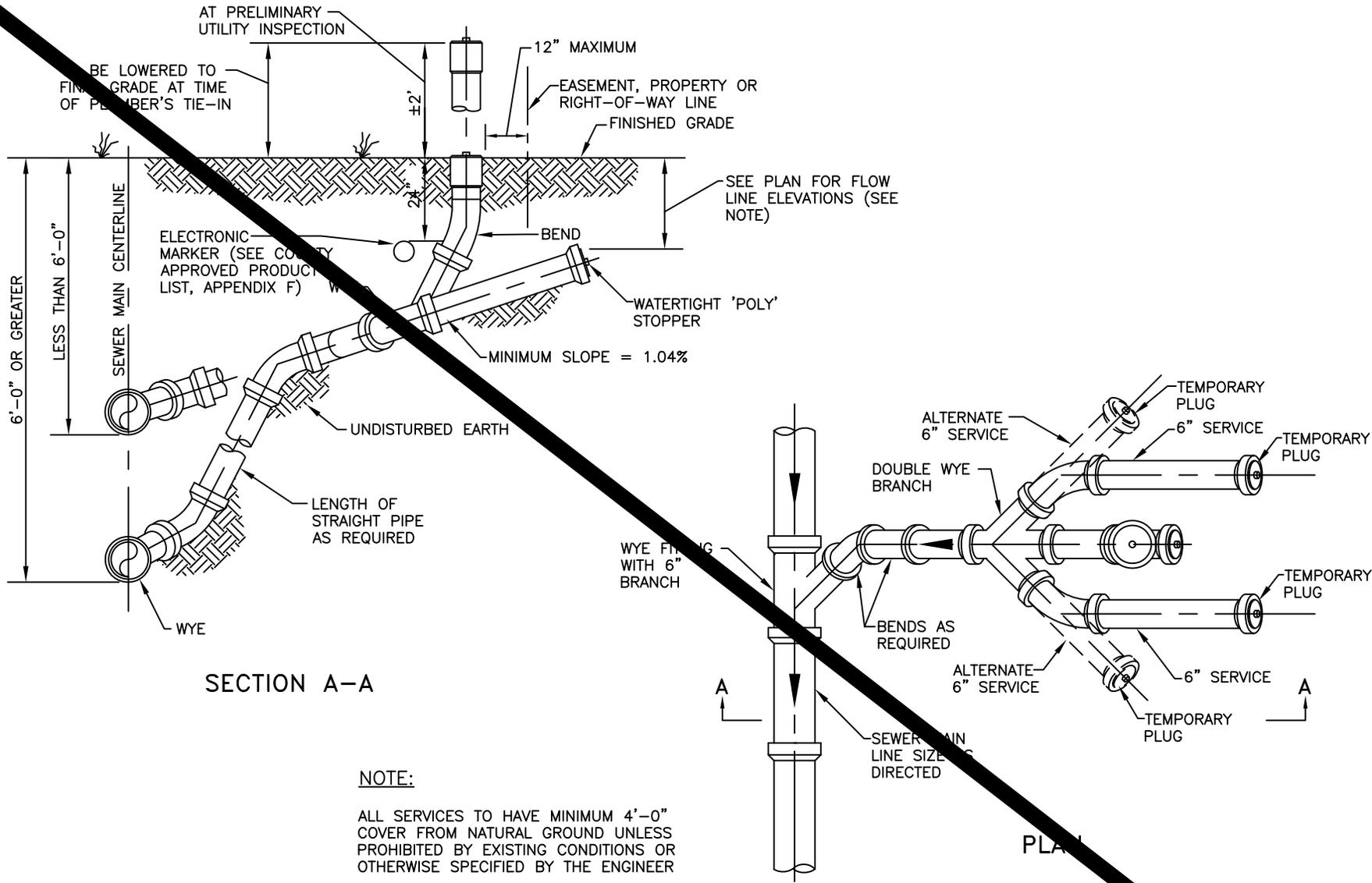
TYPICAL FLOW LINE CHANNELS DETAIL

REVISION DATE:
APRIL 2006

NTS



SHEET NO.
WW-15



SECTION A-A

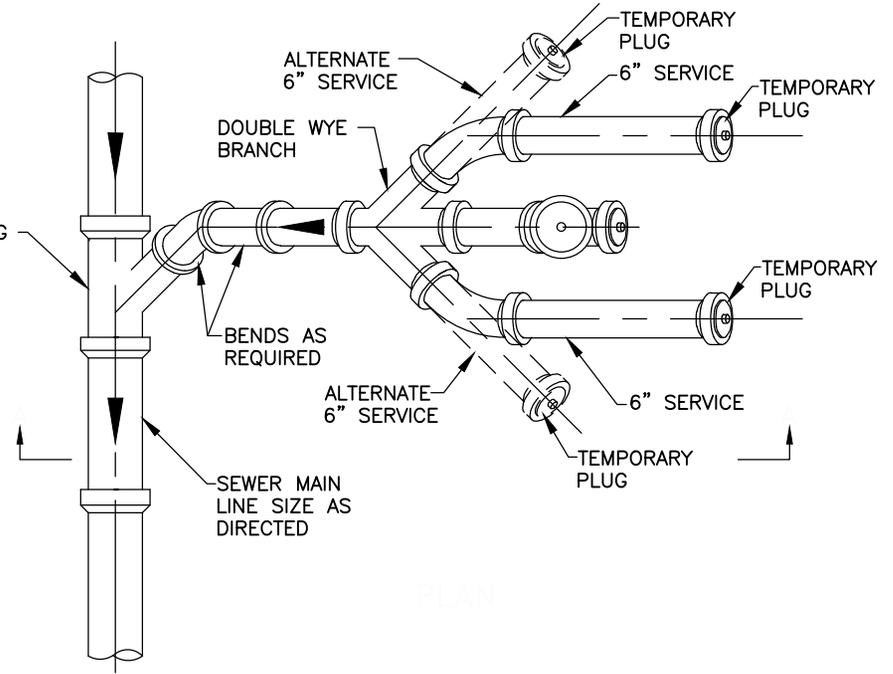
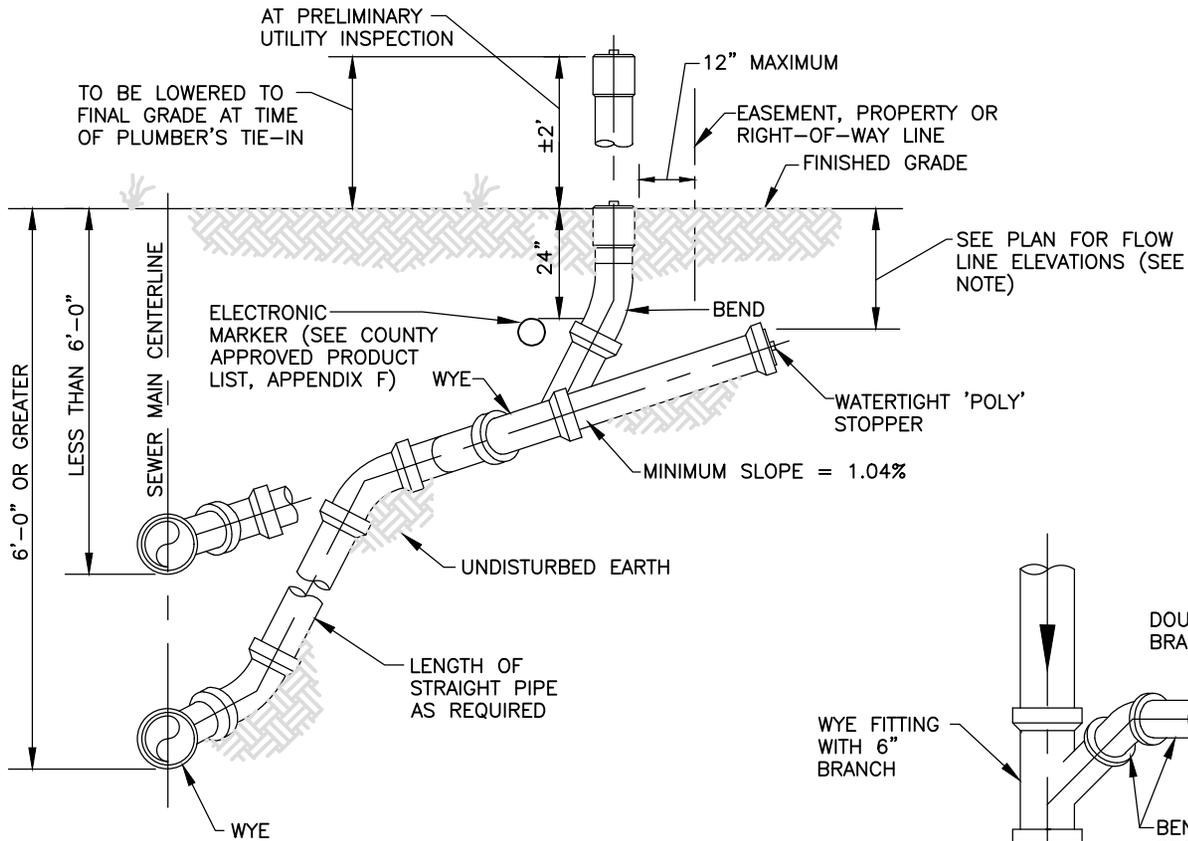
PLAN

NOTE:
 ALL SERVICES TO HAVE MINIMUM 4'-0"
 COVER FROM NATURAL GROUND UNLESS
 PROHIBITED BY EXISTING CONDITIONS OR
 OTHERWISE SPECIFIED BY THE ENGINEER

DOUBLE SEWER CLEAN-OUT DETAIL

NTS

WW-16
 REVISED: MAY 2009



NOTE:

ALL SERVICES TO HAVE MINIMUM 4'-0" COVER FROM NATURAL GROUND UNLESS PROHIBITED BY EXISTING CONDITIONS OR OTHERWISE SPECIFIED BY THE ENGINEER

DOUBLE SEWER CLEAN-OUT DETAIL

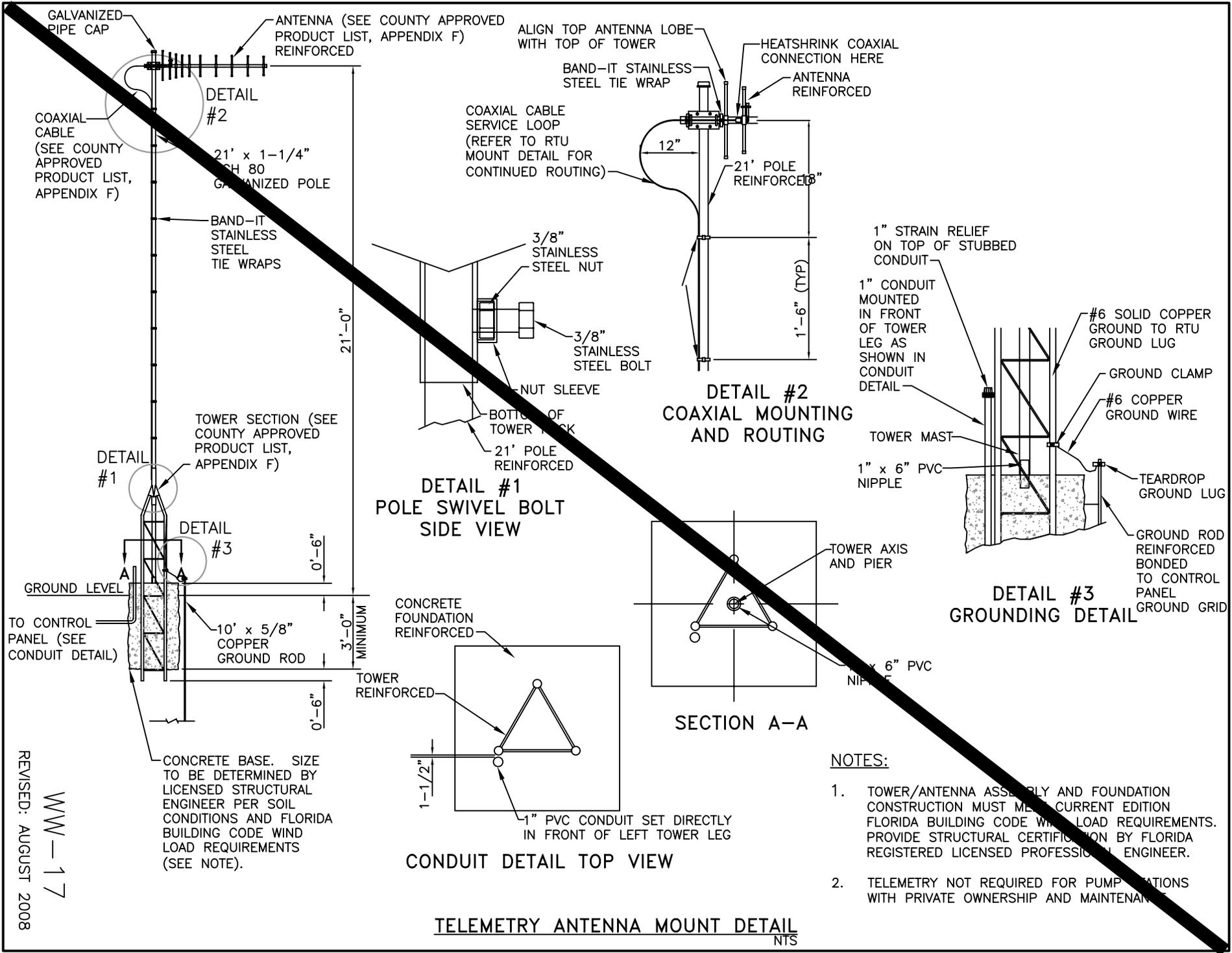
REVISION DATE:

MAY 2009

NTS



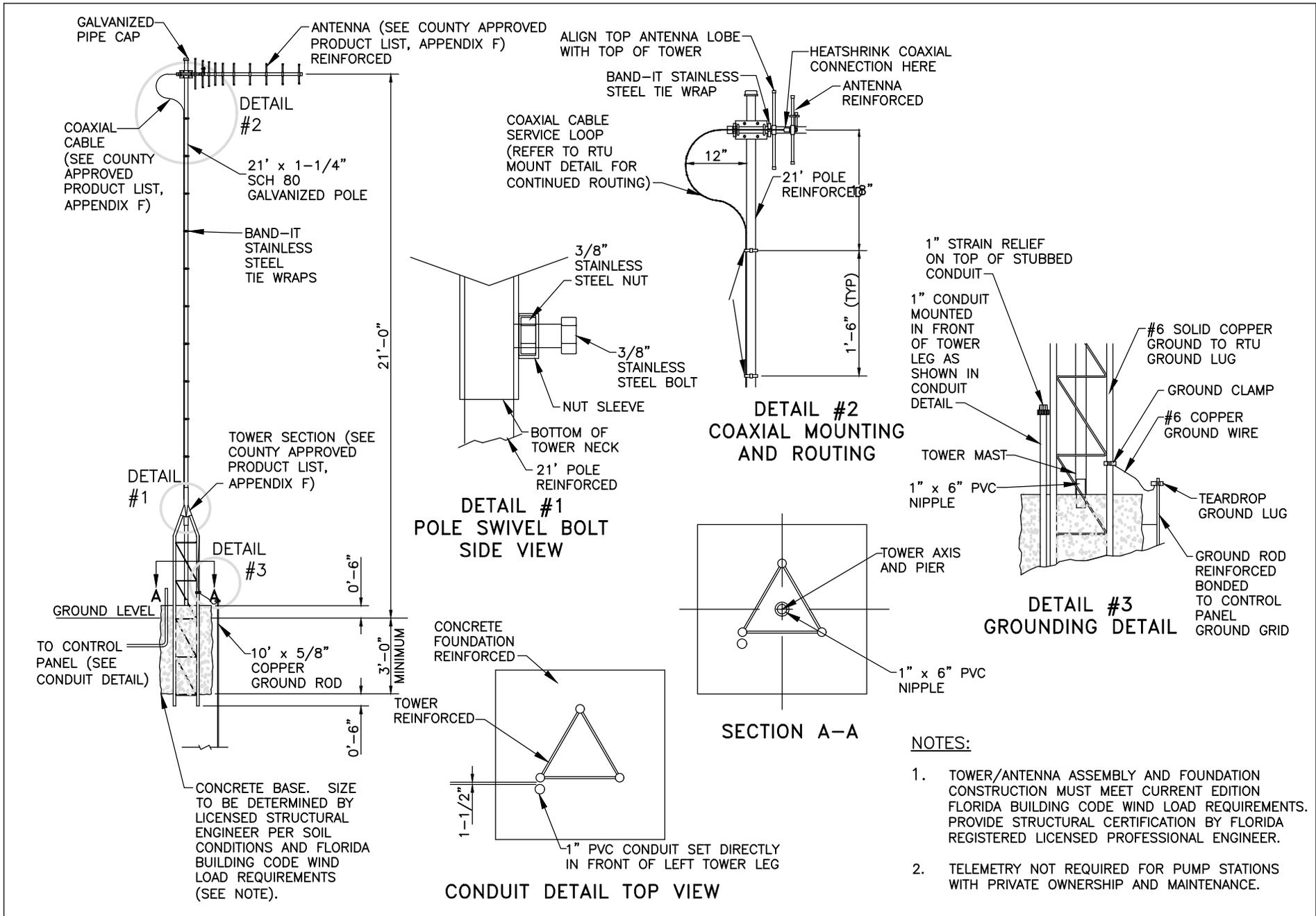
SHEET NO.
WW-16



REVISED: AUGUST 2008
 WW-17

TELEMETRY ANTENNA MOUNT DETAIL
 NTS

- NOTES:**
1. TOWER/ANTENNA ASSEMBLY AND FOUNDATION CONSTRUCTION MUST MEET CURRENT EDITION FLORIDA BUILDING CODE WIND LOAD REQUIREMENTS. PROVIDE STRUCTURAL CERTIFICATION BY FLORIDA REGISTERED LICENSED PROFESSIONAL ENGINEER.
 2. TELEMETRY NOT REQUIRED FOR PUMP STATIONS WITH PRIVATE OWNERSHIP AND MAINTENANCE.



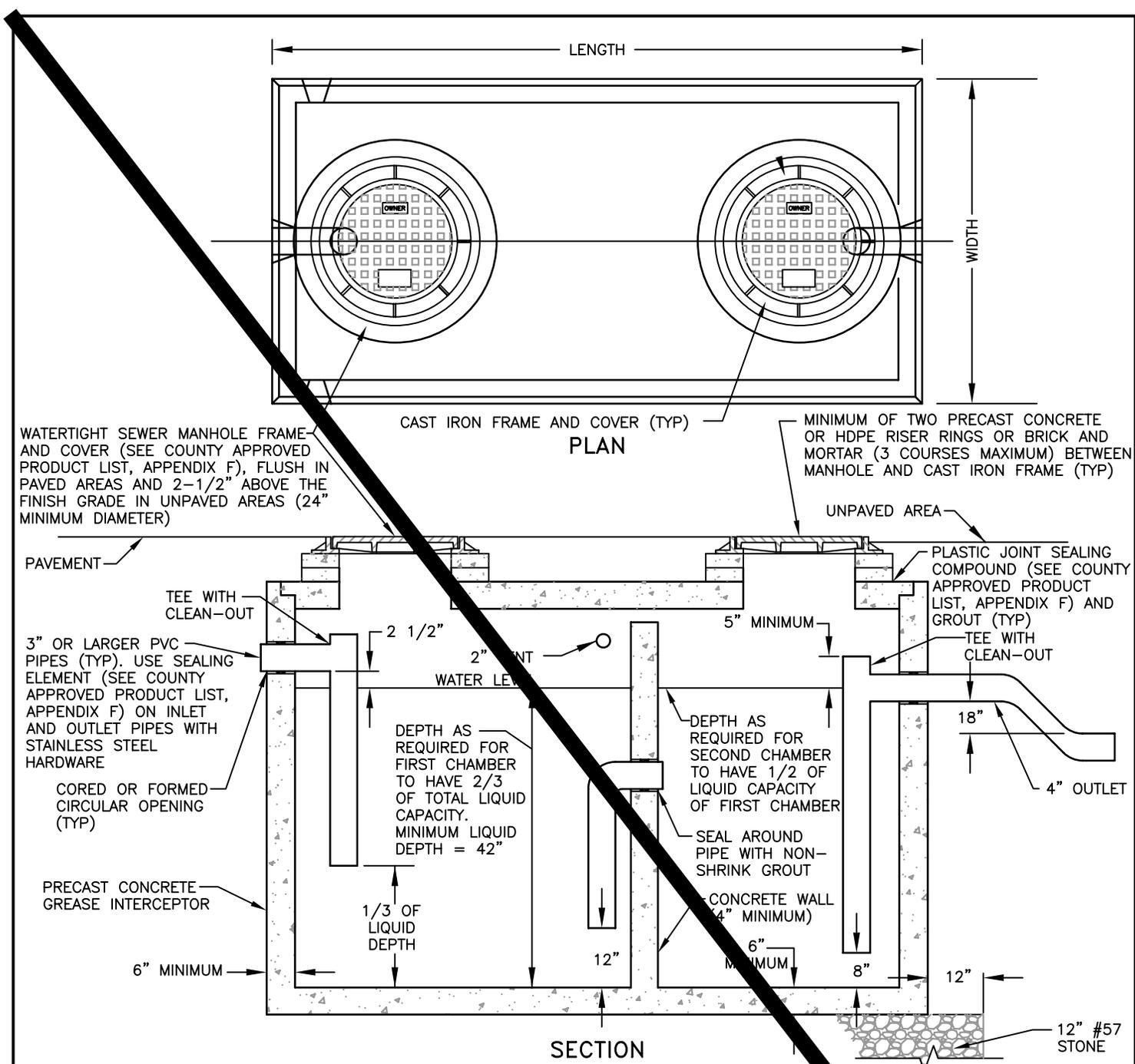
TELEMETRY ANTENNA MOUNT DETAIL

REVISION DATE:	AUGUST 2008



SHEET NO.
WW-17

NTS



WATERTIGHT SEWER MANHOLE FRAME AND COVER (SEE COUNTY APPROVED PRODUCT LIST, APPENDIX F), FLUSH IN PAVED AREAS AND 2-1/2" ABOVE THE FINISH GRADE IN UNPAVED AREAS (24" MINIMUM DIAMETER)

CAST IRON FRAME AND COVER (TYP)
PLAN

MINIMUM OF TWO PRECAST CONCRETE OR HDPE RISER RINGS OR BRICK AND MORTAR (3 COURSES MAXIMUM) BETWEEN MANHOLE AND CAST IRON FRAME (TYP)

PAVEMENT
TEE WITH CLEAN-OUT
3" OR LARGER PVC PIPES (TYP). USE SEALING ELEMENT (SEE COUNTY APPROVED PRODUCT LIST, APPENDIX F) ON INLET AND OUTLET PIPES WITH STAINLESS STEEL HARDWARE

UNPAVED AREA
PLASTIC JOINT SEALING COMPOUND (SEE COUNTY APPROVED PRODUCT LIST, APPENDIX F) AND GROUT (TYP)
TEE WITH CLEAN-OUT

CORED OR FORMED CIRCULAR OPENING (TYP)
PRECAST CONCRETE GREASE INTERCEPTOR

DEPTH AS REQUIRED FOR FIRST CHAMBER TO HAVE 2/3 OF TOTAL LIQUID CAPACITY. MINIMUM LIQUID DEPTH = 42"

DEPTH AS REQUIRED FOR SECOND CHAMBER TO HAVE 1/2 OF LIQUID CAPACITY OF FIRST CHAMBER

6" MINIMUM

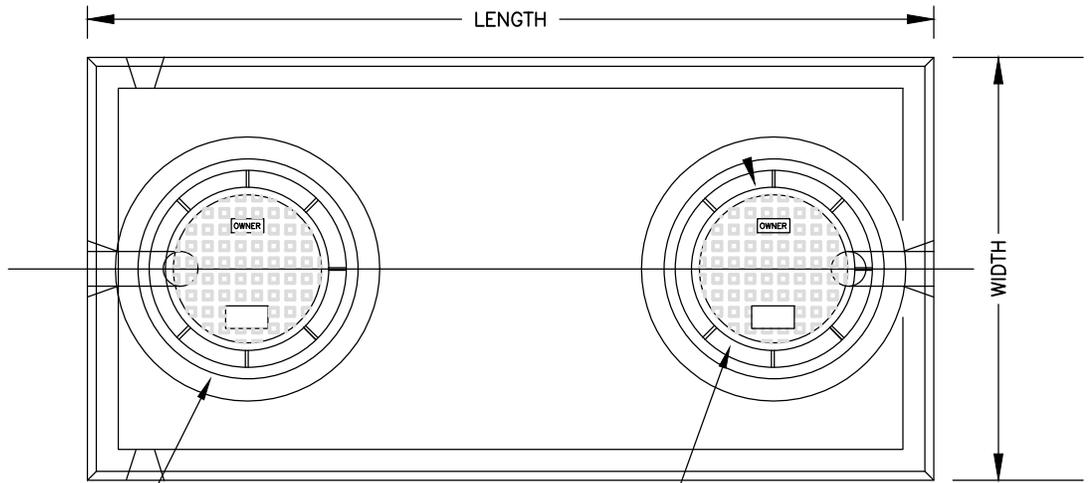
1/3 OF LIQUID DEPTH

SEAL AROUND PIPE WITH NON-SHRINK GROUT

CONCRETE WALL (4" MINIMUM)

NOTES:

- GREASE INTERCEPTOR SHALL COMPLY WITH STRUCTURAL REQUIREMENTS APPLICABLE TO SEPTIC TANKS EXCEPT THAT THE INLET INVERT SHALL DISCHARGE A MINIMUM 2-1/2 INCHES ABOVE THE LIQUID LEVEL LINE AND THE OUTLET PIPE SHALL HAVE A TEE WITH A MINIMUM DIAMETER OF FOUR (4) INCHES THAT EXTENDS TO WITHIN 8 INCHES OF THE BOTTOM OF THE TANK.
- INTERCEPTOR MUST BE LOCATED SO AS TO PROVIDE EASY ACCESS FOR ROUTINE INSPECTION AND CLEANING.
- WHERE A GREASE INTERCEPTOR IS REQUIRED, ONLY KITCHEN WASTEWATER SHALL FIRST PASS THROUGH THE INTERCEPTOR AND THEN BE DISCHARGED INTO THE FIRST COMPARTMENT OF A SEPTIC TANK OR OTHER APPROVED SYSTEM.
- SIZING OF GREASE INTERCEPTOR SHALL BE BASED ON THE DETAIL WW-18A EQUATIONS. THE MINIMUM VOLUME OF ANY GREASE INTERCEPTOR SHALL BE 750 GALLONS AND THE MAXIMUM VOLUME OF A SINGLE GREASE INTERCEPTOR SHALL BE 1250 GALLONS. WHEN THE REQUIRED EFFECTIVE CAPACITY OF THE GREASE INTERCEPTOR IS GREATER THAN 1250 GALLONS, INSTALLATION OF GREASE TRAPS IN SERIES IS REQUIRED.
- KEYED JOINT SEALED WITH BUTYL RUBBER.

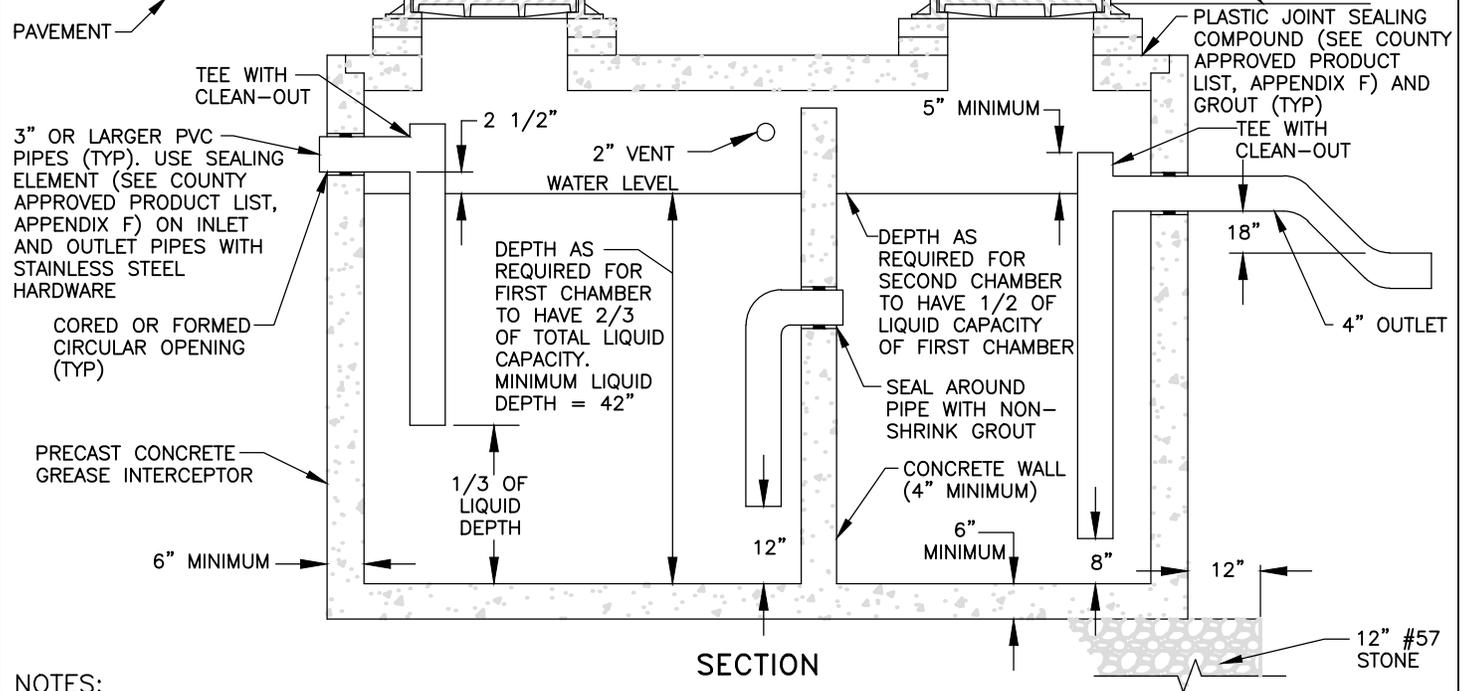


PLAN

WATERTIGHT SEWER MANHOLE FRAME AND COVER (SEE COUNTY APPROVED PRODUCT LIST, APPENDIX F), FLUSH IN PAVED AREAS AND 2-1/2" ABOVE THE FINISH GRADE IN UNPAVED AREAS (24" MINIMUM DIAMETER)

CAST IRON FRAME AND COVER (TYP)

MINIMUM OF TWO PRECAST CONCRETE OR HDPE RISER RINGS OR BRICK AND MORTAR (3 COURSES MAXIMUM) BETWEEN MANHOLE AND CAST IRON FRAME (TYP)



SECTION

NOTES:

1. GREASE INTERCEPTOR SHALL COMPLY WITH STRUCTURAL REQUIREMENTS APPLICABLE TO SEPTIC TANKS EXCEPT THAT THE INLET INVERT SHALL DISCHARGE A MINIMUM 2-1/2 INCHES ABOVE THE LIQUID LEVEL LINE AND THE OUTLET PIPE SHALL HAVE A TEE WITH A MINIMUM DIAMETER OF FOUR (4) INCHES THAT EXTENDS TO WITHIN 8 INCHES OF THE BOTTOM OF THE TANK.
2. INTERCEPTOR MUST BE LOCATED SO AS TO PROVIDE EASY ACCESS FOR ROUTINE INSPECTION AND CLEANING.
3. WHERE A GREASE INTERCEPTOR IS REQUIRED, ONLY KITCHEN WASTEWATER SHALL FIRST PASS THROUGH THE INTERCEPTOR AND THEN BE DISCHARGED INTO THE FIRST COMPARTMENT OF A SEPTIC TANK OR OTHER APPROVED SYSTEM.
4. SIZING OF GREASE INTERCEPTORS SHALL BE BASED ON THE DETAIL WW-18A EQUATIONS. THE MINIMUM VOLUME OF ANY GREASE INTERCEPTOR SHALL BE 750 GALLONS AND THE MAXIMUM VOLUME OF A SINGLE GREASE INTERCEPTOR SHALL BE 1250 GALLONS. WHEN THE REQUIRED EFFECTIVE CAPACITY OF THE GREASE INTERCEPTOR IS GREATER THAN 1250 GALLONS, INSTALLATION OF GREASE TRAPS IN SERIES IS REQUIRED.
5. KEYED JOINT SEALED WITH BUTYL RUBBER.

GREASE INTERCEPTOR

NTS

REVISION DATE:
AUGUST 2008



Collier County

SHEET NO.
WW-18

SIZING FORMULA FOR RESTAURANTS, COUNTRY CLUBS
AND ASSISTED LIVING FACILITIES

$$(S) \times (GS) \times (HR/12) \times LF = \text{EFFECTIVE CAPACITY OF GREASE INTERCEPTOR IN GALLONS}$$

WHERE:

- S = NUMBER OF SEATS IN DINING AREA.
 GS = GALLONS OF WASTE WATER PER SEAT
 (USE 25 GALLONS FOR RESTAURANTS WITH CHINA DISHES AND/OR AUTOMATIC DISHWASHER)
 (USE 10 GALLONS FOR RESTAURANTS WITH PAPER OR BASKETS AND NO DISHWASHER)
 HR = NUMBER OF HOURS RESTAURANT IS OPEN
 LF = LOADING FACTOR
 (USE 2.00 INTERSTATE HIGHWAY; 1.50 OTHER FREEWAYS; 1.25 RECREATIONAL AREA; 1.00 MAIN HIGHWAY; 0.75 OTHER HIGHWAY)

SIZING FORMULA FOR SCHOOLS AND OTHER ESTABLISHMENTS
WITH COMMERCIAL KITCHENS (NO DISHWASHER)

$$(M) \times (GM) \times (LF) = \text{EFFECTIVE CAPACITY OF GREASE INTERCEPTOR IN GALLONS}$$

WHERE:

- M = MEALS PREPARED PER DAY
 GM = GALLONS OF WASTE WATER PER MEAL
 (USE 5 GALLONS)
 LF = LOADING FACTOR
 (USE 1.00 WITH DISHWASHING MACHINE AND 0.75 WITHOUT DISHWASHING MACHINE)

NO COMMERCIAL DISHWASHER, NO CHINA OR DISPOSAL CHINA ONLY
CAPACITY OF GREASE TRAPS

TOTAL FLOW-THROUGH RATING (GPM)	GREASE RETENTION CAPACITY (POUNDS)
4	8
6	12
7	14
9	18
10	20
12	24
14	28
15	30
18	36
20	40
25	50
35	70
50	100

**SIZING FORMULA FOR RESTAURANTS, COUNTRY CLUBS
AND ASSISTED LIVING FACILITIES**

$$(S) \times (GS) \times (HR/12) \times LF = \text{EFFECTIVE CAPACITY OF GREASE INTERCEPTOR IN GALLONS}$$

WHERE:

- S = NUMBER OF SEATS IN DINING AREA.
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 HR = NUMBER OF HOURS RESTAURANT IS OPEN
 LF = LOADING FACTOR
 (USE 2.00 INTERSTATE HIGHWAY; 1.50 OTHER FREEWAYS; 1.25 RECREATIONAL AREA; 1.00 MAIN HIGHWAY; 0.75 OTHER HIGHWAY)

**SIZING FORMULA FOR SCHOOLS AND OTHER ESTABLISHMENTS
WITH COMMERCIAL KITCHENS (NO DISHWASHER)**

$$(M) \times (GM) \times (LF) = \text{EFFECTIVE CAPACITY OF GREASE INTERCEPTOR IN GALLONS}$$

WHERE:

- M = MEALS PREPARED PER DAY
 GM = GALLONS OF WASTE WATER PER MEAL
 (USE 5 GALLONS)
 LF = LOADING FACTOR
 (USE 1.00 WITH DISHWASHING MACHINE AND 0.75 WITHOUT DISHWASHING MACHINE)

**NO COMMERCIAL DISHWASHER, NO CHINA OR DISPOSAL CHINA ONLY
CAPACITY OF GREASE TRAPS**

TOTAL FLOW-THROUGH RATING (GPM)	GREASE RETENTION CAPACITY (POUNDS)
4	8
6	12
7	14
9	18
10	20
12	24
14	28
15	30
18	36
20	40
25	50
35	70
50	100

SECTION 4

APPENDICES

Go to the ~~Collier County website below for the latest revisions to the appendices:~~
For the latest revisions to the Appendices visit:

~~<https://www.colliercountyfl.gov/your-government/divisions-f-r/public-utilities-planning-and-project-management/utilities-standards-manual>~~

Collier County Public Utilities
Engineering and Project Management Resources Webpage.

**COLLIER COUNTY WATER-SEWER DISTRICT
UTILITIES STANDARDS MANUAL**

SECTION 4

APPENDICES

Table of Contents

Appendix A	Utility Deviation Form
Appendix B	Water Meter Sizing Form
Appendix C	Final Waiver of Liens – Conveyance of Utilities Facilities to County
Appendix D	Utilities Conveyance Checklist
Appendix E	Vendor and Manufacturer Approval Application Form
Appendix F	County Approved Product List
Appendix G	Approved Backflow Devices
<u>Appendix H</u>	<u>Basic User Application & Agreement for Delivery and Reuse of IQ Water</u>



Water Meter Sizing Form

One Form Per Meter

Preparer's Information:

Project Information:

Date =====> _____

Name =====> _____

Permit or AR Number _____

Title =====> _____

Name of Project =====> _____

Company=====> _____

Project Address =====> _____

Address =====> _____

Phone =====> _____

Email Address =====> _____

Please Note:

1. All commercial facilities must be metered separately from residential facilities with the exception of those commercial facilities that are within a master metered residential development and designed for the exclusive use of the residents within such development.

2. The Design Engineer/Architect must submit signed and sealed documentation supporting meter sizing. Sizing shall be based upon fixture flow values, as shown on the following page and the table on page 3, unless approved otherwise by Utility Deviation. If an increase in meter size is requested to accommodate for fire flow, the Engineer/Architect should check appropriate box below. A Utility Deviation will not be required for increasing meter size for fire flow requirements. For all meter sizes, the Engineer/Architect must consider all relevant factors before selecting the final meter size.

3. For remodeling projects, this form must be submitted only if there is a net increase in fixture flow value.

This Section to be filled out by Engineer/Architect of Record:

Demand in accordance with the attached Fixture Flow Value Worksheet(s) and the Table for Estimating Demand:

_____ GPM

Meter Size Required: _

Meter Size Requested: _

If the meter size requested is larger than the meter size required per the table below, please indicate the reason for the request by checking the appropriate box:

Existing Meter Size: _

- Fire Flow
- Other (Please attach Utility Deviation Approval)

Type or Print Name of Engineer/Architect of Record for Project

Demand Range (GPM)	Meter Size
10 to 30	3/4"
30.1 to 50	1"
50.1 to 100	1 1/2"
100.1 to 160	2"
160.1 to 450	3"
450.1 to 1,000	4"
1,000.1 to 2,000	5"
2,000.1 to 3,500	8"

Signature of Engineer/Architect of Record for Project and Date

[Affix Engineering/Architect Stamp Here]



Fixture Flow Value Worksheet

Please call Public Utilities Engineering (239) 252-2583 with any questions.

Enter # of Fixtures of each Fixture Type, per unit, then multiply by appropriate Flow Rate to get Fixture Value

Fixture	Flow Rate	# of Fixtures Per Unit	Fixture Flow Value
Automatic Clothes Washer			
Commercial	3	x	=
Residential	2	x	=
Bathroom group			
As defined in FL Plumbing Code Section 202 (1.6 gpm water closet)			
	5	x	=
Bathtub	4	x	=
Bidet	2	x	=
Dental unit or cuspidor	1	x	=
Dishwasher, residential	2.75	x	=
Drinking fountain	0.75	x	=
Shower	3	x	=
Sillcock, hose bibb	5	x	=
Sink (per faucet)			
Kitchen, residential	2	x	=
Laundry tray	4	x	=
Lavatory	2	x	=
Service	3	x	=
Wash	2	x	=
Urinal			
Standard		x	=
Flushless	0	x	=
Valve* Gallons/Flush = <input type="text"/> x10		x	=
Water Closet			
Flushometer valve* Gallons/Flush = <input type="text"/> x10		x	=
Flushometer tank	1.6	x	=
Tank	4	x	=
For any fixtures not listed, submit manufacturer's data sheets and enter appropriate description and value:			
Other:		x	=
Total Fixture Value Per Unit =====>			
Number of Units with this Fixture Count =====>			
Grand Total of Fixture Flow Value (Per Unit Total x Number of Units)** =====>			

*Valves are calculated using a flush rate of 10 flushes per minute (according to Florida Plumbing Code).

The flow rate is 10 times the gallons per flush.

The fixture flow value is calculated as follows:

Number of Valves

Calculation

1 - 2

Flow Rate **times** Number of Fixtures.

3 - 10

Flow Rate **times two plus two times** the Number of Fixtures.

11 or more

Flow Rate **times** Number of Fixtures **divided** by two.

**Use total Fixture Flow Value on "Table for Estimating Demand" to estimate water meter demand.



Table for Estimating Demand

Please call Public Utilities Engineering (239) 252-2583 with any questions.

SUPPLY SYSTEMS PREDOMINANTLY FOR FLUSH TANKS		SUPPLY SYSTEMS PREDOMINANTLY FOR FLUSH VALVES	
Load	Demand	Load	Demand
Fixture Flow Value	Gallons per minute	Fixture Flow Value	Gallons per minute
1	3.0	---	---
2	5.0	---	---
3	6.5	---	---
4	8.0	---	---
5	9.4	5	15.0
	10.7	6	17.4
7	11.8	7	19.8
8	12.8	8	22.2
9	13.7	9	24.6
10	14.6	10	27.0
11	15.4	11	27.8
12	16.0	12	28.6
13	16.5	13	29.4
14	17.0	14	30.2
15	17.5	15	31.0
16	18.0	16	31.8
17	18.4	17	32.6
18	18.8	18	33.4
19	19.2	19	34.2
20	19.6	20	35.0
25	21.5	25	38.0
30	23.3	30	42.0
35	24.9	35	44.0
40	26.3	40	46.0
45	27.7	45	48.0
50	29.1	50	50.0
60	32.0	60	54.0
70	35.0	70	58.0
80	38.0	80	61.2
90	41.0	90	64.3
100	43.5	100	67.5
120	48.0	120	73.0
140	52.5	140	77.0
160	57.0	160	81.0
180	61.0	180	85.5
200	65.0	200	90.0
225	70.0	225	95.5
250	75.0	250	101.0
275	80.0	275	104.5
300	85.0	300	108.0
400	105.0	400	127.0
500	124.0	500	143.0
750	170.0	750	177.0
1,000	208.0	1,000	208.0
1,250	239.0	1,250	239.0
1,500	269.0	1,500	269.0
1,750	297.0	1,750	297.0
2,000	325.0	2,000	325.0
2,500	380.0	2,500	380.0
3,000	433.0	3,000	433.0
4,000	535.0	4,000	535.0
5,000	593.0	5,000	593.0



Water Meter Sizing Form

One Form Per Meter

Preparer's Information:

Name =====> _____

Title =====> _____

Company=====> _____

Address =====> _____

Phone =====> _____

Email Address =====> _____

Project Information:

Date =====> _____

Permit or AR Number _____

Name of Project =====> _____

Project Address =====> _____

Please Note:

1. All commercial facilities must be metered separately from residential facilities with the exception of those commercial facilities that are within a master metered residential development and designed for the exclusive use of the residents within such development.
2. The Design Engineer/Architect must submit signed and sealed documentation supporting meter sizing. Sizing shall be based upon fixture flow values, as shown on the following page and the table on page 3, unless approved otherwise by Utility Deviation. If an increase in meter size is requested to accommodate for fire flow, the Engineer/Architect should check appropriate box below. A Utility Deviation will not be required for increasing meter size for fire flow requirements. For all meter sizes, the Engineer/Architect must consider all relevant factors before selecting the final meter size.
3. For remodeling projects this form must be submitted only if there is a net increase in fixture flow value.

This Section to be filled out by Engineer/Architect of Record:

Demand in accordance with the Fixture Flow Value Worksheet and the Table for Estimating Demand

_____ GPM

Meter Size Required: _____

Meter Size Requested: _____

Existing Meter Size: _____

If the meter size requested is larger than the meter size required per the table below, please indicate the reason for the request by checking the appropriate box:

- Fire Flow Other (Please attach Utility Deviation approval)

Demand Range (GPM)	Meter Size
0 to 30	3/4"
30.1 to 50	1"
50.1 to 100	1 1/2"
100.1 to 160	2"
160.1 to 435	3"
435.1 to 750	4"
750.1 to 1600	6"
1600.1 to 2800	8"
2800.1 to 4200	10"

Demand ranges from AWWA M22 Table 6-1 Third Edition

 Type or Print Name of Engineer/Architect of Record for Project

 Signature of Engineer/Architect of Record for Project and Date
[Affix Engineering/Architect Seal Here]



Fixture Flow Value Worksheet

Please call Public Utilities Engineering (239) 252-2380 with any questions.

Enter # of Fixtures of each Fixture Type, per unit, then multiply by appropriate Load Value to get Fixture Flow Value

Fixture	Occupancy	Type of Supply Control	Load Values, in Water Supply Fixture Units (wsfu) Total		# of Fixtures Per Unit	Fixture Flow Value
Bathroom group	Private	Flush tank	3.6	x		=
Bathroom group	Private	Flushometer valve	8	x		=
Bath tub	Private	Faucet	1.4	x		=
Bath tub	Public	Faucet	4	x		=
Bidet	Private	Faucet	2	x		=
Combination fixture	Private	Faucet	3	x		=
Dishwashing machine	Private	Automatic	1.4	x		=
Drinking fountain	Offices, etc.	3/8" valve	0.25	x		=
Kitchen sink	Private	Faucet	1.4	x		=
Kitchen sink	Hotel, restaurant	Faucet	4	x		=
Laundry trays (1 to 3)	Private	Faucet	1.4	x		=
Lavatory	Private	Faucet	0.7	x		=
Lavatory	Public	Faucet	2	x		=
Service sink	Offices, etc.	Faucet	3	x		=
Shower head	Public	Mixing valve	4	x		=
Shower head	Private	Mixing valve	1.4	x		=
Urinal	Public	1" flushometer valve	10	x		=
Urinal	Public	3/4" flushometer valve	5	x		=
Urinal	Public	Flush tank	3	x		=
Washing machine (8 lb)	Private	Automatic	1.4	x		=
Washing machine (8 lb)	Public	Automatic	3	x		=
Washing machine (15 lb)	Public	Automatic	4	x		=
Water closet	Private	Flushometer valve	6	x		=
Water closet	Private	Flush tank	2.2	x		=
Water closet	Public	Flushometer valve	10	x		=
Water closet	Public	Flush tank	5	x		=
Water closet	Public or private	Flushometer tank	2	x		=
For any fixtures not listed, submit manufacturer's data sheets and enter appropriate description and value:						
Other:				x		=
Other:				x		=
Other:				x		=
Other:				x		=
Other:				x		=
Total Fixture Value Per Unit =====>						
Number of Units with this Fixture Count =====>						
Grand Total of Fixture Flow Value (Per Unit Total x Number of Units)** =====>						

**Use total Fixture Flow Value on "Table for Estimating Demand" to estimate water meter demand.

Fixture Flow Value worksheet from FBC 2023 edition



Table for Estimating Demand

Please call Public Utilities Engineering (239) 252-2380 with any questions.

Enter # of Fixtures of each Fixture Type, per unit, then multiply by appropriate Load Value to get Fixture Flow		SUPPLY SYSTEMS PREDOMINANTLY FOR FLUSH VALVES	
Load	Demand	Load	Demand
Fixture Flow Value	Gallons per minute	Fixture Flow Value	Gallons per minute
1	3.0	---	---
2	5.0	---	---
3	6.5	---	---
4	8.0	---	---
5	9.4	5	15.0
6	10.7	6	17.4
7	11.8	7	19.8
8	12.8	8	22.2
9	13.7	9	24.6
10	14.6	10	27.0
11	15.4	11	27.8
12	16.0	12	28.6
13	16.5	13	29.4
14	17.0	14	30.2
15	17.5	15	31.0
16	18.0	16	31.8
17	18.4	17	32.6
18	18.8	18	33.4
19	19.2	19	34.2
20	19.6	20	35.0
25	21.5	25	38.0
30	23.3	30	42.0
35	24.9	35	44.0
40	26.3	40	46.0
45	27.7	45	48.0
50	29.1	50	50.0
60	32.0	60	54.0
70	35.0	70	58.0
80	38.0	80	61.2
90	41.0	90	64.3
100	43.5	100	67.5
120	48.0	120	73.0
140	52.5	140	77.0
160	57.0	160	81.0
180	61.0	180	85.5
200	65.0	200	90.0
225	70.0	225	95.5
250	75.0	250	101.0
275	80.0	275	104.5
300	85.0	300	108.0
400	105.0	400	127.0
500	124.0	500	143.0
750	170.0	750	177.0
1,000	208.0	1,000	208.0
1,250	239.0	1,250	239.0
1,500	269.0	1,500	269.0
1,750	297.0	1,750	297.0
2,000	325.0	2,000	325.0
2,500	380.0	2,500	380.0
3,000	433.0	3,000	433.0
4,000	535.0	4,000	535.0
5,000	593.0	5,000	593.0

Table for estimating demand taken from Florida Building Code 2023 Edition

Collier County Public Utilities Department
County Approved Product List
All Systems

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
- 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
Casing Spacer End Seal	Power Seal	EndSeal	Section 330523.16, Page 4, <u>3.1 B</u>
Casing Spacer End Seals	Cascade Waterworks MFG Co.	CCES	Section 330523.16, Page 4, 3.1 B
Casing Spacers Stainless Steel	Power Seal	4810	Section 330523.16, Page 4, 3.1 BG-5
Casing Spacers Stainless Steel	Cascade Waterworks MFG Co.	CCS	Section 330523.16, Page 4, 3.1 B-5
Electronic Markers	3M Electronic Band Marker	1423, 1424 & 1428	Section 1: 2.6.1, 3.1.4, 3.2.1/WW-10/WW-12/WW-16
Electronic Markers	OMNI MARKER	161, 162 & 168	Section 330518, Page 9, 3.2 O.2
Joint Restraint Devices	EBAA Iron Sales		Section 1: 2.3/Section 330503, Page 5, 2.1 L/Section 330504, Page 7, 2.5 F
Joint Restraint Devices	Romac Industries		Section 1: 2.3/Section 330503, Page 5, 2.1 L/Section 330504, Page 7, 2.5 F
Joint Restraint Devices	Sigma		Section 1: 2.3/Section 330503, Page 5, L/Section 330504, Page 7, 2.5 F
Joint Restraint Devices	Star Pipe Products		Section 1: 2.3/Section 330503, Page 5, 2.1 L/Section 330504, Page 7, 2.5 F
Joint Restraint Devices	Ford Meter Box Company		Section 1: 2.3/Section 330503, Page 5, L/Section 330504, Page 7, 2.5 F
Joint Restraint Devices, Push-On joints for push joint pipe	American Cast Iron Pipe Company	Flex-Ring & Lok-Ring	Section 330504, Page 7, F.3
Joint Restraint Devices, Push-On joints for push joint pipe	McWane Inc.	Super-Lock & TR Flex	Section 330504, Page 7, F.3
Joint Restraint Devices, Push-On joints for push joint pipe	U.S. Pipe		Section 330504, Page 7, F.3
Metalized Tape	Reef Industries, Inc. Houston, TX	Terra Tape	Section 330518, Page 9, O.1

Collier County Public Utilities Department
County Approved Product List
All Systems

NOTES:

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Item	Manufacturer	Model(s)	Location in Standards Manual
Metalized Tape	Proline Safety Products	Detectable Tape	Section 330518, Page 9, O.1
Rubber Gasket pipe	McWane Inc.	Long-Span Pipe	Section 330518, Page 10, Q.1
Rubber Gasket pipe	American Cast Iron Pipe Company	Flanged	Section 330518, Page 10, Q.1
Rubber Gasket pipe	US Pipe	Flanged	Section 330518, Page 10, Q.1
Single Sealed Gasket Push-on type joint	American Cast Iron Pipe Company	Fastite	Section 330504, Page 10, 3.3.C
Single Sealed Gasket Push-on type joint	U.S. Pipe	Tyton	Section 330504, Page 10, 3.3.C
Single Sealed Gasket Push-on type joint	McWane Inc.	Tyton	Section 330504, Page 10, 3.3.C
Two-part Coal tar Epoxy	Madewell Products Corp.	Madewell 1104	Section 330518, Page 6, 3.2 G.4

**Collier County Public Utilities Department
County Approved Product List
Water Systems**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
- 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
Automatic Flushing Device, Ground Mounted	Mueller/Hydro-Guard	HG-1	W-2
Automatic Flushing Device, Ground Mounted	Kupferle Foundry Company	Eclipse #9400-WC	W-2
Automatic Flushing Device, Hydrant Mounted	Mueller/Hydro-Guard	HG-6	W-2
Automatic Flushing Device, Hydrant Mounted	Kupferle Foundry Company	Eclipse #9700	W-2
Backflow Preventer Assembly	See Approved Backflow Devices List, Appendix G		
Bushing	Ford	G18	W-6
Corporation Stops	Ford	F1100NL SERIES	W-6
Corporation Stops	Ford	FB1100NL SERIES	W-6
Corporation Stops	A.Y. McDonald	4104NL	W-5
Corporation Stops	A.Y. McDonald	4101 BF NL	W-5
Corporation Stops	Mueller	H10045N, H15008N	Section 331200, Page 2, 2.3 A.1
Corporation Stops	Mueller	H-10046N/ H-10046	W-5
Coupling	Ford	Model numbers vary by application	W-6
Coupling	A.Y. McDonald	Model numbers vary by application	W-6
Coupling	Mueller	Model numbers vary by application	W-6
Curb Stop	Ford	B43xxxW-NL	W-12
Curb Stop	A.Y. McDonald	76102-22	W-12
Curb Stop	Mueller	Mark II Oriseal H-15172N	Section 331200, Page 2, 2.3 A.1

**Collier County Public Utilities Department
County Approved Product List
Water Systems**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
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Item	Manufacturer	Model(s)	Location in Standards Manual
HDPE Stab Fitting	Elster	Hydrosert	
Hydrant	American Darling	6-inch B-84-B	Section 331619, Page 2, 2.1 G
Hydrant	Clow	Medallion	Section 331619, Page 2, 2.1 G
Hydrant	Mueller	Centurion A-423	Section 331619, Page 2, 2.1 G
Meter Box, Light Duty	DFW	Light Duty	W-12
Meter Box, Light Duty	Carson	Light Duty	W-12
Meter Box, Heavy Duty (Staff Use)	DFW	Heavy Duty	W-12
Meter Box, Heavy Duty (Staff Use)	Carson	Heavy Duty	W-12
Meter Box, Heavy Duty (Staff Use)	Hubbel	Heavy Duty	W-12
Meter, Fire Protection (3", 4", 6", 8")	Elster AMCO	evoQ4 Electromagnetic Meter	W-9/W-14
Meter, Fire Protection (3", 4", 6", 8", 10")	Neptune	HP Fire Service Turbine Meter	W-9/W-14
Meter, Fire Protection (3/4", 1", 1-1/2", 2")	Mueller Systems - Hersey	Residential Fire Meter	W
Meter, Fire Protection (4", 6", 8", 10")	Neptune	HP Protectus III Fire Service Meter	W-9/W-14
Meter, Potable Water	Neptune	Tru/Flo	W-13
Pedestal Housing	Channel	CCWD Signature Series SPH	W-5
Pedestal Housing	Water Plus Corp	131632	NP-4
Pedestal Housing	PenCell Plastics	AV142034HDHS001009	NP-4
Sampling Station	Kupferle Foundry Company	Eclipse 88WC	W-6
Sampling Station	Water Plus Corp	301W	W-6
Sampling Station	GIL Industries	3/4"	W-6

**Collier County Public Utilities Department
County Approved Product List
Water Systems**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
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Item	Manufacturer	Model(s)	Location in Standards Manual
Service Saddles (Brass)	Ford	F202B	Section 331200, Page 7, 2.3 G.1
Service Saddles (Brass)	Mueller	DR2 B	Section 331200, Page 7, 2.3 G.1
Service Saddles (PVC) Perm Bact Sample Point	Powerseal	P3401 SERIES	Section 331200, Page 7, 2.3 G.1/W-6
Service Saddles (PVC) Perm Bact Sample Point	Ford	S 90 SERIES	Section 331200, Page 7, 2.3 G.1/W-6
Service Wye	Ford	Y44-xxx-NL	W-12
Strainer, Flanged (Staff Use)	Mars	Z-plate	
Strainer, Flanged (Staff Use)	Neptune	Rilsan nylon-coated ductile iron	
Tapping Saddle/ Hot taps	Powerseal	P3490MJ Series	W-12
Valve Box	Tyler/Union	461	Section 331200, Page 4, 2.3 B.2
Valve Box, Locking Cover	AMPro USA	LL562	Section 331200, Page , 2.3 B.2.
Valve Setter	Wilkins	WMJS	W-9A/W-11A
Valve, Air	Val-Matic	Model 801AS	W-11/W-14/W-16
Valve, Air Release	A.R.I.	D-040 (nylon), D-040 ST ST (SS)	W-5
Valve, Bacterial Sampling Station Line	Mueller	Mark II Oriseal	Section 331200, Page 3, 2.3 A.1
Valve, Ball	Ford		Section 331200, Page 3, 2.3 A.1
Valves and Appurtenances	American Darling		Section 331200 2.3 A
Valves and Appurtenances	A.Y. McDonald		Section 331200 2.3 A
Valves and Appurtenances	Clow		Section 331200 2.3 A
Valves and Appurtenances	Ford		Section 331200 2.3 A
Valves and Appurtenances	Kennedy		Section 331200 2.3 A
Valves and Appurtenances	Mueller		Section 331200 2.3 A
Valves and Appurtenances	U.S. Pipe		Section 331200 2.3 A

Collier County Public Utilities Department
County Approved Product List
Irrigation Quality (IQ) Systems

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
- 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
120VAC Surge Suppressor	Edco	HSP121	NP-E3
12VDC Power Supply	Allen Bradley	1606-XLS	NP-E3
12VDC Power Supply	Sola HD	SDN-P	NP-E3
12VDC Power Supply	PULS	Dimension - QS	NP-E3
24VDC Power Supply	Allen Bradley	1606-XLE	NP-E3
24VDC Power Supply	Sola HD	SDN-P	NP-E3
24VDC Power Supply	PULS	Dimension - QS	NP-E3
Antenna Subsystem	Data Flow Systems, Inc.	RTA209 Yagi Antenna	NP-E9
Back Pressure Sustaining Valve	Ames	No. 920	NP-1/NP-E2
Plate Strainer, Top Access	Mars		NP-1/NP-E2
Corporation Stops	Ford	FB 1100-NL/ FB 1100	NP-2
Corporation Stops	A.Y. McDonald	74704B	NP-2
Corporation Stops	A.Y. McDonald	74104NL/ 74104	NP-4
Corporation Stops	A.Y. McDonald	74101 BF NL/ 74101 BF	NP-4
Corporation Stops	Mueller	H-10046N/ H-10046	NP-4
Curb Stop	Ford	B43-444W-NL, Compression x Meter Swivel	NP-2
Data Radio	Integra	TR	NP-E3
Data Signal Line Surge Processor	Edco	PC642 Series	NP-E3
Geomembrane	GSE Environmental		Section 334713, Page 4, 1.6 A.1
Level Transducer	Wika		NP-E6

Collier County Public Utilities Department
County Approved Product List
Irrigation Quality (IQ) Systems

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- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
- 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
Meter Box	DFW	12" D1200 AMR Series, Light Duty	NP-2
Meter Box	Carson	Light Duty	NP-2
Flow Meter, Magnetic	Endress+Hauser	W400	NP-1/NP-E2
Meter, Non-Potable Propeller	McCrometer	Water Specialties No. ML-04-X with 4-20 MA Output Transmitter, TR-16	NP-1/NP-E2
Pedestal Housing	Channel	CCWD Signature Series SPH14206C1B1L01	NP-4
Pedestal Housing	Water Plus Corp	131632	NP-4
Pedestal Housing	PenCell Plastics	AV142034HDHS001009	NP-4
Rain Gauge	ISCO	674	NP-E5
Service Wye	Ford	Y44-264 NL	NP-2
Service Wye	A.Y. McDonald	708YS22	NP-2
Service Wye	Mueller	P-15343N	NP-2
Surge Suppression	Edco	SS65 Series	NP-E6/NP-E7
Surge Suppression	CITEL	TSP15M	NP-E6/NP-E7
Surge Suppression, Main Service	Lea	USP-M Series	NP-E5
Tapping Saddle/ Hot taps	Powerseal	P3490MJ Series	NP-2
Valve, Air Release	A.R.I.	D-040	NP-4
Valve, Air Release	A.R.I.	D-040 SS	NP-4
Valve, Air Release	GA Industries	942SS	NP-4
Valve, Air Release	GA Industries	Combination	Section 1 2.7/NP-1/NP-4/NP-E2
Valve, Rising Stem Gate/ OS&Y	American Flow Control	AFC-2500 SERIES	NP-1/NP-E2
Valve, V-Port Ball	DeZurik	VPB - flanged, type 317 stainless, and Teflon seat and bearings	NP-1

Collier County Public Utilities Department
County Approved Product List
Irrigation Quality (IQ) Systems

NOTES:

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Item	Manufacturer	Model(s)	Location in Standards Manual
Valve, V-Port Ball - Motor (Actuator)	Rotork	IQTM	NP-E2

**Collier County Public Utilities Department
County Approved Product List
Wastewater Systems**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
Access Frame (Pump Station)	U.S. Foundry	AHD	WW-7/WW-8
Access Hatch, Aluminum	Bilco	J-AL H20 (5-1/2" depth)	WW-13
Access Hatch, Aluminum	Halliday	H1W (3-1/2" depth)	WW-13
Access Hatch, Aluminum	U.S. Foundry	AHS (5" depth)	WW-13
Antenna Subsystem	Data Flow Systems, Inc.	RTA209 Yagi Antenna	Section 333200, Page 4, 2.1 J/WW-17
Biofiltration Odor Control System	Evoqua	Zabocs (pre-engineered)	Section 333200, Page 5, 2.1 P
Ceramic Epoxy Lining	Vulcan Painters	Protecto 401 Coating	Section 330504, Page 3, 2.1.B
Chimney Seal	Cretex		Section 333913, Page 4, 2.2 K/WW-3/WW-4/WW-5
Chimney Seal	Trelleborg		Section 333913, Page 4, 2.2 K/WW-3/WW-4/WW-5
Coaxial Cable	Data Flow Systems, Inc.	RTC 400	Section 333200, Page 2.1 J/WW-17
Diaphragm Seals	Ashcroft		Section 333313, Page 8, 2.2 G
Diaphragm Seals	Mansfield and Green	Type SB	Section 333313, Page 8, 2.2 G
Diaphragm Seals	Trerice		Section 333313, Page 8, 2.2 G
Flanged Adapter Connections	EBAA Iron Sales	E2100 SERIES	Section 333313, Page 8, 2.2 F.1.c.
Flanged Adapter Connections	Victaulic	Vic Flange Style 741	Section 333313, Page 8, 2.2 F.1.c.
Flow Meter	Endress-Hauser	Promag W400	Section 333313, Page 9, 2.2 M.1
Generator Receptacle and Angle Adapter	Crouse-Hinds	AR2042 with S22 option, and an AJA1 angle adaptor	WW-7/WW-9
Grass Covered Porous Pavement	Invisible Structures	Grasspave2	WW-8/WW-8A/WW-8B
Inflow Protector, Stainless Steel	Sewer Shield, Inc. Maitland, FL		Section 333913, Page 4, 2.2 K
Internal Protection	IET Sytems	IET Coating System	Section 333913, Page 5, 3.1 F/Section 099723/WW-3/WW-4/WW-5/WW-7

**Collier County Public Utilities Department
County Approved Product List
Wastewater Systems**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
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Item	Manufacturer	Model(s)	Location in Standards Manual
Internal Protection	Raven Lining Systems - Broken Arrow, OK	Raven 405	Section 333913, Page 5, 3.1F/Section 099723/WW-3/WW-4/WW-5/WW-7
Internal Protection	Kerneos - Chesapeake, VA	Sewpercoat Lining System	Section 333913, Page 5, 3.1F/Section 099723/WW-3/WW-4/WW-5/WW-7
Junction Box	Hoffman	A12106NFSS	WW-9
Lightning Arrestor	Square D	SDSA-1175 for 1-phase	Section 333200, Page 5, 2.1 O/WW-9
Lightning Arrestor	Square D	SDSA-3650 for 3-phase	Section 333200, Page 5, 2.1 O/WW-9
Liquid Level Regulators (Float Switch)	Roto-Float		WW-7/WW-8
Liquid Level Regulator (Float Switch)	Dura-Float	2900 Series B4	WW-7/WW-8
Pipe Interior Lining	Permax CTF	Ceramic Epoxy Lining	Section 330504, Page 3, 2.1 B
Plastic Joint Sealing Compound	Hamilton Kent, Toronto/Ontario, Canada	Kent-Seal	Section 333913, Pages 2, 2.1 A/WW-3/WW-4/WW-5/WW-6/WW-7/WW-18
Plastic Joint Sealing Compound	Henry	Ram-Nek	Section 333913, Pages 2, 2.1 A/WW-3/WW-4/WW-5/WW-6/WW-7/WW-18
Polymer Concrete Manholes	US Composite Pipe, Inc.		Section 034100, Page 5, 2.2 D
Polymer Concrete Manholes	Armorock		Section 034100, Page 5, 2.2 D
Pump Control Panel	ECS		Section 333200, Page 43, 2.1 I/WW-7/WW-9
Pump Control Panel	Suncoast Hydraulic		Section 333200, Page 43, 2.1 I/WW-7/WW-9
Pump Controller	Data Flow Systems, Inc.	TCU	Section 333200, Page 3, 2.1 J
Riser Ring, HDPE/EPP	Ladtech/Cretex(EPP)	Riser Ring	Section 333913, Page 4, 2.2 L
Sealing Element	GPT	Link-Seal	Section 333313, Page 9, 2.2 I/WW-18
Sewage Pump	Flygt	N-Series	Section 333200, Page 2, 2.1 D
Sewer Clean-Out Rim and Cover	U.S. Foundry	7621	WW-11

**Collier County Public Utilities Department
County Approved Product List
Wastewater Systems**

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Item	Manufacturer	Model(s)	Location in Standards Manual
Sewer Manhole Frame and Covers	Pamrex		WW-5
Sewer Manhole Frame and Covers	U.S. Foundry	105M	WW-2
Sewer Manhole Frame and Covers	U.S. Foundry	420-C-ORS	Section 333913, Page 2, 2.1A/WW-3/WW-4/WW-5/WW-6/WW-18
Sleeve Type Couplings	Powerseal	STYLE 3501	Section 333313, Page 8, 2.2 F.1.d.
Sleeve Type Couplings	Dresser	Style 38	Section 333313, Page 8, 2.2 F.1.d.
Sleeve Type Couplings	Smith Blair	Style 413	Section 333313, Page 8, 2.2 F.1.d.
Tower	Rohn		WW-17
Valve Box	Brooks		WW-9
Valve, 3-Way Plug (Staff Use)	Milliken Valve Co.	Model M604	WW-7/WW-8
Valve, 3-Way Plug (Staff Use)	Dezurik	Model D202	WW-7/WW-8
Valve, Air Release	HTECH	2" SS MODEL # 8889860041	WW-13/WW-14/Section 333313, Page 7, 2.2 D.11
Valve, Air Release	A.R.I.	D-025	WW-13/WW-14/Section 333313, Page 7, 2.2 D.11
Valve, Check	Kennedy Valve Manufacturing Co.	MODEL 1106LW/106LW	WW-7/WW-8/Section 333313, Page 5, 2.2 C
Valve, Check	Mueller	A-2600, A2602	WW-7/WW-8, Section 333313, Page 5, 2.2 C
Valve, Check	Milliken Valve Co.	8001	WW-7/WW-8, Section 333313, Page 5, 2.2 C
Valve, Check	GA Industries	340-W	WW-7/WW-8, Section 333313, Page 5, 2.2 C
Valve, Duckbill (Staff Use)	Red Valve Co., Inc. Longwood, FL	"Tideflex"	WW-7

**Collier County Public Utilities Department
County Approved Product List
Wastewater Systems**

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Item	Manufacturer	Model(s)	Location in Standards Manual
Valves, Plug	DeZurik	Model PEC & PEF (MJ & Flange)	WW-7/WW-8(A)(B)/Section 333313, Page 2, 2.2 A.1
Valves, Plug	Milliken Valve Co.	Model M600 & M601 (MJ & Flange)	WW-7/WW-8(A)(B)/Section 333313, Page 2, 2.2 A.1

**Collier County Public Utilities Department
County Approved Product List
All Systems**

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Item	Manufacturer	Model(s)	Location in Standards Manual
Casing Spacer End Seals	Power Seal	EndSeal	Section 330523.16, Page 4, 3.1 B
Casing Spacer End Seals	Cascade Waterworks MFG Co.	CCES	Section 330523.16, Page 4, 3.1 B
Casing Spacers Stainless Steel	Power Seal	4810	Section 330523.16, Page 4, 3.1 BG-5
Casing Spacers Stainless Steel	Cascade Waterworks MFG Co.	CCS	Section 330523.16, Page 4, 3.1 B-5
Electronic Markers	3M Electronic Ball Marker	1423, 1424 & 1428	Section 1: 2.6.1, 3.1.4, 3.2.1/WW-10/WW-12/WW-16
Electronic Markers	Tempo Communications - Omni Marker	160, 161, 162 & 168	Section 330518, Page 9, 3.2 O.2
Electronic Markers	Tempo Communications - Omni Marker II	OM-01 (66.4 kHz), OM-04 (92.0 kHz), OM-06 (121.6 kHz), OM-08 (145.7 kHz), OM-09 (169.8 kHz)	Section 330518, Page 9, 3.2 O.2
Electronic Marking System (EMS)	3M	3M EMS Warning Tape 7900 Series	Design Criteria Part 2 2.1, Part 3 3.2, 3.2.1 Section 330518 Part 3 3.2 O.1
Joint Restraint Devices	EBAA Iron Sales		Section 1: 2.3/Section 330503, Page 5, 2.1 L/Section 330504, Page 7, 2.5 F
Joint Restraint Devices	Romac Industries		Section 1: 2.3/Section 330503, Page 5, 2.1 L/Section 330504, Page 7, 2.5 F
Joint Restraint Devices	Sigma		Section 1: 2.3/Section 330503, Page 5, L/Section 330504, Page 7, 2.5 F
Joint Restraint Devices	Star Pipe Products		Section 1: 2.3/Section 330503, Page 5, 2.1 L/Section 330504, Page 7, 2.5 F
Joint Restraint Devices	Ford Meter Box Company		Section 1: 2.3/Section 330503, Page 5, L/Section 330504, Page 7, 2.5 F
Joint Restraint Devices, Push-On joints for push joint pipe	American Cast Iron Pipe Company	Flex-Ring & Lok-Ring	Section 330504, Page 7, F.3
Joint Restraint Devices, Push-On joints for push joint pipe	McWane Inc.	Super-Lock & TR Flex	Section 330504, Page 7, F.3

**Collier County Public Utilities Department
County Approved Product List
All Systems**

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2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
Joint Restraint Devices, Push-On joints for push joint pipe	U.S. Pipe		Section 330504, Page 7, F.3
Metalized Tape	Reef Industries, Inc. Houston, TX	Terra Tape	Section 330518, Page 9, O.1
Metalized Tape	Proline Safety Products	Detectable Tape	Section 330518, Page 9, O.1
Rubber Gasket pipe	McWane Inc.	Long-Span Pipe	Section 330518, Page 10, Q.1
Rubber Gasket pipe	American Cast Iron Pipe Company	Flanged	Section 330518, Page 10, Q.1
Rubber Gasket pipe	US Pipe	Flanged	Section 330518, Page 10, Q.1
Single Sealed Gasket Push-on type joint	American Cast Iron Pipe Company	Fastite -	Section 330504, Page 10, 3.3.C
Single Sealed Gasket Push-on type joint	U.S. Pipe	Tyton	Section 330504, Page 10, 3.3.C
Single Sealed Gasket Push-on type joint	McWane Inc.	Tyton	Section 330504, Page 10, 3.3.C
Two-part Coal tar Epoxy	Madewell Products Corp.	Madewell 1104	Section 330518, Page 6, 3.2 G.4

**Collier County Public Utilities Department
County Approved Product List
Water Systems**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
Automatic Flushing Device, Ground Mounted	Mueller/Hydro-Guard	HG-1	W-2
Automatic Flushing Device, Ground Mounted	Kupferle Foundry Company	Eclipse #9400-WC	W-2
Automatic Flushing Device, Hydrant Mounted	Mueller/Hydro-Guard	HG-6	W-2
Automatic Flushing Device, Hydrant Mounted	Kupferle Foundry Company	Eclipse #9700	W-2
Backflow Preventer Assembly	See Approved Backflow Devices List, Appendix G		
Bushing	Ford	C18	W-6
Corporation Stops	Ford	F1100NL SERIES	W-6
Corporation Stops	Ford	FB1100NL SERIES	W-6
Corporation Stops	A.Y. McDonald	4104NL	W-5
Corporation Stops	A.Y. McDonald	4101 BF NL	W-5
Corporation Stops	Mueller	H10045N, H15008N	Section 331200, Page 2, 2.3 A.1
Corporation Stops	Mueller	H-10046N/ H-10046	W-5
Coupling	Ford	Model numbers vary by application	W-6
Coupling	A.Y. McDonald	Model numbers vary by application	W-6
Coupling	Mueller	Model numbers vary by application	W-6
Curb Stop	Ford	B43xxxW-NL	W-12
Curb Stop	A.Y. McDonald	76102-22	W-12
Curb Stop	Mueller	Mark II Oriseal H-15172N	Section 331200, Page 2, 2.3 A.1

**Collier County Public Utilities Department
County Approved Product List
Water Systems**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
- 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
HDPE Stab Fitting	Elster	Hydrosert	
Hydrant	American Darling	6-inch B-84-B	Section 331619, Page 2, 2.1 G
Hydrant	Clow	Medallion	Section 331619, Page 2, 2.1 G
Hydrant	Mueller	Centurion A-423	Section 331619, Page 2, 2.1 G
Meter Box (Staff Use)	Carson	Fiberlyte FL12	W-12
Meter Box (Staff Use)	Carson	Fiberlyte FL30	W-12
Meter Box (Staff Use)	Oldcastle	Lid-FL12 GP (AMR)	W-12
Meter Box (Staff Use)	Oldcastle	Box, FL12 T 12 (w/mouseholes)	W-12
Meter Box (Staff Use)	Oldcastle	Unit, FL30 P	W-12
Meter Box (Staff Use)	DFW	DFW1324XX-12-AF1PT MUE	W-12
Meter Box	DFW	DFW37F-12-AF1PT MUE	W-12
Meter Box	DFW	DFW1324F-12-AF1PT MUE	W-12
Meter, Fire Protection (3", 4", 6", 8")	Elster AMCO	evoQ4 Electromagnetic Meter	W-9/W-14
Meter, Fire Protection (3", 4", 6", 8", 10")	Neptune	HP Fire Service Turbine Meter	W-9/W-14
Meter, Fire Protection (3/4", 1", 1-1/2", 2")	Mueller Systems - Hersey	Residential Fire Meter	W-9
Meter, Fire Protection (4", 6", 8", 10")	Neptune	HP Protectus III Fire Service Meter	W-9/W-14
Meter, Potable Water	Neptune	Tru/Flo	W-13
Meter, Potable Water	Neptune	Mach 10	W-13
Pedestal Housing	Channel	CCWD Signature Series SPH	W-5
Pedestal Housing	Water Plus Corp	131632	NP-4
Pedestal Housing	PenCell Plastics	AV142034HDHS001009	NP-4
Sampling Station	Kupferle Foundry Company	Eclipse 88	W-6
Sampling Station	Mueller Company	Safety Guard BOSS SMPL STA	W-6

**Collier County Public Utilities Department
County Approved Product List
Water Systems**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
- 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
Sampling Station	Mueller Company	2" BOSS-BSS0212CHANLCSR	W-6
Service Saddles (Brass)	Ford	F202B	Section 331200, Page 7, 2.3 G.1
Service Saddles (Brass)	Mueller	DR2 B	Section 331200, Page 7, 2.3 G.1
Service Saddles (PVC) Perm Bact Sample Point	Powerseal	P3401 SERIES	Section 331200, Page 7, 2.3 G.1/W-6
Service Saddles (PVC) Perm Bact Sample Point	Ford	S 90 SERIES	Section 331200, Page 7, 2.3 G.1/W-6
Service Wye	Ford	Y44-xxx-NL	W-12
Strainer, Flanged (Staff Use)	Mars	Z-plate	
Strainer, Flanged (Staff Use)	Neptune	Rilsan nylon-coated ductile iron	
Tapping Saddle/ Hot taps	Powerseal	P3490MJ Series	W-12
Valve Box	Tyler/Union	461	Section 331200, Page 4, 2.3 B.2
Valve Box, Locking Cover	AMPro USA	LL562	Section 331200, Page 4, 2.3 B.2.
Valve Setter	Wilkins	WMJS	W-9A/W-11A
Valve, Air	Val-Matic	Model 801AS	W-11/W-14/W-16
Valve, Air Release	A.R.I.	D-040 (nylon), D-040 ST ST (SS)	W-5
Valve, Bacterial Sampling Station Line	Mueller	Mark II Oriseal	Section 331200, Page 3, 2.3 A.1
Valve, Ball	Ford		Section 331200, Page 3, 2.3 A.1
Valves and Appurtenances	American Darling		Section 331200 2.3 A
Valves and Appurtenances	A.Y. McDonald		Section 331200 2.3 A
Valves and Appurtenances	Clow		Section 331200 2.3 A
Valves and Appurtenances	Ford		Section 331200 2.3 A
Valves and Appurtenances	Kennedy		Section 331200 2.3 A
Valves and Appurtenances	Mueller		Section 331200 2.3 A
Valves and Appurtenances	U.S. Pipe		Section 331200 2.3 A

**Collier County Public Utilities Department
County Approved Product List
Irrigation Quality (IQ) Systems**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
- 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
120VAC Surge Suppressor	Edco	HSP121	NP-E3
12VDC Power Supply	Allen Bradley	1606-XLS	NP-E3
12VDC Power Supply	Sola HD	SDN-P	NP-E3
12VDC Power Supply	PULS	Dimension - QS	NP-E3
24VDC Power Supply	Allen Bradley	1606-XLE	NP-E3
24VDC Power Supply	Sola HD	SDN-P	NP-E3
24VDC Power Supply	PULS	Dimension - QS	NP-E3
Antenna Subsystem	Data Flow Systems, Inc.	RTA209 Yagi Antenna	NP-E9
Back Pressure Sustaining Valve	Ames	No. 920	NP-1/NP-E2
Plate Strainer, Top Access	Mars		NP-1/NP-E2
Corporation Stops	Ford	FB 1100-NL/ FB 1100	NP-2
Corporation Stops	A.Y. McDonald	74704B	NP-2
Corporation Stops	A.Y. McDonald	74104NL/ 74104	NP-4
Corporation Stops	A.Y. McDonald	74101 BF NL/ 74101 BF	NP-4
Corporation Stops	Mueller	H-10046N/ H-10046	NP-4
Curb Stop	Ford	B43-444W-NL, Compression x Meter Swivel	NP-2
Data Radio	Integra	TR	NP-E3
Data Signal Line Surge Processor	Edco	PC642 Series	NP-E3
Geomembrane	GSE Environmental		Section 334713, Page 4, 1.6 A.1
Level Transducer	Wika		NP-E6

**Collier County Public Utilities Department
County Approved Product List
Irrigation Quality (IQ) Systems**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
- 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
Meter Box (Staff Use)	Carson	Fiberlyte FL12	NP-2
Meter Box (Staff Use)	Carson	Fiberlyte FL30	NP-2
Meter Box (Staff Use)	Oldcastle	Lid-FL12 GP (AMR)	NP-2
Meter Box (Staff Use)	Oldcastle	Box, FL12 T 12 (w/mouseholes)	NP-2
Meter Box (Staff Use)	Oldcastle	Unit, FL30 P	NP-2
Meter Box (Staff Use)	DFW	DFW1324XX-12-AF1PT MUE	NP-2
Meter Box	DFW	DFW37F5-12-AF5PT MUE	NP-2
Meter Box	DFW	DFW1324F5-12-AF5PT MUE	NP-2
Flow Meter, Magnetic	Mueller		
Meter, Non-Potable Propeller			
Pedestal Housing	Endress+Hauser	W400	NP-1/NP-E2
Pedestal Housing	McCrometer	Water Specialties No. ML-04-X with 4-20 MA Output Transmitter, TR-16	NP-1/NP-E2
Pedestal Housing	Channel	CCWD Signature Series SPH14206C1B1L01	NP-4
Rain Gauge	Water Plus Corp	131632	NP-4
Service Wye	PenCell Plastics	AV142034HDHS001009	NP-4
Service Wye	ISCO	674	NP-E5
Service Wye	Ford	Y44-264-NL	NP-2
Surge Suppression	A.Y. McDonald	708YS22	NP-2
Surge Suppression	Mueller	P-15343N	NP-2
Surge Suppression, Main Service	Edco	SS65 Series	NP-E6/NP-E7
Tapping Saddle/ Hot taps	CITEL	TSP15M	NP-E6/NP-E7
Valve, Air Release	Lea	USP-M Series	NP-E5
Valve, Air Release	Powerseal	P3490MJ Series	NP-2
Valve, Air Release	A.R.I.	D-040	NP-4

**Collier County Public Utilities Department
County Approved Product List
Irrigation Quality (IQ) Systems**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
- 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
Valve, Air Release	A.R.I.	D-040 SS	NP-4
Valve, Rising Stem Gate/ OS&Y	GA Industries	942SS	NP-4
Valve, V-Port Ball	GA Industries	Combination	Section 1 2.7/NP-1/NP-4/NP-E2
Valve, V-Port Ball - Motor (Actuator)	Rotork	IQTM	NP-E2
	American Flow Control	AFC-2500 SERIES	NP-1/NP-E2
	DeZurik	VPB - flanged, type 317 stainless, and Teflon seat and bearings	NP-1

**Collier County Public Utilities Department
County Approved Product List
Wastewater Systems**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
- 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
Access Frame (Pump Station)	U.S. Foundry	AHD	WW-7/WW-8
Access Hatch, Aluminum	Bilco	J-AL H20 (5-1/2" depth)	WW-8/WW-8A/WW-8B
Access Hatch, Aluminum	Halliday	H1W (3-1/2" depth)	WW-8/WW-8A/WW-8B
Access Hatch, Aluminum	U.S. Foundry	AHS (5" depth)	WW-8/WW-8A/WW-8B
Antenna Subsystem	Data Flow Systems, Inc.	RTA209 Yagi Antenna	Section 333200, Page 4, 2.1 J/WW-17
Biofiltration Odor Control System	Evoqua	Zabocs (pre-engineered)	Section 333200, Page 5, 2.1 P
Ceramic Epoxy Lining	Vulcan Painters	Protecto 401 Coating	Section 330504, Page 3, 2.1.B
Chimney Seal	Cretex		Section 333913, Page 4, 2.2 K/WW-3/WW-4/WW-5
Chimney Seal	Trelleborg		Section 333913, Page 4, 2.2 K/WW-3/WW-4/WW-5
Coaxial Cable	Data Flow Systems, Inc.	RTC 400	Section 333200, Page 2.1 J/WW-17
Diaphragm Seals	Ashcroft		Section 333313, Page 8, 2.2 G
Diaphragm Seals	Mansfield and Green	Type SB	Section 333313, Page 8, 2.2 G
Diaphragm Seals	Trerice		Section 333313, Page 8, 2.2 G
Flanged Adapter Connections	EBAA Iron Sales	E2100 SERIES	Section 333313, Page 8, 2.2 F.1.c.
Flanged Adapter Connections	Victaulic	Vic Flange Style 741	Section 333313, Page 8, 2.2 F.1.c.
Flow Meter	Endress-Hauser	Promag W400	Section 333313, Page 9, 2.2 M.1
Generator Receptacle and Angle Adapter	Crouse-Hinds	AR2042 with S22 option, and an AJA1 angle adaptor	WW-7/WW-9
Grass Covered Porous Pavement	Invisible Structures	Grasspave2	WW-8/WW-8A/WW-8B
Inflow Protector, Stainless Steel	Sewer Shield, Inc. Maitland, FL		Section 333913, Page 4, 2.2 K
Inflow Protector, Stainless Steel	Rainstopper LLC.		Section 333913, Page 4, 2.2 K
Inflow Protector, Stainless Steel	L.F. Manufacturing, Inc.		Section 333913, Page 4, 2.2 K
Internal Protection	IET Systems	IET Coating System	Section 333913, Page 5, 3.1 F/Section 099723/WW-3/WW-4/WW-5/WW-7

**Collier County Public Utilities Department County
Approved Product List
Wastewater Systems**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
- 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
Internal Protection	Raven Lining Systems - Broken Arrow, OK	Raven 405	Section 333913, Page 5, 3.1F/Section 099723/WW-3/WW-4/WW-5/WW-7
Internal Protection	Kerneos - Chesapeake, VA	Sewpercoat Lining System	Section 333913, Page 5, 3.1F/Section 099723/WW-3/WW-4/WW-5/WW-7
Junction Box	Hoffman	A12106NFSS	WW-9
Lightning Arrestor	Square D	SDSA-1175 for 1-phase	Section 333200, Page 5, 2.1 O/WW-9
Lightning Arrestor	Square D	SDSA-3650 for 3-phase	Section 333200, Page 5, 2.1 O/WW-9
Liquid Level Regulators (Float Switch)	Roto-Float		WW-7/WW-8
Liquid Level Regulator (Float Switch)	Dura-Float	2900 Series B4	WW-7/WW-8
Pipe Interior Lining	Permax CTF	Ceramic Epoxy Lining	Section 330504, Page 3, 2.1 B
Plastic Joint Sealing Compound	Hamilton Kent, Toronto/Ontario, Canada	Kent-Seal	Section 333913, Pages 2, 2.1 A/WW-3/WW-4/WW-5/WW-6/WW-7/WW-18
Plastic Joint Sealing Compound	Henry	Ram-Nek	Section 333913, Pages 2, 2.1 A/WW-3/WW-4/WW-5/WW-6/WW-7/WW-18
Polymer Concrete Manholes	US Composite Pipe, Inc.		Section 034100, Page 5, 2.2 D
Polymer Concrete Manholes	Armorock		Section 034100, Page 5, 2.2 D
Power Distribution Blocks	Schneider (Square D)	Class 9080 Power Distribution Blocks	WW-9/WW-9A/WW-9B
Pump Control Panel	ECS		Section 333200, Page 43, 2.1 I/WW-7/WW-9
Pump Control Panel	Suncoast Hydraulic		Section 333200, Page 43, 2.1 I/WW-7/WW-9
Pump Controller	Data Flow Systems, Inc.	TCU	Section 333200, Page 3, 2.1 J
Riser Ring, HDPE/EPP	Ladtech/Cretex(EPP)	Riser Ring	Section 333913, Page 4, 2.2 L
Sealing Compound	Crouse-Hindz	Chico Sealing Compound	WW-9/WW-9A/WW-9B

**Collier County Public Utilities Department County
Approved Product List
Wastewater Systems**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
2) If a product is not listed, refer to the Specifications for performance standards.

Item	Manufacturer	Model(s)	Location in Standards Manual
Sealing Element	GPT	Link-Seal	Section 333313, Page 9, 2.2 I.1/WW-18
Sewage Pump	Flygt	N-Series	Section 333200, Page 2, 2.1 D
Sewer Clean-Out Rim and Cover	U.S. Foundry	7621	WW-11
Sewer Manhole Ring and Cover	U.S. Foundry		WW-3, WW-4, WW-5, WW-6, Section 333913
Sewer Manhole Frame and Covers	Pamrex		WW-5
Sewer Manhole Frame and Covers	U.S. Foundry	105M	WW-2
Sewer Manhole Frame and Covers	U.S. Foundry	420-C-ORS	Section 333913, Page 2, 2.1A/WW-3/WW-4/WW-5/WW-6/WW-18
Sleeve Type Couplings	Powerseal	STYLE 3501	Section 333313, Page 8, 2.2 F.1.d.
Sleeve Type Couplings	Dresser	Style 38	Section 333313, Page 8, 2.2 F.1.d.
Sleeve Type Couplings	Smith Blair	Style 413	Section 333313, Page 8, 2.2 F.1.d.
Tower	Rohn		WW-17
Valve Box	Brooks		WW-9
Valve, 3-Way Plug (Staff Use)	Milliken Valve Co.	Model M604	WW-7/WW-8
Valve, 3-Way Plug (Staff Use)	Dezurik	Model D202	WW-7/WW-8
Valve, Air Release	HTECH	2" SS MODEL # 8889860041	WW-13/Section 333313, Page 7, 2.2 D.11
Valve, Air Release	A.R.I.	D-025	WW-5/Section 333313, Page 7, 2.2 D.11
Valve, Check	Kennedy Valve Manufacturing Co.	MODEL 1106LW/106LW	WW-7/WW-8/Section 333313, Page 5, 2.2 C
Valve, Check	Mueller	A-2600, A2602	WW-7/WW-8, Section 333313, Page 5, 2.2 C
Valve, Check	Milliken Valve Co.	8001	WW-7/WW-8, Section 333313, Page 5, 2.2 C
Valve, Check	GA Industries	340-W	WW-7/WW-8, Section 333313, Page 5, 2.2 C
Valve, Check	VSI Waterworks	CVIX AWWA C508	Section 333313

**Collier County Public Utilities Department County
Approved Product List
Wastewater Systems**

NOTES:			
1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.			
2) If a product is not listed, refer to the Specifications for performance standards.			
Item	Manufacturer	Model(s)	Location in Standards Manual
Valve, Duckbill (Staff Use)	Red Valve Co., Inc. Longwood, FL	"Tideflex"	WW-7
Valves, Plug	DeZurik	Model PEC & PEF (MJ & Flange)	WW-7/WW-8(A)(B)/Section 333313, Page 2, 2.2 A.1
Valves, Plug	Milliken Valve Co.	Model M600 & M601 (MJ & Flange)	WW-7/WW-8(A)(B)/Section 333313, Page 2, 2.2 A.1
Valves, Plug	Cam-Centric	55XX, 56XXF, 57XXF, 58XXR, 59XXR (TN, N, TL, XF)	WW-7/WW-8(A)(B)/Section 333313, Page 2, 2.2 A.1
Valves, Plug	VSI Waterworks	PVII & PVIF AWWA C517	Section 333313

**Collier County Public Utilities Department
County Approved Contract List**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
- 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Vendor	Contract #	Applicability
Epoxytech CPP Epoxy coating, equipment and services	Florida Service Painting, Inc.	23-8169	Water, Wastewater, and Irrigation Quality (IQ) Systems
Commodities and services for utility plant operations	John Mader Enterprises, Inc.	PB-421	Water, Wastewater, and Irrigation Quality (IQ) Systems

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**Collier County Public Utilities Department
County Approved Waiver List
Single/ Sole Source**

NOTES:

- 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
2) If a product is not listed, refer to the Specifications for performance standards.

Item	Vendor	Division	Applicability
Teledyne ISCO Refrigerated Autosampler, sampler bottles, tubing, spare and replacement parts and services.	Accutech Instrumentation, Inc.	Wastewater	Wastewater Systems
Belt Press Dewatering Equipment & Services	Alfa Laval	Engineering & Project Management	Water Systems
McCrometer meters, repair, parts, and services	Avanti Inc.	Wastewater	Wastewater Systems
HOMA submersible sewage pumps and services	Barney's Pump Inc.	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
NOV/Moyno progressive cavity pumps and services	Carl Eric Johnson	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
Flowserve vertical turbine pumps and services	Carter & Verplanck	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
Chemtrac's HydroAct Residual Chlorine Analyzer	ChemTrac	Water	Water Systems
CROM utility storage tanks and services	CROM Coatings and Restorations (CCR)	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
Contractor shall provide Supervisory Control and Data Acquisition equipment and software (SCADA) as well as technical support.	Data Flow Systems, Inc.	Wastewater	Water, Wastewater, and Irrigation Quality (IQ) Systems
Master Meter Flow Meter and software	Empire Pipe and Supply Company Inc.	Wastewater	Wastewater Systems

**Collier County Public Utilities Department
County Approved Waiver List
Single/ Sole Source**

NOTES:
 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Vendor	Division	Applicability
Promag Electromagnet Flow Meters, Analyzers, Level Transmitters, replacement parts, and service	Endress Hauser	Wastewater	Wastewater Systems
Aqua-Aerobic Systems Cloth Media, Traveling Bridge Filtration equipment, parts and services	EnviroSales of Florida, Inc.	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
NozzTeq nozzles and services	Evervac Equipment	Wastewater	Wastewater Systems
Chemicals, components, services, etc.	Evoqua Water Technologies	Wastewater	Water, Wastewater, and Irrigation Quality (IQ) Systems
Centrifugal/Chopper/Conditioning Pumps and Services	FJ Nugent & Associates, Inc.	Wastewater	Wastewater Systems
Replacement parts, maintenance, and equipment.	Fluid Control Specialties, Inc (Rosemount)	Wastewater	Water, Wastewater, and Irrigation Quality (IQ) Systems
Rotork valve actuators, replacement parts and repair services.	Fluid Control Specialties, Inc (Rotork)	Wastewater	Water, Wastewater, and Irrigation Quality (IQ) Systems
Aeration Blower & Service	Gardner Denver Nash	Wastewater	Wastewater Systems
License, service, and support for the SCADA System	GE Digital LLC	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
Siemens Level Sensor - Ultrasonic and services	Gilson Engineering Sales of Florida	Wastewater	Wastewater Systems
Service, and support for the SCADA System, including licensing for supporting applications	Gray Matter Systems	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems

**Collier County Public Utilities Department
County Approved Waiver List
Single/ Sole Source**

NOTES:
 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Vendor	Division	Applicability
Laboratory Equipment, Supplies, and Materials, Testing Services, etc.	Hach Company	Water	Equipment, Chemicals, & Services
Parts, Services, and Repairs for Sand Separator	HC Warner	Water	Water Systems
Screening and Screening Handling and services	Hydra Service Inc.	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
Grit Removal System	Hydro International & Huber	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
Laboratory parts, supplies, and services	IDEXX Distribution, Inc.	Wastewater	Laboratory Parts, Supplies, & Services
Valve Exercise / Operator and services	Illinois Tool Works dba E.H. WACHS	Water	Water Systems
Belt Press Parts and Services	Komline-Sanderson	Engineering & Project Management	Wastewater Systems
Service Agreement and Updates	Labworks, LLC	Water/ Wastewater	Water, Wastewater, and Irrigation Quality (IQ) Systems
HF Scientific equipment, parts, and services	Lazenby & Associates, Inc.	Wastewater	Water, Wastewater, and Irrigation Quality (IQ) Systems
Lime Feed and Slaker system and services	Merrick Industries, Inc.	Water	Water Systems
Xylem- Sanitaire Diffused Aeration Equipment and UGSI Chemical Feed, Inc. Liquid Polymer Dosing System	Moss Kelley/MKI Services, Inc.	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
Grit Removal Equipment, Clarifiers parts, sludge thickener parts, and service	Ovivo USA, LLC	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems

**Collier County Public Utilities Department
County Approved Waiver List
Single/ Sole Source**

NOTES:
 1) Substitutions for any item listed below shall be submitted using the "Vendor and Manufacturer Approval Application Form," Appendix E, and reviewed to be considered an equal.
 2) If a product is not listed, refer to the Specifications for performance standards.

Item	Vendor	Division	Applicability
Aqua Guard Self Cleaning Bar/Filter Screen	Parkson Corporation	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
New York Blower Odor Control Blowers and services	Pero Engineering & Sales Co.	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
ASME pressure valves and replacement parts	Protec Arisawa	Water	Water, Wastewater, and Irrigation Quality (IQ) Systems
SCADA components, parts, panels, etc.	Rexel USA, Inc	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
Service Agreement, Parts and Supplies	Seal Analytical, Inc.	Water/ Wastewater	Water, Wastewater, and Irrigation Quality (IQ) Systems
Seepex Progressive Cavity Pumps, and services	Tencarva/Hudson Pumps	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
Service/ Repair of CO2 Tanks	TOMCO2 Systems	Water	Water, Wastewater, and Irrigation Quality (IQ) Systems
Telog Software, Pressure Sensor, Recorders and Services.	Trimble, Inc.	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
ProMInent Equipment, Parts, and Services	TriNova Inc	Wastewater	Water, Wastewater, and Irrigation Quality (IQ) Systems
Trillium Flow Technologies Grit Pumping, Sludge Pumping, Grit Separation Equipment, and services	TSC-Jacobs South	Engineering & Project Management	Water, Wastewater, and Irrigation Quality (IQ) Systems
Component parts, equipment, software and support to maintain the Itron meter systems.	United Systems and Software Inc	Water	Water, Wastewater, and Irrigation Quality (IQ) Systems

**Collier County Public Utilities Department
County Approved Waiver List
Single/ Sole Source**

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Item	Vendor	Division	Applicability
Limiterque Valve Actuators and Services	Valve & Actuation Service	Water	Water, Wastewater, and Irrigation Quality (IQ) Systems
ATI Analytical Products	Volition Controls Corp	Water/ Wastewater	Water, Wastewater, and Irrigation Quality (IQ) Systems
Internal Recycling Dry Pit Submersible Pumps, Repair/Replacement Parts, and services.	Xylem Water Solutions U.S.A.	Water/ Wastewater	Wastewater Systems

**Collier County Public Utilities Department
County Approved Waiver Product List**

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Item	Vendor / Manufacturer	Model(s)	Applicability
Analog Control Module (ACM002)	Data Flow Systems, Inc.	DFS-00350-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Analog Monitor Module (AMM002)	Data Flow Systems, Inc.	DFS-00240-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Bus Extender Module	Data Flow Systems, Inc.	DFS-00223-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Digital Control Module (DCM003-01) AC 8DO, 4DI	Data Flow Systems, Inc.	DFS-00297-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Digital Control Module (DCM003-02) AC 4DO, 8DI	Data Flow Systems, Inc.	DFS-00297-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
Digital Control Module (DCM003-03) AC/DC 8DO, 4DI (Requires the use of snubbers 007-0084)	Data Flow Systems, Inc.	DFS-00297-008-03	Water, Wastewater, and Irrigation Quality (IQ) Systems
Digital Control Module (DCM003-04) AC/DC 4DO, 8DI (AC Requires the use of snubbers 007-0084 / DC requires 006-0019)	Data Flow Systems, Inc.	DFS-00297-008-04	Water, Wastewater, and Irrigation Quality (IQ) Systems
Digital Control Module (DCM003-05) DC 8DO, 4DI	Data Flow Systems, Inc.	DFS-00297-008-05	Water, Wastewater, and Irrigation Quality (IQ) Systems
Digital Control Module (DCM003-06) DC 4DO, 8DI	Data Flow Systems, Inc.	DFS-00297-008-06	Water, Wastewater, and Irrigation Quality (IQ) Systems
Digital Monitor Module (DMM003)	Data Flow Systems, Inc.	DFS-00518-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Power Supply Module (PSM003-1, 100W)	Data Flow Systems, Inc.	DFS-00296-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Solar Power Module (SPM002)	Data Flow Systems, Inc.	DFS-00517-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Programmable Logic Controller (PLC001)	Data Flow Systems, Inc.	DFS-00213-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems

**Collier County Public Utilities Department
County Approved Waiver Product List**

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Item	Vendor / Manufacturer	Model(s)	Applicability
Programmable Logic Controller (PLC800) w/PMT	Data Flow Systems, Inc.	DFS-00539-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
PLC Bypass Card (PBC001)	Data Flow Systems, Inc.	DFS-00309-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
TIM007-34 (VDR002-01, 217-220 MHz)	Data Flow Systems, Inc.	DFS-00513-008-34	Water, Wastewater, and Irrigation Quality (IQ) Systems
TIM007 Board-Only (no radio, all TIM007 versions)	Data Flow Systems, Inc.	DFS-00513-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
VDR002-01 (for TIM007-34, 217-220 MHz)	Data Flow Systems, Inc.	DFS-00530-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Network Interface Module - (NIM001)	Data Flow Systems, Inc.	DFS-00375-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Switch Interface Module (SIM001, 5 PORT)	Data Flow Systems, Inc.	DFS-00375-008-13	Water, Wastewater, and Irrigation Quality (IQ) Systems
Network Switch Module - (NSM001, 8 PORT)	Data Flow Systems, Inc.	DFS-00375-008-16	Water, Wastewater, and Irrigation Quality (IQ) Systems
Network Switch (5-Port, Prosafe, -04 NSM & SIM)	Data Flow Systems, Inc.	002-0567	Water, Wastewater, and Irrigation Quality (IQ) Systems
Network Switch (8-Port, Prosafe, -16 NSM)	Data Flow Systems, Inc.	002-0568	Water, Wastewater, and Irrigation Quality (IQ) Systems
Fiber Interface Module - (FIM001-10/100)	Data Flow Systems, Inc.	DFS-00375-008-09	Water, Wastewater, and Irrigation Quality (IQ) Systems
Network Fiber Module - (NFM001-10/100)	Data Flow Systems, Inc.	DFS-00375-008-10	Water, Wastewater, and Irrigation Quality (IQ) Systems
Media Converter 10/100 (AT-MMC200/ST) This part is used on the FIM001 and NFM001	Data Flow Systems, Inc.	002-0566	Water, Wastewater, and Irrigation Quality (IQ) Systems
NFM Cable - For connecting extra NFM's in an HSS	Data Flow Systems, Inc.	002-0268	Water, Wastewater, and Irrigation Quality (IQ) Systems

**Collier County Public Utilities Department
County Approved Waiver Product List**

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Item	Vendor / Manufacturer	Model(s)	Applicability
Network Cell-Router Module - (NCM001)	Data Flow Systems, Inc.	DFS-00375-008-15	Water, Wastewater, and Irrigation Quality (IQ) Systems
Hyper Server Module (HSM003)	Data Flow Systems, Inc.	DFS-00543-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
RTU202 Assembly- includes: (1) Fiberglass Enclosure, (1) MBP202, (1) PSM003-1, (1) Polyphaser, (1) SPS00l, (1) RF Pigtail, (1) 2.6 aH Battery DEDUCT DFS-00349-008-04 for NO Tower Mount Brackets DEDUCT DFS-00392-008-01 for Network	Data Flow Systems, Inc.	DFS-00349-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
RTU202 "CUT FOR PLC" includes: (1) Fiberglass Enclosure, (1) MBP202-3, (1) PSM003-1, (1) Polyphaser, (1) SPS00l, (1) RF Pigtail, (1) 2.6 aH Battery DEDUCT DFS-00349 008-04 for NO Tower Mount Brackets DEDUCT DFS-00392-008-01 for Network	Data Flow Systems, Inc.	DFS-00349-008-03	Water, Wastewater, and Irrigation Quality (IQ) Systems
RTU202 "Solar" Assembly- includes 18 X 16 Fiberglass Enclosure with backplate, MBP202-2, Solar PSM, Polyphaser Coaxial Surge Protector, RF Pigtail, & 12V 18Amp Battery DEDUCT DFS-00349-008-04 for NO Tower Mount Brackets	Data Flow Systems, Inc.	DFS-00349-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems

**Collier County Public Utilities Department
County Approved Waiver Product List**

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Item	Vendor / Manufacturer	Model(s)	Applicability
RTU204 w/MBP001 - includes: (1) 204 316SS NEMA 4X Enclosure, (1) MBP001, (1) PSM003-1, (1) Polyphaser Coaxial Surge Protector, (1) SPS001, (1) RF Pigtail, (1) 2.6 Ah Battery, (1) I0A Breaker. DEDUCT DFS-00392-008-01 for Network (NO Polyphaser/Pigtail) 16.5" Din-Rail space	Data Flow Systems, Inc.	DFS-00280-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
RTU204 w/MBP002 (the rest is same as 204 above)	Data Flow Systems, Inc.	DFS-00280-008-03	Water, Wastewater, and Irrigation Quality (IQ) Systems
RTU204 w/MBP001-3 for PLC (the rest is same as 204 above) Add PLC Backplane Switch Options	Data Flow Systems, Inc.	DFS-00280-008-04	Water, Wastewater, and Irrigation Quality (IQ) Systems
RTU204 w/MBP001-4 for FTU - includes: (1) 204 Enclosure, (1) MBP001- 4, (1) PSM003-1, (2) Polyphaser Coaxial Surge Protector, (1) SPS001, (2) RF Pigtail, (1) 2.6 Ah Battery	Data Flow Systems, Inc.	DFS-00280-008-05	Water, Wastewater, and Irrigation Quality (IQ) Systems
RTU210/216 - Special Quote Required from Systems Engineering	Data Flow Systems, Inc.		Water, Wastewater, and Irrigation Quality (IQ) Systems
RTU202 Fiberglass Enclosure (MBP NOT INCLUDED) 14"h 12"w 811d	Data Flow Systems, Inc.	038-0053	Water, Wastewater, and Irrigation Quality (IQ) Systems
RTU202 Modular Backplane, MBP202-01	Data Flow Systems, Inc.	DFS-00348-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
RTU202 Modular Backplane, MBP202-02 (CUT FOR SOLAR)	Data Flow Systems, Inc.	DFS-00348-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
RTU202 Modular Backplane, MBP202-03 (CUT FOR PLC)	Data Flow Systems, Inc.	DFS-00348-008-03	Water, Wastewater, and Irrigation Quality (IQ) Systems
Aluminum Plate for 202 Enclosure 14x 12 (BP1412AL)	Data Flow Systems, Inc.	039-0135	Water, Wastewater, and Irrigation Quality (IQ) Systems
RTU204 Enclosure (MBP NOT INCLUDED) 15.5"h 23"w 7.5"d	Data Flow Systems, Inc.	DFS-00280-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Modular Backplane (MBP00I-1) (for single backplane use)	Data Flow Systems, Inc.	DFS-00279-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Modular Backplane (MBP00I-2) (2nd & 3rd for 210, 216)	Data Flow Systems, Inc.	DFS-00279-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
Modular Backplane (MBP00I-3) (for PLC use)	Data Flow Systems, Inc.	DFS-00279-008-03	Water, Wastewater, and Irrigation Quality (IQ) Systems
Modular Backplane (MBP00I-4 for Solar Power Module SPM)	Data Flow Systems, Inc.	DFS-00279-008-04	Water, Wastewater, and Irrigation Quality (IQ) Systems
Modular Backplane (MBP00I-5 for FTU - requires 2 RIMs)	Data Flow Systems, Inc.	DFS-00279-008-05	Water, Wastewater, and Irrigation Quality (IQ) Systems
Tower Mount Bracket "Pair" for RTU202 & TAC Pack Enclosures	Data Flow Systems, Inc.	DFS-00349-008-04	Water, Wastewater, and Irrigation Quality (IQ) Systems
Telemetry Control Unit (TCU00I) - No Radio, controller only (add P3 and P4 connectors for Mod bus application)	Data Flow Systems, Inc.	DFS-00367-008-03	Water, Wastewater, and Irrigation Quality (IQ) Systems
TAC Pack TCU w/VDR002 (217-220 MHz)	Data Flow Systems, Inc.	DFS-00367-008-21	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
TCU800 - NO RADIO, MODBUS CONFIG	Data Flow Systems, Inc.	DFS-00540-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU800 - NO RADIO, SERIAL FOR EXTERNAL RADIO	Data Flow Systems, Inc.	DFS-00540-008-03	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU800-IP - NETWORK INTERFACE (NO RADIO)	Data Flow Systems, Inc.	DFS-00540-008-16	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU800 w/VDR002 (217-220 MHz)	Data Flow Systems, Inc.	DFS-00540-008-21	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU800 w/DUAL COMMS (VDR002 217-220 MHz & NETWORK)	Data Flow Systems, Inc.	DFS-00540-008-31	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU001 "Basic Snap-In" Installation Kit - Includes: snap-in mounting bracket, spring loaded connectors, Wago terminals for resistors and fuses only, SPS00I, 10A Circuit Breaker, TFS, TFS Install kit for TCU, 2.6 aH Battery.	Data Flow Systems, Inc.	DFS-00392-008-09	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU001 "Deluxe Snap-In" Installation Kit WITH WIRE HARNESS & ADDED COMPONENTS- Includes: snap-in mounting bracket, spring loaded connectors, Wago terminals for every wire termination, (1) EDCO DRS036 Analog Surge Protector, SPS00I, 10A Circuit Breaker, TFS, TFS.	Data Flow Systems, Inc.	DFS-00396-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
TCU001 "Basic Front-Mount" Installation Kit- Includes dead-front mounting bracket, spring loaded connectors, Wago terminals for resistors and fuses only, SPS001, 10A Circuit Breaker, TFS, TFS Install kit for TCU, 2.6 aH Battery. (Add 3-Phase Surge Protector & Polyphaser Kit)	Data Flow Systems, Inc.	DFS-00392-008-05	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU001 "Deluxe Front-Mount" Installation Kit WITH WIRE HARNESS & ADDED COMPONENTS - Includes: dead-front mounting bracket, spring loaded connectors, Wago terminals for every wire termination, (1) EDCO DRS036 Analog Surge Protector, SPS001, 10A Circuit Breaker, TFS, TFS Install kit for TCU, 2.6 aH Battery. (Add 3-Phase Surge Protector & Polyphaser Kit)	Data Flow Systems, Inc.	DFS-00396-008-03	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU001 Harness Upgrade Kit for TCU800, Includes: 002-0596 USB, 002-0597 USB Cover, 019-0174 USB Lanyard, 016-0270 20 pin P3 Connector	Data Flow Systems, Inc.	DFS-00540-108-07	Water, Wastewater, and Irrigation Quality (IQ) Systems

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County Approved Waiver Product List**

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Item	Vendor / Manufacturer	Model(s)	Applicability
TCU800 "Basic Snap-In" Installation Kit - Includes: snap-in mounting bracket, PI/P2/P3 spring loaded connectors, Wago terminals for resistors and fuses only, SPS00I, 10A Circuit Breaker, TFS, TFS Install kit for TCU, 7aH Battery. (Add 3-Phase Surge Protector & Polyphaser Kit)	Data Flow Systems, Inc.	DFS-00552-008-08	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU800 "Deluxe Snap-In" Installation Kit WITH WIRE HARNESS & ADDED COMPONENTS - Includes: snap-in mounting bracket, PI/P2/P3 spring loaded connectors, Wago terminals for every wire termination, (4) ASI Analog Surge Protectors, SPS00I, 10A Circuit Breaker, TFS, TFS Install kit for TCU, 7aH Battery. (Add 3-Phase Surge Protector & Polyphaser Kit)	Data Flow Systems, Inc.	DFS-00552-008-09	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU800 "Basic Front-Mount" Installation Kit - Includes dead-front mounting bracket, PI/P2/P3 spring loaded connectors, Wago terminals for resistors and fuses only, SPS00I, 10A Circuit Breaker, TFS, TFS Install kit for TCU, 7aH Battery. (Add 3-Phase)	Data Flow Systems, Inc.	DFS-00552-008-10	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
TCU800 "Deluxe Front-Mount" Installation Kit WITH WIRE HARNESS & ADDED COMPONENTS - Includes: dead-front mounting bracket, PI/P2/P3 spring loaded connectors, Wago terminals for every wire termination, (4) ASI Analog Surge Protectors, SPS00I, 10A Circuit Breaker, TFS, TFS Install kit for TCU, 7aH Battery. (Add 3-Phase Surge Protector & Polyphaser Kit)	Data Flow Systems, Inc.	DFS-00552-008-11	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU800 HARNESS 480V 3-PHASE UPGRADE KIT. (Use this 480V upgrade if purchasing a Deluxe Installation Kit)	Data Flow Systems, Inc.	DFS-00393-008-05	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU PI,P2 Connector (Wire Enters Top, Snap-In, 24-Pin) Each	Data Flow Systems, Inc.	016-0154	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU PI,P2 Connector (Wire Enters Rear, Front Mount, 24-Pin) Each	Data Flow Systems, Inc.	016-0182	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU00I ONLY- P3 Connector (Configuration/ Address Board)	Data Flow Systems, Inc.	DFS-00391-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU800 ONLY- P3 Connector (Added 1/0)	Data Flow Systems, Inc.	016-0270	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
TCU P4 Connector (RS-232 / R-S485) - Spring-Load Terminal (Not included with Installation Kits - Required for RIO and Modbus Interface)	Data Flow Systems, Inc.	016-0156	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU P4 Connector (RS-232 / R-S485) - Spring-Load Terminal (Not included with Installation Kits - Required for RIO and Modbus Interface) - FOR FRONT-MOUNTED TCU	Data Flow Systems, Inc.	016-0184	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU Snap-in Mounting Bracket	Data Flow Systems, Inc.	DFS-00370-008-10	Water, Wastewater, and Irrigation Quality (IQ) Systems
Adjustable Depth (4.5") Bracket (Short), Snap-In Bracket Req'd For 6-8" deep enclosure	Data Flow Systems, Inc.	DFS-00394-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Adjustable Depth (8.75") Bracket (Medium), Snap-In Bracket Req'd For 10-12" deep enclosure	Data Flow Systems, Inc.	DFS-00394-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
Adjustable Depth (12.25") Bracket (Tall), Snap-In Bracket Req'd For 14-18" deep enclosure	Data Flow Systems, Inc.	DFS-00394-008-03	Water, Wastewater, and Irrigation Quality (IQ) Systems
Accu-CT split-core current transformer (20A), ACTL-0750-020 (EACH)	Data Flow Systems, Inc.	008-0076	Water, Wastewater, and Irrigation Quality (IQ) Systems
Accu-CT split-core current transformer (50A), ACTL-0750-050 (EACH) NOTE: 50A is TCU800 default setting	Data Flow Systems, Inc.	008-0077	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
Accu-CT split-core current transformer (IO0A), ACTL-0750-100 (EACH)	Data Flow Systems, Inc.	008-0078	Water, Wastewater, and Irrigation Quality (IQ) Systems
Fiberglass Enclosure Assembly for TAC Pack TCU Includes: (1) Fiberglass 18x16 Enclosure w/Backplate, (1) Snap-In Install Kit w/240V 3-Phase protector, Polyphaser & RF Pigtail. ADD 480V 3-PHASE KIT UPGRADE IF REQUIRED	Data Flow Systems, Inc.	DFS-00275-008-04	Water, Wastewater, and Irrigation Quality (IQ) Systems
316 SS Enclosure Assembly for TAC Pack TCU Includes: (1) 316 SS 18x16 Enclosure, (1) Snap-In Install Kit w/240V 3- Phase protector, Polyphaser & RF Pigtail. ADD 480V 3-PHASE KIT UPGRADE IF REQUIRED	Data Flow Systems, Inc.	DFS-00275-008-05	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU00I Harness Upgrade Kit for TCU800, Includes: 002-0596 USB, 002-0597 USB Cover, 019-0174 USB Lanyard, 016-0270 20 pin P3 Connector	Data Flow Systems, Inc.	DFS-00540-108-07	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU00I SS Enclosure - ENCL ONLY 18"h 16"w 10"d	Data Flow Systems, Inc.	038-0012	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU00I Fiberglass Enclosure - ENCL ONLY 18"h 16"w 8"d	Data Flow Systems, Inc.	038-0051	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
TCU00118x16 Enclosure Plate (CUSTOM - RAW PLATE ONLY)	Data Flow Systems, Inc.	039-0127	Water, Wastewater, and Irrigation Quality (IQ) Systems
Tower Mount Bracket "Pair" for RTU202 & TCU Enclosures	Data Flow Systems, Inc.	DFS-00349-008-04	Water, Wastewater, and Irrigation Quality (IQ) Systems
Fiberglass Enclosure Assembly for TCU800 (with radio) Includes: (1) Fiberglass 24Hx20W Enclosure w/Backplate, (1) Snap-In Install Kit w/Harness, 240V 3-Phase protector, 7aH battery, Polyphaser & RF Pigtail. ADD price of DFS-00393-008-03 480V 3-PHASE KIT IF REQUIRED	Data Flow Systems, Inc.	DFS-00552-008-06	Water, Wastewater, and Irrigation Quality (IQ) Systems
316 SS Enclosure Assembly for TCU800 (with radio) Includes: (1) 316 SS 24Hx20W Enclosure w/Backplate, (1) Snap-In Install Kit w/Harness, 240V 3-Phase protector, 7aH battery, Polyphaser & RF Pigtail. ADD price of DFS-00393-008-03 480V 3-PHASE KIT IF REQUIRED	Data Flow Systems, Inc.	DFS-00552-008-07	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU800 HARNESS RELAY ADDER (adds interposing relays for all outputs)	Data Flow Systems, Inc.	DFS-00552-008-04	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU800 SS Enclosure- ENCL ONLY 24"h 20"w 10"d	Data Flow Systems, Inc.	038-0197	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU800 Fiberglass Enclosure - ENCL ONLY 24"h 20"w 10"d	Data Flow Systems, Inc.	038-0206	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
TCU800 24x20 Enclosure Plate (CUSTOM - RAW PLATE ONLY)	Data Flow Systems, Inc.	039-0337	Water, Wastewater, and Irrigation Quality (IQ) Systems
Tower Mount Bracket "Pair" for RTU202 & TCU Enclosures	Data Flow Systems, Inc.	DFS-00349-008-04	Water, Wastewater, and Irrigation Quality (IQ) Systems
2.6 aH Battery (12V Battery w/Leads)	Data Flow Systems, Inc.	DFS-00363-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
7 aH Battery 12V Battery w/Leads)	Data Flow Systems, Inc.	DFS-00363-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
18aH Battery (12V battery as used in RTU202 solar assembly) No leads - Universal Battery, Part# UB12180	Data Flow Systems, Inc.	023-0045	Water, Wastewater, and Irrigation Quality (IQ) Systems
Battery Lead (battery-side for 2.6, 3.0 and 7.0 aH)	Data Flow Systems, Inc.	DFS-00165-008-04	Water, Wastewater, and Irrigation Quality (IQ) Systems
Battery Cable, RTU204/202, 12"	Data Flow Systems, Inc.	DFS-00165-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Battery Cable, RTU210, 36"	Data Flow Systems, Inc.	DFS-00165-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
Battery Cable, TCU/TAC PACK, 48"	Data Flow Systems, Inc.	DFS-00165-008-05	Water, Wastewater, and Irrigation Quality (IQ) Systems
Battery Cable, TCU/TAC PACK, 72"	Data Flow Systems, Inc.	DFS-00165-008-07	Water, Wastewater, and Irrigation Quality (IQ) Systems
10' Big-Ass Battery Cable Assembly (see Battery White Paper)	Data Flow Systems, Inc.	DFS-00501-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
Battery Shelf (for 2.6, 3.0 and 7.0 aH batteries only)	Data Flow Systems, Inc.	039-0018	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
RTU Surge Protection Kit includes: the following: (1) Polyphaser Coaxial Surge Protector, (1) SPS001, (1) TFS.	Data Flow Systems, Inc.	DFS-00364-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU Surge Protection Kit includes: (1) SPS001120V, (1) TFS, (1) TFS Install Kit for TCU (Add 3-Phase Surge Protector per below)	Data Flow Systems, Inc.	DFS-00364-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
SPS001, 120VAC Single-Phase Surge Protector	Data Flow Systems, Inc.	005-0061	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU 240VAC 1-Phase Surge Protector {Ditek, UL LISTED} (Also 208VAC)	Data Flow Systems, Inc.	005-0120	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU 240VAC 3-Phase Surge Protector (Ditek, UL LISTED)	Data Flow Systems, Inc.	005-0062	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU 480VAC 3-Phase Surge Protector {Ditek, UL LISTED}	Data Flow Systems, Inc.	005-0063	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU 480VAC 3-Phase Surge Protector KIT (Ditek, UL LISTED)	Data Flow Systems, Inc.	DFS-00393-008-05	Water, Wastewater, and Irrigation Quality (IQ) Systems
Polyphaser Kit- includes Polyphaser and RF Pigtail (specify length)	Data Flow Systems, Inc.	DFS-00392-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Polyphaser Coax Surge Protector (Standard, BS0LN-C2)	Data Flow Systems, Inc.	005-0058	Water, Wastewater, and Irrigation Quality (IQ) Systems
Edco DRS-036 (DIN MOUNT ANALOG SURGE PROTECTOR)	Data Flow Systems, Inc.	022-0231	Water, Wastewater, and Irrigation Quality (IQ) Systems
Edco PC-642C-036 {MODULE}	Data Flow Systems, Inc.	022-0056	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
Edco PC-642C (BASE)	Data Flow Systems, Inc.	012-0011	Water, Wastewater, and Irrigation Quality (IQ) Systems
Edco PH-036 (MODULE)	Data Flow Systems, Inc.	022-0129	Water, Wastewater, and Irrigation Quality (IQ) Systems
Edco PH-036 (BASE)	Data Flow Systems, Inc.	012-0011	Water, Wastewater, and Irrigation Quality (IQ) Systems
API ANALOG LOOP ISOLATOR {API-4380-G-D)	Data Flow Systems, Inc.	022-0268	Water, Wastewater, and Irrigation Quality (IQ) Systems
API OCTAL BASE (NDS-8)	Data Flow Systems, Inc.	012-0019	Water, Wastewater, and Irrigation Quality (IQ) Systems
Zone Barrier CATS/CAT6 Network Surge Protector (Network RTU/TCU/HSS)	Data Flow Systems, Inc.	002-0584	Water, Wastewater, and Irrigation Quality (IQ) Systems
Transient Filter Shield - TFS00I-2	Data Flow Systems, Inc.	DFS-00306-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
TFS Install Kit for TCU and TAC Pack TCU	Data Flow Systems, Inc.	DFS-00319-008-03	Water, Wastewater, and Irrigation Quality (IQ) Systems
TFS Install Kit for RTU2XX with PCM001	Data Flow Systems, Inc.	DFS-00319-008-05	Water, Wastewater, and Irrigation Quality (IQ) Systems
10 Amp Breaker (Din Mount)	Data Flow Systems, Inc.	014-0010	Water, Wastewater, and Irrigation Quality (IQ) Systems
B&B Converter, RS-232 to RS-485	Data Flow Systems, Inc.	022-0340	Water, Wastewater, and Irrigation Quality (IQ) Systems
B&B RS485 Surge Protector (typical for TCU P4 / Modbus)	Data Flow Systems, Inc.	005-0165	Water, Wastewater, and Irrigation Quality (IQ) Systems
Tripp-Lite DTEL2 "Inline" Telephone Line Surge Protector (replaces both Edco PCTEL MODULE & BASE)	Data Flow Systems, Inc.	002-0605	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
Wago Operating Tool (Wago Bone)	Data Flow Systems, Inc.	026-0003	Water, Wastewater, and Irrigation Quality (IQ) Systems
1 Amp fuse holder assembly (mounts to din-rail)	Data Flow Systems, Inc.	DFS-00271-008-09	Water, Wastewater, and Irrigation Quality (IQ) Systems
2 Amp fuse holder assembly (mounts to din-rail)	Data Flow Systems, Inc.	DFS-00271-008-10	Water, Wastewater, and Irrigation Quality (IQ) Systems
¼ Amp fuse holder assembly (mounts to din-rail)	Data Flow Systems, Inc.	DFS-00271-008-11	Water, Wastewater, and Irrigation Quality (IQ) Systems
FUSE BLOCK, MIDGET, 3 POS,30A,600V (for 480V 3PH kit) (add fuses)	Data Flow Systems, Inc.	040-0044	Water, Wastewater, and Irrigation Quality (IQ) Systems
IA FUSE, MIDGET, TIME DELAY, 600 VAC, KTQ (for 480V 3PH kit)	Data Flow Systems, Inc.	040-0043	Water, Wastewater, and Irrigation Quality (IQ) Systems
47K RESISTOR 2 COND WAGO TERMINAL	Data Flow Systems, Inc.	DFS-00271-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
249 Ohm RESISTOR 2 COND WAGO TERMINAL	Data Flow Systems, Inc.	DFS-00271-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
100K IW RESISTOR 2 COND WAGO TERMINAL	Data Flow Systems, Inc.	DFS-00271-008-07	Water, Wastewater, and Irrigation Quality (IQ) Systems
200K 2W RESISTOR 2 COND WAGO TERMINAL	Data Flow Systems, Inc.	DFS-00271-008-08	Water, Wastewater, and Irrigation Quality (IQ) Systems
100K 1/2W,0.1% RESISTOR (for old "pre-2020" 480V 3PH kit)	Data Flow Systems, Inc.	DFS-00271-008-14	Water, Wastewater, and Irrigation Quality (IQ) Systems
49.9K RESISTOR 2 COND WAGO TERMINAL (for new 480V 3PH kit)	Data Flow Systems, Inc.	DFS-00271-008-24	Water, Wastewater, and Irrigation Quality (IQ) Systems
4 COND WAGO THRU BLOCK (feed through, 4 hole)	Data Flow Systems, Inc.	026-0063	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
3 COND WAGO THRU BLOCK (feed through, 3 hole)	Data Flow Systems, Inc.	026-0062	Water, Wastewater, and Irrigation Quality (IQ) Systems
2 COND WAGO THRU BLOCK (feed through, 2 hole)	Data Flow Systems, Inc.	026-0061	Water, Wastewater, and Irrigation Quality (IQ) Systems
WAGO 2 COND END PLATE (GREY)	Data Flow Systems, Inc.	026-0021	Water, Wastewater, and Irrigation Quality (IQ) Systems
WAGO 2 COND END PLATE (ORANGE)	Data Flow Systems, Inc.	026-0022	Water, Wastewater, and Irrigation Quality (IQ) Systems
WAGO END STOP (Qty 50 in package)	Data Flow Systems, Inc.	026-0002	Water, Wastewater, and Irrigation Quality (IQ) Systems
WAGO JUMPER-ADJACENT GREY	Data Flow Systems, Inc.	026-0034	Water, Wastewater, and Irrigation Quality (IQ) Systems
WAGO JUMPER-ALTERNATE GREY	Data Flow Systems, Inc.	026-0035	Water, Wastewater, and Irrigation Quality (IQ) Systems
IDEC SLIM POWER RELAY, 120VAC, SPDT	Data Flow Systems, Inc.	012-0063	Water, Wastewater, and Irrigation Quality (IQ) Systems
IDEC SLIM POWER RELAY, 12VDC, SPDT	Data Flow Systems, Inc.	012-0064	Water, Wastewater, and Irrigation Quality (IQ) Systems
IDEC RJ SLIM POWER RELAY BASE	Data Flow Systems, Inc.	012-0065	Water, Wastewater, and Irrigation Quality (IQ) Systems
OMRON/AAE OCTAL RELAY, 120 VAC COIL, DPDT (use 012-0019 base)	Data Flow Systems, Inc.	012-0002	Water, Wastewater, and Irrigation Quality (IQ) Systems
OMRON/AAE OCTAL RELAY, 24 VDC COIL, DPDT (use 012-0019 base)	Data Flow Systems, Inc.	012-0023	Water, Wastewater, and Irrigation Quality (IQ) Systems
OMRON/AAE OCTAL RELAY BASE (NDS-8)	Data Flow Systems, Inc.	012-0019	Water, Wastewater, and Irrigation Quality (IQ) Systems

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SNUBBER,0.1UF,47 OHM,1/2WATT	Data Flow Systems, Inc.	007-0084	Water, Wastewater, and Irrigation Quality (IQ) Systems
.375A, SLOW BLOW FUSE FOR TCU, 1.25"x.25"	Data Flow Systems, Inc.	040-0042	Water, Wastewater, and Irrigation Quality (IQ) Systems
WIN-RTU / PLC Test Kit- includes: (1) Resource CD, (1) RIM/ PLC Service Interface Cable (6'), (1) Serial Male to USB Male Adapter	Data Flow Systems, Inc.	DFS-00242-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU / PCU Test Kit - includes: (1) Resource CD, (1) TCU / PCU Service Interface Cable (6'), (1) Serial Male to USB Male Adapter	Data Flow Systems, Inc.	DFS-00242-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
RETROFIT KIT, BIRD 4300-400 PEAK POWER (use with high speed TIM)	Data Flow Systems, Inc.	035-0037	Water, Wastewater, and Irrigation Quality (IQ) Systems
36" RG-58 cable w/BNC Connector (Watt Meter & Attenuator to radio)	Data Flow Systems, Inc.	DFS-00125-008-16	Water, Wastewater, and Irrigation Quality (IQ) Systems
RIM/PLC Service Port Cable, 9-Pin Female "D" to PLC	Data Flow Systems, Inc.	DFS-00128-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
7' TCU/PCU Service Port Cable, 9-Pin to Telephone Style	Data Flow Systems, Inc.	DFS-00128-008-05	Water, Wastewater, and Irrigation Quality (IQ) Systems
GENDER CHANGER,25PIN FEMALE TO FEMALE	Data Flow Systems, Inc.	016-0020	Water, Wastewater, and Irrigation Quality (IQ) Systems
TCU Panel Simulation Fixture (aka TCU Test Fixture/ TCU Demo Box)	Data Flow Systems, Inc.	DFS-00243-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
RTA209 -VHF (217-220 MHz) 9.2 db Yagi	Data Flow Systems, Inc.	DFS-00303-008-03	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
LAA217 - 217 MHz "0 dB" Grounded Antenna (Length: 68 inches)	Data Flow Systems, Inc.	DFS-00322-008-13	Water, Wastewater, and Irrigation Quality (IQ) Systems
CTA209 Dipole (4 lobes)- (217-220 MHz) (Telewave ANT220D6-9) - Assembled antenna cannot be shipped (requires DFS Delivery@ SQR) TOP-MOUNT ASSEMBLIES:DFS-00322-008-04: CTA209, 200MHZ, 9DB OFFSET (TOP) DFS-00322-008-07: CTA209, 200MHZ, 9DB CARDIOID (20") (TOP) DFS-00322-008-11: CTA209, 200MHZ, 9DB BIDIRECTIONAL (TOP) SIDE-MOUNT ASSEMBLIES: DFS-00322-008-19: CTA209, 200MHZ, 9DB OFFSET (SIDE) DFS-00322-008-20: CTA209, 200MHZ, 9DB CARDIOID (20") (SIDE) DFS-00322-008-21: CTA209,200MHZ, 9DB BIDIRECTIONAL (SIDE)	Data Flow Systems, Inc.	DFS-00322-008-XX	Water, Wastewater, and Irrigation Quality (IQ) Systems
CTA206 Dipole (2 lobes)- (217-220 MHz) (Telewave ANT220D3) Assembled antenna cannot be shipped (requires DFS Delivery@ SQR)	Data Flow Systems, Inc.	DFS-00322-008-12 (CAN'T SHIP)	Water, Wastewater, and Irrigation Quality (IQ) Systems
CTA203 Dipole (1 lobe)-(217-220 MHz) (Telewave ANT220D)	Data Flow Systems, Inc.	005-0118 (CAN'T SHIP)	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
Rubber Duck for 217-220 MHz - Antennex BEXB000BN NOTE: Connector type is BNC, may require a BNC to N-Type Adapter	Data Flow Systems, Inc.	005-0074	Water, Wastewater, and Irrigation Quality (IQ) Systems
BNC to N-Type Adapter (Female BNC to Male N-Type)	Data Flow Systems, Inc.	016-0059	Water, Wastewater, and Irrigation Quality (IQ) Systems
RF Pigtails (BNC to N-Type)	Data Flow Systems, Inc.		Water, Wastewater, and Irrigation Quality (IQ) Systems
811 RF Pigtail - (used in RTU202 and 204)	Data Flow Systems, Inc.	DFS-00125-008-09	Water, Wastewater, and Irrigation Quality (IQ) Systems
20" RF Pigtail - (used in TAC Pack Enclosure)	Data Flow Systems, Inc.	DFS-00125-008-10	Water, Wastewater, and Irrigation Quality (IQ) Systems
33" RF Pigtail - (used in RTU210)	Data Flow Systems, Inc.	DFS-00125-008-11	Water, Wastewater, and Irrigation Quality (IQ) Systems
46" RF Pigtail - (used in large RTU panels & TCU control panels)	Data Flow Systems, Inc.	DFS-00125-008-12	Water, Wastewater, and Irrigation Quality (IQ) Systems
72" RF Pigtail - (used in large RTU panels & TCU control panels)	Data Flow Systems, Inc.	DFS-00125-008-18	Water, Wastewater, and Irrigation Quality (IQ) Systems
DFS RTC-400 Pre-assembled 23' with connectors	Data Flow Systems, Inc.	DFS-00316-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
DFS RTC-400 (price per foot) LMR400-DB (500' Roll)	Data Flow Systems, Inc.	019-0063	Water, Wastewater, and Irrigation Quality (IQ) Systems
DFS RTC-400 coax connectors (RFN-1006-3I) (crimp pin)	Data Flow Systems, Inc.	016-0058	Water, Wastewater, and Irrigation Quality (IQ) Systems
DFS RTC-600 (price per foot) LMR600-DB	Data Flow Systems, Inc.	019-0084	Water, Wastewater, and Irrigation Quality (IQ) Systems

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DFS RTC-600 N-Type Male coax connector (crimp pin) 3190-1268	Data Flow Systems, Inc.	016-0123	Water, Wastewater, and Irrigation Quality (IQ) Systems
DFS RTC-600 N-Type Female coax conn (unique, crimp pin) 3190-616	Data Flow Systems, Inc.	016-0147	Water, Wastewater, and Irrigation Quality (IQ) Systems
Band-it 9" coated SS cable tie (100 in bag)	Data Flow Systems, Inc.	020-0016	Water, Wastewater, and Irrigation Quality (IQ) Systems
Band-it 18" coated SS cable tie	Data Flow Systems, Inc.	020-0050	Water, Wastewater, and Irrigation Quality (IQ) Systems
1" Glue-Type Heat Shrink, LIST PRICE IS PER FOOT (comes in 4' lengths)	Data Flow Systems, Inc.	020-0001	Water, Wastewater, and Irrigation Quality (IQ) Systems
N-Type Barrel Connector (female-to-female)	Data Flow Systems, Inc.	016-0094	Water, Wastewater, and Irrigation Quality (IQ) Systems
Anatech Filter	Data Flow Systems, Inc.	005-0084	Water, Wastewater, and Irrigation Quality (IQ) Systems
Analog Control Module (ACM001) obsolete	Data Flow Systems, Inc.	DFS-00185-009-XX	Water, Wastewater, and Irrigation Quality (IQ) Systems
Analog Control Module (ACM002)	Data Flow Systems, Inc.	DFS-00350-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Analog Monitor Module (AMM001) obsolete	Data Flow Systems, Inc.	DFS-00108-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Analog Monitor Module (AMM002)	Data Flow Systems, Inc.	DFS-00240-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Bus Extender Module	Data Flow Systems, Inc.	DFS-00223-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Digital Control Module (DCM001) (obsolete)	Data Flow Systems, Inc.	DFS-00101-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Digital Control Module (DCM002) (obsolete)	Data Flow Systems, Inc.	DFS-00211-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Digital Control Module (DCM003-01, -03, -OS)	Data Flow Systems, Inc.	DFS-00297-008-0X	Water, Wastewater, and Irrigation Quality (IQ) Systems
Digital Control Module (DCM003-02, -04, -06)	Data Flow Systems, Inc.	DFS-00297-008-0X	Water, Wastewater, and Irrigation Quality (IQ) Systems
Digital Monitor Module (DMM001) (obsolete)	Data Flow Systems, Inc.	DFS-00100-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Digital Monitor Module (DMM002) (obsolete)	Data Flow Systems, Inc.	DFS-00285-008-0X	Water, Wastewater, and Irrigation Quality (IQ) Systems
Digital Monitor Module (DMM003)	Data Flow Systems, Inc.	DFS-00518-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Power Supply Module (PSM002, S0w) (obsolete)	Data Flow Systems, Inc.	DFS-00209-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
Power Supply Module (PSM003-1, 100W)	Data Flow Systems, Inc.	DFS-00296-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Solar Power Module (SPM001) (obsolete)	Data Flow Systems, Inc.	DFS-00260-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Solar Power Module (SPM002)	Data Flow Systems, Inc.	DFS-00517-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Programmable Logic Controller (PLC001)	Data Flow Systems, Inc.	DFS-00213-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Programmable Logic Controller (PLC033)	Data Flow Systems, Inc.	DFS-00507-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Programmable Logic Controller (PLC800) w/PMT	Data Flow Systems, Inc.	DFS-00539-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Modular Backplane (MBP001-XX) (all versions)	Data Flow Systems, Inc.	DFS-00279-008-XX	Water, Wastewater, and Irrigation Quality (IQ) Systems
RTU202 Modular Backplane (all versions)	Data Flow Systems, Inc.	DFS-00348-008-XX	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
RIM006 Module (no radio)	Data Flow Systems, Inc.	DFS-00295-008-26	Water, Wastewater, and Irrigation Quality (IQ) Systems
TIM007 Board-Only (no radio, all TIM007 versions)	Data Flow Systems, Inc.	DFS-00513-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Back Pack Radio (BPR) Board-Set (no radio)	Data Flow Systems, Inc.	DFS-00264-008-XX	Water, Wastewater, and Irrigation Quality (IQ) Systems
VDR002-01, -02, 217-220 2W Radio (for TIM or TCU)	Data Flow Systems, Inc.	024-0040	Water, Wastewater, and Irrigation Quality (IQ) Systems
VDR002-03, 450-470 2W Radio (for TIM or TCU)	Data Flow Systems, Inc.	024-0042	Water, Wastewater, and Irrigation Quality (IQ) Systems
Integrated Network Adapter (for TCU00I-IP)	Data Flow Systems, Inc.		Water, Wastewater, and Irrigation Quality (IQ) Systems
Integrated Network Adapter (for TCU800-IP)	Data Flow Systems, Inc.		Water, Wastewater, and Irrigation Quality (IQ) Systems
Pump Control Unit (PCU00I) (no radio)	Data Flow Systems, Inc.	DFS-00219-008-02	Water, Wastewater, and Irrigation Quality (IQ) Systems
Telemetry Control Unit (TCU00I) (no radio,IP,AD,C)	Data Flow Systems, Inc.	DFS-00367-008-03	Water, Wastewater, and Irrigation Quality (IQ) Systems
Telemetry Control Unit (TCU800) (no radio,IP,AD,C)	Data Flow Systems, Inc.	DFS-00540-008-03	Water, Wastewater, and Irrigation Quality (IQ) Systems
Network Interface Module - (NIM00I)	Data Flow Systems, Inc.	DFS-00375-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
Switch Interface Module - (SIM00I)	Data Flow Systems, Inc.	DFS-00375-008-13	Water, Wastewater, and Irrigation Quality (IQ) Systems
Network Switch Module - (NSM00I)	Data Flow Systems, Inc.	DFS-00375-008-04	Water, Wastewater, and Irrigation Quality (IQ) Systems
Fiber Interface Module - (FIM00I-10/100)	Data Flow Systems, Inc.	DFS-00375-008-09	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Network Fiber Module- (NFM001-10/100)	Data Flow Systems, Inc.	DFS-00375-008-10	Water, Wastewater, and Irrigation Quality (IQ) Systems
Hyper Server Module-HSM003 (STANDARD REPAIR)	Data Flow Systems, Inc.	DFS-00525-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
HSM003 (REPLACE DRIVE - REPAIR ADDER)	Data Flow Systems, Inc.		Water, Wastewater, and Irrigation Quality (IQ) Systems
HSM003 (REPLACE PROCESSOR- REPAIR ADDER)	Data Flow Systems, Inc.		Water, Wastewater, and Irrigation Quality (IQ) Systems
RIO-128 Input/ Output Device	Data Flow Systems, Inc.	DFS-00398-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
RIO-032 Input/ Output Device	Data Flow Systems, Inc.	DFS-00408-008-01	Water, Wastewater, and Irrigation Quality (IQ) Systems
ZABOCS Hybrid Biological Odor Control Units	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
MIDAS OCM Carbon Odor Control Units	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
LOPRO Chemical Scrubber Odor Control Units	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
BTF Bio-trickling Odor Control Scrubbers	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
Bioxide	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
Bioxide Plus 71	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
Bioxide AE	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
Odophos	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
Odophos Plus	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
Ferric Sulfate (9%)	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
50% Hydrogen Peroxide	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
VX-456 (Bulk Tanker)	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
VX-456 (Tote)	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
Aktivox (Full Truck)	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
Aktivox (Partial Load)	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
Perox Pus	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
Alkaqen AO	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
ZB-30 Mini	Evoqua Water Technologies LLC	Biofilter	Water, Wastewater, and Irrigation Quality (IQ) Systems
ZB-42 Mini	Evoqua Water Technologies LLC	Biofilter	Water, Wastewater, and Irrigation Quality (IQ) Systems
ZB-54 Mini	Evoqua Water Technologies LLC	Biofilter	Water, Wastewater, and Irrigation Quality (IQ) Systems
ZABOCS-4000	Evoqua Water Technologies LLC	Biofilter	Water, Wastewater, and Irrigation Quality (IQ) Systems
ZABOCS-5000	Evoqua Water Technologies LLC	Biofilter	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
ZABOCS-6000	Evoqua Water Technologies LLC	Biofilter	Water, Wastewater, and Irrigation Quality (IQ) Systems
ZABOCS-7000	Evoqua Water Technologies LLC	Biofilter	Water, Wastewater, and Irrigation Quality (IQ) Systems
ZABOCS-7010	Evoqua Water Technologies LLC	Biofilter	Water, Wastewater, and Irrigation Quality (IQ) Systems
ZABOCS-7012	Evoqua Water Technologies LLC	Biofilter	Water, Wastewater, and Irrigation Quality (IQ) Systems
ZABOCS-7015	Evoqua Water Technologies LLC	Biofilter	Water, Wastewater, and Irrigation Quality (IQ) Systems
ZABOCS-7018	Evoqua Water Technologies LLC	Biofilter	Water, Wastewater, and Irrigation Quality (IQ) Systems
ZABOCS-7020	Evoqua Water Technologies LLC	Biofilter	Water, Wastewater, and Irrigation Quality (IQ) Systems
ZABOCS-7025	Evoqua Water Technologies LLC	Biofilter	Water, Wastewater, and Irrigation Quality (IQ) Systems
ZABOCS-8025	Evoqua Water Technologies LLC	Biofilter	Water, Wastewater, and Irrigation Quality (IQ) Systems
RJMC-0150	Evoqua Water Technologies LLC	Carbon	Water, Wastewater, and Irrigation Quality (IQ) Systems
RJMC-0200	Evoqua Water Technologies LLC	Carbon	Water, Wastewater, and Irrigation Quality (IQ) Systems
RJMC-0250	Evoqua Water Technologies LLC	Carbon	Water, Wastewater, and Irrigation Quality (IQ) Systems
RJMC-0300	Evoqua Water Technologies LLC	Carbon	Water, Wastewater, and Irrigation Quality (IQ) Systems
RJMC-0350	Evoqua Water Technologies LLC	Carbon	Water, Wastewater, and Irrigation Quality (IQ) Systems

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RJMC-0400	Evoqua Water Technologies LLC	Carbon	Water, Wastewater, and Irrigation Quality (IQ) Systems
RJMC-0450	Evoqua Water Technologies LLC	Carbon	Water, Wastewater, and Irrigation Quality (IQ) Systems
RJMC-0500	Evoqua Water Technologies LLC	Carbon	Water, Wastewater, and Irrigation Quality (IQ) Systems
VoCarb P60 Supersack	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
VoCarb P60 Bag	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
VoCarb 36C Supersack	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
VoCarb 36C Bag	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
MIDAS C20 (coconut based) Supersack	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
MIDAS C30 (coconut based) Supersack	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
MIDAS OCM (coal based) Supersack	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
MIDAS OCM (coal based) Bag	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
Biofilter Nutrient 8-2-8 (5-Drum Quantity)	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
Biofilter Nutrient 8-2-8 (5-Gallon Minimum)	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
Bioglas Media	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems

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AcruLog 0-50 ppm Logger	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
AcruLog 0-200 ppm Logger	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
AcruLog 0-1000 ppm Logger	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
LRSS-2 Sampling System	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
CEM Single Point	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
CEM Two Point	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
CEM Three Point	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
DiCom Perimeter Monitor	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
AcruLog Differential Pressure Logger	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
AcruLog IPX Logger	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
AcruLog PPB Logger	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
AcruLog Dilution Logger	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
AcruLog NH3 Logger	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
AcruLog Shelter	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems

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Calibration Gas Kit	Evoqua Water Technologies LLC		Water, Wastewater, and Irrigation Quality (IQ) Systems
Rotork valve actuators, replacement parts and repair services	Fluid Control Specialties, LLC (Rotork)		Water, Wastewater, and Irrigation Quality (IQ) Systems
Process & Lab instruments & accessories	Hach Company		Equipment, Chemicals, & Services
Chemistries, reagents, and solutions	Hach Company		Equipment, Chemicals, & Services
Service contracts	Hach Company		Equipment, Chemicals, & Services
Hach Samplers	Hach Company		Equipment, Chemicals, & Services
Belt Filter Press equipment, parts and services	Komline- Sanderson		Wastewater Systems
MTOL+ IR 0-100 AUTO CLN	Lazenby & Associates	28052	Water, Wastewater, and Irrigation Quality (IQ) Systems
MTOL+ WL 0-100 AUTO CLN	Lazenby & Associates	28053	Water, Wastewater, and Irrigation Quality (IQ) Systems
FLOW THRU ASSY, MICRO 200/M-TOL	Lazenby & Associates	50125	Water, Wastewater, and Irrigation Quality (IQ) Systems
LAMP ASSY I/R MTOL	Lazenby & Associates	21396S	Water, Wastewater, and Irrigation Quality (IQ) Systems
DESICCANT REFILL FOR MTOL/M200	Lazenby & Associates	21555R	Water, Wastewater, and Irrigation Quality (IQ) Systems
LAMP ASSY WT/LT MTOL	Lazenby & Associates	24082S	Water, Wastewater, and Irrigation Quality (IQ) Systems
STILLING CHAMBER	Lazenby & Associates	20106	Water, Wastewater, and Irrigation Quality (IQ) Systems
CUVETTE AUTO CLN TOL3 & 4	Lazenby & Associates	24166S	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
KIT TUBING, VALVE, FTGS M200TOL	Lazenby & Associates	21062	Water, Wastewater, and Irrigation Quality (IQ) Systems
CAL KIT.02,1,10 NTU MTOL LR	Lazenby & Associates	H-39950	Water, Wastewater, and Irrigation Quality (IQ) Systems
CAL KIT.02,10,100 NTU TOL3 H/P	Lazenby & Associates	39953	Water, Wastewater, and Irrigation Quality (IQ) Systems
CALKIT 02,10,1000 M100/TOL H/P	Lazenby & Associates	39957	Water, Wastewater, and Irrigation Quality (IQ) Systems
PRESSURE REGULATOR MTOL	Lazenby & Associates	24306S	Water, Wastewater, and Irrigation Quality (IQ) Systems
KIT MTOL+ EASY MOUNT ADAPTER PLATE	Lazenby & Associates	28157	Water, Wastewater, and Irrigation Quality (IQ) Systems
O-RING & SEAL KIT	Lazenby & Associates	28168S	Water, Wastewater, and Irrigation Quality (IQ) Systems
CUVETTE FLOW THRU 28MM 3/PK	Lazenby & Associates	50036	Water, Wastewater, and Irrigation Quality (IQ) Systems
SPANNER WRENCH	Lazenby & Associates	50122S	Water, Wastewater, and Irrigation Quality (IQ) Systems
CORD POWER SET OF 2 120/240V	Lazenby & Associates	20779S	Water, Wastewater, and Irrigation Quality (IQ) Systems
REPLACEMENT JCT BOX POWER SUPL	Lazenby & Associates	24017S	Water, Wastewater, and Irrigation Quality (IQ) Systems
ELECTRONIC SERVICE MODULE MTOL+ WL	Lazenby & Associates	02853	Water, Wastewater, and Irrigation Quality (IQ) Systems
ELECTRONIC SERVICE MODULE MTOL+ IR	Lazenby & Associates	02852	Water, Wastewater, and Irrigation Quality (IQ) Systems
KEYPAD KIT	Lazenby & Associates	29240S	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
M100+ WL LAB TURBIDIMETER 0-4000	Lazenby & Associates	28060	Water, Wastewater, and Irrigation Quality (IQ) Systems
M100+ IR LAB TURBIDIMETER 0-4000	Lazenby & Associates	28061	Water, Wastewater, and Irrigation Quality (IQ) Systems
ProCal Calibration Kit (0-4000 NTU), W/L	Lazenby & Associates	39940	Water, Wastewater, and Irrigation Quality (IQ) Systems
ProCal Calibration Kit (0-4000 NTU), IR	Lazenby & Associates	39941	Water, Wastewater, and Irrigation Quality (IQ) Systems
REPLACEMENT LAMP ASSEMBLY, W/L	Lazenby & Associates	24082S	Water, Wastewater, and Irrigation Quality (IQ) Systems
REPLACEMENT LAMP ASSEMBLY, IR	Lazenby & Associates	21396S	Water, Wastewater, and Irrigation Quality (IQ) Systems
LAMP MD FOR MICRO 100/1000 WL	Lazenby & Associates	19972	Water, Wastewater, and Irrigation Quality (IQ) Systems
KIT TUBING, VALVE, FTGS M200TOL	Lazenby & Associates	21062	Water, Wastewater, and Irrigation Quality (IQ) Systems
CUVETTE SAMPLE 28MM 3/PK	Lazenby & Associates	50051	Water, Wastewater, and Irrigation Quality (IQ) Systems
CUVETTE SAMPLE 28MM 10/PK	Lazenby & Associates	50052	Water, Wastewater, and Irrigation Quality (IQ) Systems
Kit, Formazin Stock Solution	Lazenby & Associates	50040	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 1000 NTU 1LT HF PRIMARY	Lazenby & Associates	53070	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, .02 NTU 125ML HF PRIMARY	Lazenby & Associates	53090	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, .02 NTU 1LT HF PRIMARY	Lazenby & Associates	53030	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
STD, 4 NTU 1LT HF PRIMARY	Lazenby & Associates	53040	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 0.5 NTU 125ML HF PRIMARY	Lazenby & Associates	H-53120	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 1.0 NTU 125ML HF PRIMARY	Lazenby & Associates	H-53130	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 1000 NTU 125ML HF PRIMARY	Lazenby & Associates	53140	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 0.1 NTU 125ML HF PRIMARY	Lazenby & Associates	53380	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 5.0 NTU 125ML HF PRIMARY	Lazenby & Associates	H-53420	Water, Wastewater, and Irrigation Quality (IQ) Systems
CAL STD, 10 NTU 1LT HF PRIMARY	Lazenby & Associates	53000	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, .02 NTU 1LT HF PRIMARY	Lazenby & Associates	53030	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 4 NTU 1LT HF PRIMARY	Lazenby & Associates	53040	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 100 NTU 1LT HF PRIMARY	Lazenby & Associates	53050	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 20 NTU 1LT HF PRIMARY	Lazenby & Associates	53060	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 1000 NTU 1LT HF PRIMARY	Lazenby & Associates	53070	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 1.0 NTU 1LT HF PRIMARY	Lazenby & Associates	53080	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 0.5 NTU 1LT HF PRIMARY	Lazenby & Associates	53170	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
STD, 5.0 NTU 1LT HF PRIMARY	Lazenby & Associates	53180	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, .02 NTU 500ML HF PRIMARY	Lazenby & Associates	53240	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 2.0 NTU 500ML HF PRIMARY	Lazenby & Associates	53250	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 10 NTU 500ML HF PRIMARY	Lazenby & Associates	53260	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 50 NTU 1 LITER HF PRIMARY	Lazenby & Associates	53280	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 0.02 NTU 1GL HF PRIMARY	Lazenby & Associates	53290	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 10 NTU 1GL HF PRIMARY	Lazenby & Associates	53300	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 100 NTU 1GL HF PRIMARY	Lazenby & Associates	53310	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 1000 NTU 500ML HF PRIM	Lazenby & Associates	53340	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 20 NTU 1GL HF PRIMARY	Lazenby & Associates	53370	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 100 NTU 500ML HF PRIM	Lazenby & Associates	53390	Water, Wastewater, and Irrigation Quality (IQ) Systems
STD, 1.0 NTU 500ML HF PRIM	Lazenby & Associates	53400	Water, Wastewater, and Irrigation Quality (IQ) Systems
CAL STD.10000NTU WL HF PRO CAL	Lazenby & Associates	39938	Water, Wastewater, and Irrigation Quality (IQ) Systems
CAL STD.10000NTU IR HF PRO CAL	Lazenby & Associates	39939	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
CAL STANDARD 4000 NTU PRO CAL	Lazenby & Associates	53410	Water, Wastewater, and Irrigation Quality (IQ) Systems
CAL STD 100 NTU, 125ML HF PRIMARY	Lazenby & Associates	39824	Water, Wastewater, and Irrigation Quality (IQ) Systems
CAL STD 10 NTU, 125ML HF PRIMARY	Lazenby & Associates	39825	Water, Wastewater, and Irrigation Quality (IQ) Systems
39845+M-TPW PORTABLE TURB W	Lazenby & Associates	20000	Water, Wastewater, and Irrigation Quality (IQ) Systems
39845+M-TPI PORTABLE TURB	Lazenby & Associates	20008	Water, Wastewater, and Irrigation Quality (IQ) Systems
CUVETTE MICROTPI 3 PK	Lazenby & Associates	19856	Water, Wastewater, and Irrigation Quality (IQ) Systems
CAL SET POCKET TPI/TPW HF POL	Lazenby & Associates	39845	Water, Wastewater, and Irrigation Quality (IQ) Systems
ELECTRONIC MDL TOL3 IR	Lazenby & Associates	02056	Water, Wastewater, and Irrigation Quality (IQ) Systems
ELECTRONIC MDL TOL4 W/L	Lazenby & Associates	02063	Water, Wastewater, and Irrigation Quality (IQ) Systems
ELECTRONIC MDL TOL 5 W/L	Lazenby & Associates	04060	Water, Wastewater, and Irrigation Quality (IQ) Systems
SPANNER WRENCH	Lazenby & Associates	50122S	Water, Wastewater, and Irrigation Quality (IQ) Systems
CUVETTE STAND	Lazenby & Associates	19981	Water, Wastewater, and Irrigation Quality (IQ) Systems
CORD POWER SET OF 2 120/240V	Lazenby & Associates	20779S	Water, Wastewater, and Irrigation Quality (IQ) Systems
TUBING,BLK TYG R3400 50FT ROLL	Lazenby & Associates	21201S	Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
LAMP MODULE IR M100	Lazenby & Associates	22423S	Water, Wastewater, and Irrigation Quality (IQ) Systems
FLOW THRU ASSY NYLON TOL/ACCUV	Lazenby & Associates	24165S	Water, Wastewater, and Irrigation Quality (IQ) Systems
PRESSURE REGULATOR MTOL	Lazenby & Associates	24306S	Water, Wastewater, and Irrigation Quality (IQ) Systems
REPLACEMENT JCT BOX POWER SUPL	Lazenby & Associates	24017S	Water, Wastewater, and Irrigation Quality (IQ) Systems
LAMP MD FOR MICRO 1000 IR	Lazenby & Associates	24547S	Water, Wastewater, and Irrigation Quality (IQ) Systems
DETECTOR ASSY LAMP TOL REPLACE	Lazenby & Associates	28332S	Water, Wastewater, and Irrigation Quality (IQ) Systems
PLC Hardware - ControlLogix, CompactLogix	Rexel		Water, Wastewater, and Irrigation Quality (IQ) Systems
Micro Control System	Rexel		Water, Wastewater, and Irrigation Quality (IQ) Systems
I/O Devices	Rexel		Water, Wastewater, and Irrigation Quality (IQ) Systems
Operator Interface- Panelview Plus, Versa views, Power monitors, Optix, ASEM Cmptrs & Mntrs	Rexel		Water, Wastewater, and Irrigation Quality (IQ) Systems
Power Monitoring Equipment	Rexel		Water, Wastewater, and Irrigation Quality (IQ) Systems
Low Voltage Drives & Medium Voltage Drive Parts	Rexel		Water, Wastewater, and Irrigation Quality (IQ) Systems
Industrial Controls	Rexel		Water, Wastewater, and Irrigation Quality (IQ) Systems
Ethernet Switches Stratix Family	Rexel		Water, Wastewater, and Irrigation Quality (IQ) Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
Drives & Accessories	Rexel		Water, Wastewater, and Irrigation Quality (IQ) Systems
End of Life Products (EOL)	Rexel		Water, Wastewater, and Irrigation Quality (IQ) Systems
Software	Rexel		Water, Wastewater, and Irrigation Quality (IQ) Systems
Custom Support Services & Equipment	Rexel		Water, Wastewater, and Irrigation Quality (IQ) Systems
Refrigerated Autosampler Products and Services	Teledyne ISCO		Wastewater Systems
67 I 2FR Refrigerated Sampler (120 V AC, 60 Hz).	Teledyne ISCO	68-6710-072	Wastewater Systems
1-bottle Configuration.	Teledyne ISCO	68-6700-038	Wastewater Systems
3/8-inch ID x 25 ft. long vinyl suction line with standard weighted polypropylene strainer. Includes tubing coupler.	Teledyne ISCO	60-9004-379	Wastewater Systems
Temperature Sensor	Teledyne ISCO	60-9004-226	Wastewater Systems
Evaporator Sensor	Teledyne ISCO	60-9004-240	Wastewater Systems
BLZZRD Package with 14 x 950ml poly bottle configuration and 3/8-inch ID x 25 ft. long vinyl suction line standard weighted polypropylene strainer	Teledyne ISCO	68-2960-028	Wastewater Systems
BLZZRD 14-bottle configuration. Includes 14 polypropylene 950-mL bottles with caps, two discharge tubes, bottle carrier and adapter.	Teledyne ISCO	68-2960-020	Wastewater Systems

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Item	Vendor / Manufacturer	Model(s)	Applicability
BLZZRD 2.5-gal (10 liter) glass bottle with PTFE lined caps	Teledyne ISCO	68-2960-021	Wastewater Systems
2.5-gallon (9.5-liter) glass round bottle with PTFE lined cap	Teledyne ISCO	68-2700-005	Wastewater Systems
BLZZRD Mobility Kit	Teledyne ISCO	60-2974-048	Wastewater Systems
3/8-inch vinyl suction line - 500 ft.	Teledyne ISCO	68-1680-059	Wastewater Systems
Discharge tubing for 5800/4700 and 6700 Series/Avalanche Sampler, pump tubing for 3800 series, GLS, and Glacier Samplers	Teledyne ISCO	60-6700-047	Wastewater Systems
Tubing coupler, 3/8 inch. One-piece, clampless coupler made of stainless steel.	Teledyne ISCO	60-3709-002	Wastewater Systems
3/8-inch stainless steel strainer, low flow.	Teledyne ISCO	69-2903-138	Wastewater Systems
Distributer arm	Teledyne ISCO	60-2974-025	Wastewater Systems
Model 913 High-Capacity Power Pack. Converts 120 V AC, 50/60 Hz to 12 VDC	Teledyne ISCO	60-1684-088	Wastewater Systems
Model 934 Nickel-Cadmium Battery. Rechargeable, 12 VDC, 4 amp-hours	Teledyne ISCO	60-1684-040	Wastewater Systems
Flygt Pumps	Xylem Water Solutions U.S.A.		Wastewater Systems
Flygt Parts	Xylem Water Solutions U.S.A.		Wastewater Systems

Approved Backflow Devices

VENDOR	SIZE	MODEL NO.	TYPE	USE
Ames / Watts	3/4" - 2"	400B / 919	RP	Residential or commercial potable water locations
Watts	3/4" - 2"	909-009 Series	RP	Residential or commercial potable water locations
Wilkins	3/4" - 2"	975	RP	Residential or commercial potable water locations
Ames / Watts	2.5" - 10"	C-400 / 957	RP	Large size meter - potable water for commercial or residential applications
Watts	2.5" - 10"	909	RP	Large size meter - potable water for commercial or residential applications
Wilkins	2.5" - 10"	375	RP	Large size meter - potable water for commercial or residential applications
Ames	3/4" - 2"	4000B-LBV 4000B-FP	RP	Combo services: fire and domestic lines
Watts	3/4" - 2"	000LF	RP	Combo services: fire and domestic lines
Wilkins	3/4" - 2"	975XL (w/OS&Y only)	RP	Combo services: fire and domestic lines
Ames Colt	2.5" - 10"	C-400 (w/OS&Y only)	RP	Combo services: fire and domestic lines
Watts	2.5" - 10"	909 (w/OS&Y only)	RP	Combo services: fire and domestic lines
Wilkins	2.5" - 10"	375	RP	Combo services: fire and domestic lines
Ames	2"	3000B	DCDA	Fire Lines - Standard
Watts	2" - 3"	007	DCDA	Fire Lines - Standard
Wilkins	2"	950XLTDAF	DCDA	Fire Lines - Standard
Ames	2.5" - 10"	C300/M300	DCDA	Fire Lines - Standard
Watts	3" - 10"	709	DCDA	Fire Lines - Standard
Wilkins	2.5" - 12"	350	DCDA	Fire Lines - Standard
Wilkins	4" - 10"	450 (N-Shape)	DCDA	Fire Lines - Standard
<p>Note: All fire line Backflow Devices shall be UL or FM approved for fire service installation. Above is a small list, others may be used if requirements are met and information is provided</p>				

Approved Backflow Devices

VENDOR	SIZE	MODEL NO.	TYPE	USE
Ames / Watts	3/4" - 2"	LF4000B / LF009	RP	Residential or commercial potable water locations
Watts	3/4" - 2"	LF919	RP	Residential or commercial potable water locations
Wilkins	3/4" - 2"	975XL	RP	Residential or commercial potable water locations
Ames / Watts	2.5" - 10"	C400 / 957	RP	Large size meter - potable water for commercial or residential applications
Watts	2.5" - 10"	LF909	RP	Large size meter - potable water for commercial or residential applications
Wilkins	2.5" - 10"	375 or 375AST	RP	Large size meter - potable water for commercial or residential applications
Ames	3/4" - 2"	LF4000B	RP	Combo services: fire and domestic lines
Watts	3/4" - 2"	LF009	RP	Combo services: fire and domestic lines
Wilkins	3/4" - 2"	975XL	RP	Combo services: fire and domestic lines
Ames Colt	2.5" - 10"	C400 (w/OSY)	RP	Combo services: fire and domestic lines
Watts	2.5" - 10"	LF909 (w/OSY)	RP	Combo services: fire and domestic lines
Wilkins	2.5" - 10"	375 or 375AST (w/OSY)	RP	Combo services: fire and domestic lines
Ames	2"	3000B	DCDA	Fire Lines - Standard
Watts	2" - 3"	007DCDA	DCDA	Fire Lines - Standard
Wilkins	2"	950XLTD	DCDA	Fire Lines - Standard
Ames	2.5" - 10"	C300/M300	DCDA	Fire Lines - Standard
Watts	3" - 10"	709DCDA	DCDA	Fire Lines - Standard
Wilkins	2.5" - 12"	350DA or 350ASTDA	DCDA	Fire Lines - Standard
Wilkins	4" - 10"	450DA or 450STDA (N-Shape)	DCDA	Fire Lines - Standard
<p>Note: All fire line Backflow Devices shall be UL or FM approved for fire service installation. Above is a small list, others may be used if requirements are met and information is provided</p>				



Appendix H

Basic User Application & Agreement for Delivery and Reuse of Irrigation Quality (IQ) Water

1. Property & Customer Information

Property Owner Name:	Date:
Mailing Address:	Phone Number:
Service Address:	Email Address:
Section Township Range	Folio (Parcel) Number:
Total Property Acres:	Acres irrigated by IQ Water only:

2. Irrigation Information

Total Number of Zones:

<u>Each Zones Gallons per Minute-Use another sheet if necessary</u>		
<u>Zone 1 =</u>	<u>Zone 6 =</u>	<u>Zone 11 =</u>
<u>Zone 2 =</u>	<u>Zone 7 =</u>	<u>Zone 12 =</u>
<u>Zone 3 =</u>	<u>Zone 8 =</u>	<u>Zone 13 =</u>
<u>Zone 4 =</u>	<u>Zone 9 =</u>	<u>Zone 14 =</u>
<u>Zone 5 =</u>	<u>Zone 10 =</u>	<u>Zone 15 =</u>
<u>Maximum number of zones running at once =</u>		

3. Do you have a backflow prevention device installed on your potable (drinking) water line?

<u>Yes</u>	<u>No</u>	<u>Unknown</u>
------------	-----------	----------------

4. For what purpose are you using IQ Water? Please select all that apply.

<input type="checkbox"/>	<u>Golf Course Irrigation</u>
<input type="checkbox"/>	<u>Common Area Irrigation (i.e. condo associations, parks, schools, medians)</u>
<input type="checkbox"/>	<u>Single Family Home landscape irrigation</u>
<input type="checkbox"/>	<u>Cooling Tower</u>
<input type="checkbox"/>	<u>Other, please specify _____</u>

5. How many total individual dwelling units will this serve? Please enter a number or N/A. A single family home = 1, a condo with 20 units = 20

<input type="checkbox"/>	<u>Golf Course Irrigation</u>
<input type="checkbox"/>	<u>Common Area Irrigation (i.e. condo associations, parks, schools, medians)</u>

6. What is your estimated average and maximum IQ Water usage in gallons per day?



I, _____, (property owner) have read, understand, and shall abide Collier County Ordinance, No. 2013-48 as amended; Collier County Ordinance No. 1997-33, as amended; Ordinance No. 2001-73, as amended, the Federal, State, and local laws, rules, and regulations that pertain to the use of IQ Water.

I understand that due to the composition of IQ water, it may not be suitable for the irrigation of certain susceptible vegetation, and I agree that the District will not be held liable for damages that may occur to susceptible vegetation or any damages that may occur due to the uses of IQ Water, and agree to defend and hold harmless the Collier County Water-Sewer District (District) from all claims and judgments arising therefrom against the District by any person. It is further agreed that submission of this application does not ensure IQ water delivery and the Owner further agrees that the County shall not be liable to the Owner for any damages or expenses incurred by the Owner as a result of the District's failure to deliver IQ Water.

It is further agreed that District employees or authorized agents shall have the right to enter the applicant's property served by the District with IQ Water to inspect the IQ Water System and shall have the right to discontinue IQ Water service should any infraction exist.

Sign and return the completed application, an 8.5"X11" drawing of property detailing desired meter location, and the Legal Property Description to: Reuse Manager, 4370 Mercantile Ave, Naples, FL 34104.

Printed Name: _____ Signed: _____ Date: _____

Frequently Asked Questions

1. Where can I find the applicable Ordinances? www.municode.com
2. Where can I find my Legal Property Description? On your deed which may be found at www.collierappraiser.com
3. Where can I find applicable State laws regarding IQ/reclaimed water? www.dep.state.fl.us/water/reuse
4. Where do I find billing information? www.colliercountyfl.gov
5. How do I report IQ water, potable water, or sewer issues? Call (239) 252-2600 for IQ water and wastewater and (239) 252-6245 for potable water.
6. What are irrigated acres? The acres that are irrigated, you can calculate irrigated acres by subtracting non irrigated areas such as ponds, mulched areas, etc; from the site's pervious acres.

For District Use Only

<u>Service Level:</u>	<u>Bulk</u>	<u>Pressurized</u>	<u>Pressurized & Distributed</u>
<u>User Type:</u>	<u>Major User</u>	<u>Basic User</u>	
<u>Base Charge:</u>	<u>Allocation Based</u>	<u>Meter Based Charge</u>	

<u>Peak GPM for proposed system</u>	<u>Minimum Meter Size Required</u>
<u>Existing Service Tap/Tap Fee \$</u>	<u>Existing Customer</u>
<u>Meter Hang Fee \$</u>	<u>Total Fees \$</u>
<u>Approved by:</u>	<u>Date:</u>
<u>Notes:</u>	

Item	Sub-Section I Detail	Revision Summary	Fiscal Impact of change to Developer (Approx.)
Introduction			
1	Introduction	Modified third paragraph to 'introduction' explaining PE responsibilities. Web page reference change.	None
Section 1 – Design Criteria			
2	Cover Page	Web page reference change.	None
3	Table of Contents	Modified Table of Contents to reflect changes and correct scrivener's errors.	None
4	3.3 Wastewater pump stations	Revised section 3.3 Wastewater Pump Stations. Added section 3.3.1 Private Pump Stations.	None
Section 2 - Technical Specifications			
5	Cover Page	Web page reference change.	None
6	Table of Contents	Modified Table of Contents to reflect changes.	None
7	017839 Project Record Documents	Corrected scrivener's error on paragraph 1.3.C. Added notes m and n to part (3.2 B.6) identifying that m) meter boxes and n) Locations of direct bury, conduits, handholes, junction boxes and vaults for buried electric and communication cables that will be conveyed to the County shall be depicted.	None

Item	Sub-Section I Detail		Revision Summary	Fiscal Impact of change to Developer (Approx.)
8	020500	Connections to existing systems	Revised section 1.3 General Requirements (F.2 and F.3). Inserted new Sunshine 811 website. Changed language regarding utility conflicts. Removed pager number and provided new emergency number.	None
9	221336	Diesel Backup Pump	Add sections 1.1 B, 2.5A, and 2.5B on platform requirements.	\$10,000 - \$30,000 Depending on site
10	263213.13	Standby Diesel Generators	Add sections 1.01.A.12, 2.05A, 2.05B, and 2.05C on platform requirements.	\$10,000 - \$30,000 Depending on site
11	330518	Laying and jointing buried pipelines	Changed language in Part 3.2 A.2. to decrease vertical dip tolerance from 1.5" to 1.0".	None
12	312316	Excavation – Earth and Rock	Revised section 1.4 Site Conditions (C.2 and C.3). Inserted new Sunshine 811 website. Changed language regarding utility conflicts. Removed pager number and provided new emergency number.	None
13	330502	High Density Polyethylene (HDPE) Pipe and Fittings	Revised section 2.1A eliminating PE3408 and added PE4710. Revised section 2.1F eliminating PE3408 and added PE4710. Removed cell classification 345434C and 345434E and added cell classifications 445574C and 445574E.	None
14	333200	Pump Stations	Added language to 1.1 SCOPE OF WORK ' <u>FOR COUNTY PUMP STATIONS</u> '. Added language to 1.1.A. This section includes the following items for ' <u>COUNTY owned and operated pump stations:</u> '	None
15	333200	Pump Stations	Add section 1.2 'Scope of Work for Private Grinder Pump Stations'	None
16	333200	Pump Stations	Add language to 1.1F to include gates.	None

Item	Sub-Section I Detail	Revision Summary	Fiscal Impact of change to Developer (Approx.)
17	333200 Pump Stations	Added communications (1.1G.) note requesting letter of availability	None
18	333200 Pump Stations	Add sections 1.1 H, 2.1 R, and 2.1 S on platform requirements.	\$10,000 - \$30,000 Depending on site
19	333200 Pump Stations	Add 'For County Pump Stations' to section 2.1 heading.	None
20	333200 Pump Stations	Revised section 2.1 J. Added language for 2-Watt digital radio. Added pump controller type to be utilized.	None
21	333200 Pump Stations	Added section 2.2 'Materials for Private Pump Stations'. Added section 3.1 'Installation'.	None
22	409500 Fiber-Optic Communication Standards	New Fiber-Optic Communication Standards	\$15,000 approx. cost to install equipment for a fiber connected site. Additional cost will be required to install fiber to the pump station from the County's network.
Section 3 - Utilities Detail Drawings			
23	Cover Page	Web page reference change.	None
24	Table of Contents	Modified Table of Contents to reflect changes and correct scrivener's errors.	None
25	Various Details – Title Block Addition	Collier County title block added to details: G-1, G-4, G-5, G-6, G-10, NP-E1, NP-E2, NP-E3, NP-E4, NP-E5, NP-E6, NP-E7, NP-E8, NP-E9, W-5, W-6, W-11A, W-16, WW-1, WW-4, WW-5, WW-6, WW-10, WW-15, WW-16, WW-17, WW-18, WW-18A.	None

Item	Sub-Section Detail	Revision Summary	Fiscal Impact of change to Developer (Approx.)
26	G-10 Pipe Restraint Schedule	The detail was modified to include additional restrained pipe length tables for vertical bends.	None
27	G-12 IT Fiber-Optic Telecommunications	New Detail	\$15,000 approx. cost to install equipment for a fiber connected site. Additional cost will be required to install fiber to the pump station from the County's network.
28	W-1 Temporary Blowoff Assembly with Bacterial Sample Point Detail	Corrected PDF to reflect 2014 revision.	None
29	W-2 Automatic Water Main Flushing Device Detail	Corrected PDF to reflect 2014 revision.	None
30	W-3 Fire Hydrant Detail	Added note # 9 noting fire hydrant installation requirements.	None
31	W-3 Fire Hydrant Detail	Added text 'See note 9' below FH connection point range (MIN 18", MAX 22"). Added notes 'Urban: See note 9' and 'Rural: See note 9.'	None
32	W-6 Permanent Bacterial Sample Point Detail	Brass models added to approved product list. Stainless steel models removed.	Potential cost savings
33	W-12 Typical short and long side water service meter setting detail for connection to water main	Temporary construction fence graphic added around the water meter boxes, with note referencing 'Note 8' on Detail W-12A. Revised meter callout to 'AMI/AMR meter'.	\$200/installation
34	W-12A Service connection sizing chart and notes	Added note # 8 to Equipment Specifications, calling out temporary construction fence installation.	\$200/installation
35	W-13 3" and over potable water meter assembly detail	Added note # 9 to Equipment Specifications including maintenance access in County CUE or R/W.	None

Item	Sub-Section I Detail	Revision Summary	Fiscal Impact of change to Developer (Approx.)
36	W-14 4" and over potable water fire and domestic meter assembly detail	Added note #10 to Equipment Specifications including maintenance access in County CUE or R/W.	None
37	WW-2 Private Force Main Connection to County Force Main Detail	Corrected PDF to reflect 2018 revision.	None
38	WW-3 Precast reinforced concrete manhole detail	Added ASTM callouts. Added min slab and sidewall thicknesses notes.	None
39	WW-4 Shallow manhole detail	Added ASTM callouts. Added min slab and sidewall thicknesses notes.	None
40	WW-5 Drop manhole detail	Added ASTM callouts. Added min slab and sidewall thicknesses notes.	None
41	WW-6 Manhole ring and cover detail	Updated new required manhole dimensions.	None
42	WW-6 Manhole ring and cover detail	Added note to call out for revised ring and cover models.	None
43	WW-7 Pump Station Detail - Profile	Mark # 3 for access door was modified by adding, '(Opposite discharge piping)'. Also added to detail callout.	None
44	WW-7 Pump Station Detail - Profile	Mark # 4 was modified by adding the sentence 'No spacers permitted between check and plug valves'.	None
45	WW-7 Pump Station Detail - Profile	Mark # 7 was modified by adding the sentence 'RAM-NEK may be used in lieu of o-ring rubber gaskets (see specification Section 034100)'.	None
46	WW-7 Pump Station Detail - Profile	Mark #7 was modified by adding the sentence, 'Pump Station wetwell shall be designed by a Florida Professional Engineer and signed and sealed shop drawings shall be submitted.'	None. Already a requirement

Item	Sub-Section I Detail	Revision Summary	Fiscal Impact of change to Developer (Approx.)
47	WW-7 Pump Station Detail - Profile	Mark # 8 was modified by adding the text 'with external weight/lever'.	None
48	WW-7 Pump Station Detail - Profile	Added reference to plan sheets under profile callout 'Section A-A'.	None
49	WW-7 Pump Station Detail - Profile	Added ASTM callouts. Added note, 'Top slab, 8" min thickness'. Revised footer dimension to 'A+32" min'. Added mark references.	None
50	WW-7D Private Grinder Pump Station Detail	Detail added to County detail set.	None
51	WW-8 Pump Station Detail - Plan	Mark # 4 was modified by adding the sentence 'No spacers permitted between check and plug valves'.	None
52	WW-8 Pump Station Detail - Plan	Mark # 8 was modified by adding the text "with external weight/lever".	None
53	WW-8 Pump Station Detail - Plan	Mark # 14 was modified by adding the sentence "Single door panels to open away from wetwell".	None
54	WW-8 Pump Station Detail - Plan	Callout for access drive material was modified by deleting the option for grass covered porous pavement and leaving only the option for concrete or asphalt. Access drive dimension was set as the distance between the fence and the wetwell top. Callout 'Provide clear distance between fence and wetwell top' was added.	Potential cost savings
55	WW-8 Pump Station Detail - Plan	Note added next to section A-A, referencing plan view on detail WW-7.	None
56	WW-8 Pump Station Detail - Plan	Note added next to Dimension Table, '(To be completed by EOR)'.	None

Item	Sub-Section I Detail	Revision Summary	Fiscal Impact of change to Developer (Approx.)
57	WW-8A Community Pump Station with Generator Detail - Plan	Mark # 4 was modified by adding the sentence 'No spacers permitted between check and plug valves'.	None
58	WW-8A Community Pump Station with Generator Detail - Plan	Mark # 7 was added: "Fiber-optic handhole: See technical details specification 409500 and detail G-12, where applicable". Conduit and handhole graphic added to the detail.	\$15,000 approx. cost to install equipment for a fiber connected site. Additional cost will be required to install fiber to the pump station from the County's network.
59	WW-8A Community Pump Station with Generator Detail - Plan	Mark # 8 was modified by adding the text "with external weight/lever".	None
60	WW-8A Community Pump Station with Generator Detail - Plan	Mark # 10 was added: "IT telecommunications panel: See technical specification 409500 and detail G-12, where applicable". IT telecommunications graphic added to the detail.	\$15,000 approx. cost to install equipment for a fiber connected site. Additional cost will be required to install fiber to the pump station from the County's network.
61	WW-8A Community Pump Station with Generator Detail - Plan	Mark # 14 was modified by adding the sentence "Single door panels to open away from wetwell".	None
62	WW-8A Community Pump Station with Generator Detail - Plan	Callout for access drive material was modified by deleting the option for grass covered porous pavement and leaving only the option for concrete or asphalt. Access drive dimension was set as the distance between the fence and the wetwell top. Callout 'Provide clear distance between fence and wetwell top' was added.	Potential cost savings
63	WW-8A Community Pump Station with Generator Detail - Plan	Note added next to section A-A, referencing plan view on detail WW-7.	None

Item	Sub-Section I Detail	Revision Summary	Fiscal Impact of change to Developer (Approx.)
64	WW-8A Community Pump Station with Generator Detail - Plan	Note added next to Dimension Table, '(To be completed by EOR)'.	None
65	WW-8B Community Pump Station with Diesel Pump Detail - Plan	Mark # 2 was added: "Fiber-optic handhole: See technical details specification 409500 and detail G-12, where applicable". Conduit and handhole graphic added to the detail.	\$15,000 approx. cost to install equipment for a fiber connected site. Additional cost will be required to install fiber to the pump station from the County's network.
66	WW-8B Community Pump Station with Diesel Pump Detail - Plan	Mark # 4 was modified by adding the sentence "No spacers permitted between check and plug valves".	None
67	WW-8B Community Pump Station with Diesel Pump Detail - Plan	Mark # 7 was added: "Fiber-optic handhole: See technical details specification 409500 and detail G-12, where applicable". Conduit and handhole graphic added to the detail.	\$15,000 approx. cost to install equipment for a fiber connected site. Additional cost will be required to install fiber to the pump station from the County's network.
68	WW-8B Community Pump Station with Diesel Pump Detail - Plan	Mark # 8 was modified by adding the text "with external weight/lever".	None
69	WW-8B Community Pump Station with Diesel Pump Detail - Plan	Mark # 14 was modified by adding the sentence "Single door panels to open away from wetwell".	None
70	WW-8B Community Pump Station with Diesel Pump Detail - Plan	Callout for access drive material was modified by deleting the option for grass covered porous pavement and leaving only the option for concrete or asphalt.	Potential cost savings
71	WW-8B Community Pump Station with Diesel Pump Detail - Plan	An additional concrete post was added to the control panel.	Approx. \$500

Item	Sub-Section I Detail	Revision Summary	Fiscal Impact of change to Developer (Approx.)
72	WW-8B Community Pump Station with Diesel Pump Detail - Plan	Note added next to Dimension Table, '(To be completed by EOR)'.	None
73	WW-8B Community Pump Station with Diesel Pump Detail - Plan	Note added next to section A-A, referencing plan view on detail WW-7.	None
74	WW-9 Pump Station Control Panel Detail	Note # 3 was modified by adding the sentence "Single door panels to open away from wetwell".	None
75	WW-9 Pump Station Control Panel Detail	Added callouts to details: 'Square D Powerblocks to be installed in j-box' & 'Plastic Unistrut endcap callout'	\$50/pump station for Square D Powerblocks
76	WW-9 Pump Station Control Panel Detail	Note # 9 was added: "Side panel penetrations are acceptable with the use of Myers Hubs".	\$250.00/Hub (Only used when necessary)
77	WW-9 Pump Station Control Panel Detail	Note # 10 was added: "Phase monitor to be installed parallel with FPL meter (on FPL side)".	\$100-\$350/Monitor (Prices vary with voltages)
78	WW-9 Pump Station Control Panel Detail	Note # 11 was added: "CHICO used to seal-off in explosion proof fittings under J-box, putty for all other conduit openings".	\$50/pump station
79	WW-9 Pump Station Control Panel Detail	Note # 12 was added: "All uni-struts to be mounted flush with post and penetrate post with stainless steel hardware".	None
80	WW-9 Pump Station Control Panel Detail	Note # 13 was added: "All mounted equipment must be evenly spaced, level, plumb, and installed in a workmanlike manner".	None
81	WW-9 Pump Station Control Panel Detail	Pump controls conduit graphic brought forward 'in front of' panel controls conduit on detail.	None
82	WW-9A Community Pump Station Control Panel Detail VFD Station with Generator	Note # 3 was modified by adding the sentence "Single door panels to open away from wetwell".	None

Item	Sub-Section I Detail	Revision Summary	Fiscal Impact of change to Developer (Approx.)
83	WW-9A Community Pump Station Control Panel Detail VFD Station with Generator	An additional concrete post graphic was added to the panel.	Approx. \$500
84	WW-9A Community Pump Station Control Panel Detail VFD Station with Generator	Added callout to detail: 'Square D Powerblocks to be utilized in j-box'.	\$50/pump station
85	WW-9A Community Pump Station Control Panel Detail VFD Station with Generator	Note # 8 was added: "Side panel penetrations are acceptable with the use of Myers Hubs"	\$250.00/Hub (Only used when necessary)
86	WW-9A Community Pump Station Control Panel Detail VFD Station with Generator	Note # 9 was added: "Phase monitor to be installed parallel with FPL meter (on FPL side)".	\$100-\$350/Monitor (Prices vary with voltages)
87	WW-9A Community Pump Station Control Panel Detail VFD Station with Generator	Note # 10 was added: "CHICO used to seal-off in explosion proof fittings under J-box, putty for all other conduit openings". Updated detail to show fittings under control panel.	\$50/pump station
88	WW-9A Community Pump Station Control Panel Detail VFD Station with Generator	Note # 11 was added: "Add emergency stop for generator and fire extinguisher on post furthest from generator with appropriate signage".	Fire Extinguisher Class C – Approx. \$500
89	WW-9A Community Pump Station Control Panel Detail VFD Station with Generator	Note # 12 was added: "All uni-struts to be mounted flush with post and penetrate post with stainless steel hardware"	None
90	WW-9A Community Pump Station Control Panel Detail VFD Station with Generator	Note # 13 was added: "All mounted equipment must be evenly spaced, level, plumb, and installed in a workmanlike manner".	None

Item	Sub-Section I Detail	Revision Summary	Fiscal Impact of change to Developer (Approx.)
91	WW-9A Community Pump Station Control Panel Detail VFD Station with Generator	Pump controls conduit graphic brought forward 'in front of' panel controls conduit on detail.	None
92	WW-9B Community Pump Station Control Panel Detail Non-VFD Station with Generator	Note # 3 was modified by adding the sentence "Single door panels to open away from wetwell".	None
93	WW-9B Community Pump Station Control Panel Detail Non-VFD Station with Generator	An additional concrete post graphic was added to the panel.	Approx. \$500
94	WW-9B Community Pump Station Control Panel Detail Non-VFD Station with Generator	Added callout to detail: 'Square D Powerblocks to be utilized in j-box'.	\$50/pump station
95	WW-9B Community Pump Station Control Panel Detail Non-VFD Station with Generator	Note # 8 was added: "Side panel penetrations are acceptable with the use of Myers Hubs"	\$250.00/Hub (Only used when necessary)
96	WW-9B Community Pump Station Control Panel Detail Non-VFD Station with Generator	Note # 9 was added: "Phase monitor to be installed parallel with FPL meter (on FPL side)".	\$100-\$350/Monitor (Prices vary with voltages)
97	WW-9B Community Pump Station Control Panel Detail Non-VFD Station with Generator	Note # 10 was added: "CHICO used to seal-off in explosion proof fittings under J-box, putty for all other conduit openings".	\$50/pump station

Item	Sub-Section I Detail	Revision Summary	Fiscal Impact of change to Developer (Approx.)
98	WW-9B Community Pump Station Control Panel Detail Non-VFD Station with Generator	Note # 11 was added: "Add emergency stop for generator and fire extinguisher on post furthest from generator with appropriate signage".	Fire Extinguisher Class C – Approx. \$500
99	WW-9B Community Pump Station Control Panel Detail Non-VFD Station with Generator	Note # 12 was added: "All uni-struts to be mounted flush with post and penetrate post with stainless steel hardware"	None
100	WW-9B Community Pump Station Control Panel Detail Non-VFD Station with Generator	Note # 13 was added: "All mounted equipment must be evenly spaced, level, plumb, and installed in a workmanlike manner".	None
101	WW-12 Sewer Clean-out Detail - Non Paved Areas	Corrected PDF to reflect 2014 revision.	None
Section 4 – Appendices			
102	Cover Page	Web page reference change.	None
103	Table of Contents	Modified Table of Contents to reflect changes	None

Item	Sub-Section I Detail	Revision Summary	Fiscal Impact of change to Developer (Approx.)
104	Appendix B Water Meter Sizing Form	<p>The demand range table on the Water meter sizing form (pg.1) was updated and taken from AWWA M22 Table 6-1 (Third Edition). The flow ranges for 3/4", 1", 1 1/2", and 2" meter sizes are flow ranges for positive displacement meters. The flow ranges for 3", 4", 6", 8" and 10" meter sizes are flow ranges for turbine class II meters. (This table can vary depending on meter type).</p> <p>Modified language on signature line (pg.1). Replaced 'Stamp' with 'Seal'.</p> <p>The fixture flow value worksheet (pg.2) was updated and taken from the Florida Building Code (2023 Edition).</p>	None
105	Appendix F Approved Products List	<ul style="list-style-type: none"> Appendix F was revised to include new products that are to be placed on the approved product list. 	Approx. \$100 increase for water and IQ meter boxes (only identified fiscal impact to Developers)
106	Appendix G Approved Backflow Devices	<ul style="list-style-type: none"> Added LF to models that are used in residential service and available in both Lead Free and Not Lead Free Changed 4000B-LBV (less ball valve) to 4000B so all models in that section are comparable and include ball valves Deleted 4000B-FP since it is not available lead free and this section serves residential requiring lead free Deleted OSY on 975XL since it is not available lead free – All models in that section would include ball valves – No one offers a lead free 3/4" – 2" OSY valve Changed Wilkins model number to include bypass 950XLTD – All models in this section are not lead free since these are dedicated Fire Lines – This is allowable – All models shown are standard w/OSY valves Added large diameter stainless models 	None
107	Appendix H IQ User Application and Agreement	Added basic User Application & Agreement for Delivery and Reuse of Irrigation Quality (IQ) Water	None

INTRODUCTION

This Manual has been established by action of the Board of County Commissioners and is authorized by County Ordinance 2004-31, as amended.

This Utilities Standards Manual has been prepared to guide the design, construction, and asset management of potable water, non-potable irrigation water, and wastewater system extensions to Collier County Water-Sewer District (COUNTY) utilities; the Manual applies to utilities in new developments in the County, as well as County Projects involving utilities.

The following standards shall be included in the design and preparation of plans and specifications for all utilities construction projects for Collier County, including utilities and services connected to the COUNTY's utilities systems or constructed for future transfer of ownership to the COUNTY. These standards are provided for uniformity in utilities construction within Collier County, and represent MINIMUM standards acceptable to the COUNTY. The Engineer of Record shall review these MINIMUM standards for applicability and acceptance for the proposed construction project. Where necessary, additional design features may be required to meet specific project requirements. The Engineer of Record shall be responsible for the specific project under their control.

Not all specification details may apply to an individual project; however, approval of utilities construction within Collier County will require conformance to applicable requirements of these specifications. Approval of any deviation from the specifications must be obtained utilizing the appropriate form included in Appendix A, Utility Deviation Form.

NOTE: Go to Collier County Public Utilities Engineering and Project Management Resources Webpage for the latest revisions to the Utilities Standards Manual.

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- 2.2 Design of Pipeline Size and Location
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SECTION 1

DESIGN CRITERIA

For the latest revisions to the Design Criteria, please visit:

**Collier County Public Utilities
Engineering and Project Management Resources Webpage.**

**COLLIER COUNTY WATER-SEWER DISTRICT
UTILITIES STANDARDS MANUAL**

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DESIGN CRITERIA

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PART 1 GENERAL

1.1. Pipeline Separation Requirements

1. Potable water pipelines shall be separated from wastewater lines and /or stormwater lines by a minimum clear vertical distance of 18 inches and a horizontal distance of 10 feet. The 18 inches minimum vertical separation distance does not apply to separations of sewer laterals and potable water pipeline installations. 57 stone shall be utilized for separation between wastewater lines and stormwater lines if separation is less than 18 inches.
2. Non-potable irrigation water pipelines two inches and larger shall be separated from potable water mains, wastewater lines and/or stormwater lines by a minimum clear vertical distance of 18 inches and a horizontal distance of five feet as shown in the Utilities Detail Drawings.
3. Wastewater lines shall be separated from stormwater lines by a minimum clear vertical distance of 18 inches and a horizontal distance of five feet. All pipeline crossings with vertical clearance less than 18 inches shall be made using a full 20 foot length of thickness Class 200 AWWA C900 PVC pipe or Class 235 AWWA C905 PVC pipe, centered on the crossing. The sewer pipe in these locations shall be back-filled with bedding stone or sand to a height six inches above the crown of the pipe.
4. Potable water, non-potable irrigation water, and wastewater pipelines shall be separated from telephone, power, cable and gas sleeves/lines and any other underground utilities by a minimum clear vertical distance of 18 inches and horizontal distance of five feet.
5. Potable water, non-potable irrigation water, and wastewater lines shall be separated from raw water mains by a clear vertical distance of 18 inches and a horizontal distance of 10 feet. Stormwater lines shall be separated from raw water mains by a clear vertical distance of 18 inches and a horizontal distance of five feet.
6. Wastewater lines shall be separated from public drinking water supply wells by a horizontal distance of 100 feet. Wastewater lines shall be separated from private drinking water supply wells by a horizontal distance of 75 feet.
7. Also see separation requirements in Section 020500, 1.3.F.
8. Potable water mains, non-potable irrigation water mains, and wastewater force mains shall have a minimum setback of five feet from the centerline of the pipe to residential roadways, curb and gutters, structures, fence posts, walls, or plantings not specifically allowed by ordinance. Also, potable water mains, non-potable irrigation water mains, and wastewater force mains shall have a minimum setback of 10 feet from the centerline of the pipe to a building and shall not be placed beneath any existing or proposed building or structure. Additionally, potable water mains, non-potable irrigation water mains, and wastewater force mains shall have a five-foot minimum setback from the center line of pipe to the edge of a right of way (ROW) or County utility easement (CUE), unless there is an adjacent CUE.

1.2. Horizontal Directional Drilling

When horizontal directional drilling is used on any capital improvement project for the Public Utilities Department, detailed construction drawings shall be prepared by a Licensed

Professional Engineer registered in the State of Florida which, at a minimum, show the following information:

1. The proposed entry and exit point of the drill
2. The overall geometry of the drill include entry and exit angles, minimum and maximum bending radii, and the horizontal and vertical path of the drill
3. The minimum and maximum depth of the drill
4. Minimum separation distances between adjacent pipes, structures, watercourses, etc.
5. The estimated pull back force required for the drill

The design Engineer shall calculate the estimated pull back force required for the directional drill and ensure that it does not exceed the maximum allowable safe pull back forces as defined by the Plastic Pipe Institute's (PPI) Handbook for Polyethylene Pipe, Chapter 12 – Horizontal Directional Drilling.

		Safe Pull Back Force, lbs.	
Size	Nom. OD	DR 9	DR 11
4	4.800	8,217	6,876
6	6.900	16,980	14,208
8	9.050	29,210	24,442
10	11.100	43,942	36,770
12	13.200	62,141	51,998
14	15.300	83,486	69,859
16	17.400	107,977	90,353
18	19.500	135,613	113,478
20	21.600	166,395	139,235
24	25.800	237,395	198,647
30	32.000	365,201	305,592
36	38.300	N.A.	437,764

Source: Table 6, "PE4xxx 12 hour Pull DIPS Size", *Handbook for Polyethylene Pipe, Second Edition*, Plastic Pipe Institute

PART 2 POTABLE WATER AND NON-POTABLE IRRIGATION WATER SYSTEMS

All potable water, non-potable irrigation (including reclaimed or reuse) water and raw water pipe, material, equipment and appurtenances shall be new, and shall conform to Section 2, Technical Specifications and Section 3, Utilities Detail Drawings.

All material and equipment designed or used in connection with a potable (drinking) water system shall conform to the requirements of the National Sanitation Foundation (NSF) Standard 61, "Drinking Water System Components – Health Effects" and the Reduction of Lead in Drinking Water Act amending the Safe Drinking Water Act.

2.1 Pipe and Fitting Material

All potable water or non-potable irrigation water pipelines shall be constructed of ductile iron, HDPE, or PVC pipe, and shall utilize pipe meeting the requirements of the Technical Specifications. HDPE shall not be used for pipelines with service connections.

All pipe and pipe fittings shall contain no lead pursuant to the Reduction in Lead in Drinking Water Act. All pipe and pipe fittings installed shall be color coded or marked in accordance with F.A.C. 62-555.320(21)(b)3.

Potable water pipelines shall be blue in color. Raw water pipelines shall be white in color. Non-potable irrigation, reclaimed, and reuse water pipelines shall be pantone purple in color.

All Ductile Iron buried water main pipelines shall have blue stripes applied to the pipe wall. If tape or paint is used to stripe pipe during installation, the tape or paint shall be applied in a continuous line that runs parallel to the axis of the pipe and that is located along the top of the pipe.

All buried water pipelines and mains, except those installed by horizontal directional drilling or jack-and-bore methods, shall be marked using metalized warning tape for HDPE and PVC pipe and non-magnetic for ductile iron pipe. The locator tape shall be placed in the pipe trench two feet below grade or one-half the pipe's bury, whichever is less, and labeled "potable water" or "non-potable water" as applicable. Horizontal directional drilling shall include installation of at least two locating tone wires as described in the Technical Specifications.

All water main aerial crossings shall be Pressure Class 350 flanged ductile iron pipe and shall be coated on the exterior using a suitable grade of appropriately colored, field applied (or factory applied with field touch-up as required) epoxy coating. Potable water mains shall be painted Federal Safety Blue. Raw water mains shall be painted white. Non-potable irrigation, reclaimed, and reuse water mains shall be painted Pantone Purple 522C. Specific colors shall be subject to approval of the County Manager or designee. All nuts and bolts used in aerial crossings shall be stainless steel. All canal, river, or creek crossings shall be aerial, unless otherwise approved by the County Manager or designee. Aerial crossings shall be designed to incorporate valves or other flow regulation devices in accordance with F.A.C. 62-555.320(21)(b). Aerial crossings shall be designed to maintain existing or required navigational capabilities within the waterway and to reserve riparian rights of adjacent property Owners. Submit aerial pipe and flange computations, including support and anchor design, for review. The submittal must be signed and sealed by a Florida registered Licensed Professional Engineer.

2.2 Design of Pipeline Size and Location

2.2.1 Water Pipeline Sizing Criteria

All potable water mains to be maintained by the COUNTY shall be a minimum of six inches in diameter. Hydraulic calculations shall show the capability of maintaining required fire flow (according to NFPA 1) plus potable demand as required below.

Water systems shall be designed to maintain adequate flows and pressures and water quality standards as established by Florida Department of Environmental Protection (FDEP). The following criteria shall be used to design water systems and analyze model chloramine dissipation:

- A. Minimum residual node pressure within a proposed project system shall be 20 psi under peak hour with fire flow conditions, assuming a source pressure verified by the results of a fire flow test not older than six months. The design source pressure shall be calculated as follows: $P_d = P_s - (P_s - P_r) (D / Q)^{1.85}$, where P_d is the design source pressure (i.e. theoretical residual pressure for the design demand), P_s is the static pressure from the fire flow test, P_r is the residual pressure from the fire flow test, D is the design demand (i.e. peak hour demand plus required fire flow), and Q is the flow rate from the fire flow test.
- B. The design Engineer shall model the proposed system, including all dead ends, for chloramine dissipation and assume a chloramine residual of 2.0 ppm at the entrance point to the project.
- C. When estimating potable water demands multiply the estimated wastewater flows from Part 3 Wastewater Collection and Transmission Systems by 1.4.
- D. The standard chloramine decay rate is - 0.012 ppm per hour. Using the decay rate and solving for the elapsed time from the initial chloramine level to the minimum chloramine level residual of 0.6 ppm in the following: $0.6 \text{ ppm} = 2.0 \text{ ppm} \times e^{(-0.012 \text{ ppm} \times \text{\#hours})} \Rightarrow \text{time} = 100.33 \text{ hours}$.

The Project Engineer shall submit an analysis to the Growth Management Department as part of the review package, certifying that all points within the proposed system shall maintain a minimum level of 0.6 ppm chloramine residual under the conditions listed above.

Systems unable to meet minimum design requirements or maintain minimum chloramine residual levels shall not be eligible for ownership and maintenance by the COUNTY.

Water mains not designed to carry fire flows shall not have fire hydrants connected to them.

2.2.2 Distribution System Layout

Potable and non-potable irrigation water pipelines and fittings, except for service piping, shall have a minimum depth of 30 inches and a maximum depth of 48 inches below finished grade.

Water distribution systems shall be designed so that all systems are located adjacent to, and are accessible from, paved or unpaved roadways so as to allow access for short and long term maintenance, repair, and/or replacement of such system.

New potable water distribution systems shall be designed as “looped” systems to avoid dead ends. A “looped” system should have two independent connections off the source main (unless served by a master meter). If two independent connections aren’t possible, a stub out for future development in a location agreed to by the County shall be provided in an easement or ROW to the limits of the project. In cases where no nearby water main is available for looping, a County approved automatic flushing device (AFD) shall be provided at each dead end of a water main. An AFD shall also be provided near the mid-point of a looped water main unless the design engineer can provide information to confirm that the minimum residual chlorine will be maintained based on the predicted water consumption at the time of County acceptance of the water main. At no time shall a dead end serve more than 149 residential units. On dead end water mains that do not have service connections, no automatic flushing devices are required.

Installation of the automatic flushing devices shall be designed so as to prevent erosion of nearby areas as well as prevent silt and sediment transport.

All commercial facilities must be metered separately from residential facilities with the exception of those commercial facilities that are within a master metered residential development and designed for the exclusive use of the residents within such development. Master meters and backflow assemblies shall be located within a County Utility Easement (CUE), which shall be located outside of, but contiguous to, the road Right-Of-Way (ROW).

Deviations from these design parameters shall only be approved in cases where such installations can be shown to be necessary in order to comply with minimum chlorine residuals or other FDEP quality parameters, unless otherwise approved by the County Manager or designee. In such cases, the water main shall be located within a separate tract of land or CUE dedicated to the Water-Sewer District. Such tracts shall be delineated with fencing, landscaping, signage, pavement, or other methods determined to be acceptable to the Water-Sewer District. All such installations shall require approval from the Water-Sewer District. In addition, an agreement shall be provided authorizing the COUNTY to traverse all private property outside of the CUE for the purpose of access, maintenance, repair, and/or replacement of such main. The agreement shall also hold the COUNTY harmless for any damage to the private property resulting from the COUNTY’s maintenance, repair and/or replacement activities within or outside of the CUE.

The encasement of potable water mains in concrete shall only be made after review and approval by the County Manager or designee.

2.2.3 Valve Locations

Valves shall be provided at all intersections and branches in sufficient numbers as to allow for zone isolation of distribution areas in order to limit impacts of line breaks and service disruptions to customers. In-line gate valves shall be provided in accordance with AWWA requirements and at no greater than 1,000 foot intervals when no other valves exist within internal distribution systems. All gate valves 20 inches and smaller shall be of the resilient-seated wedge type, conforming to AWWA C509 or C515, or latest revisions thereof. All gate valves or plug valves 30 inches or larger shall have a concrete slab placed under the valve to help distribute the total weight of the valve and reduce line sagging. See Technical Specifications 331200 2.3.A.2. All valves shall be furnished with valve boxes extending to finished grade as shown in the Utilities Detail Drawings (G-7).

2.3 Conflict Crossings

All storm sewer, non-potable irrigation water mains, and wastewater transmission system conflicts with water systems or portion(s) thereof that must be crossed shall be performed using AWWA C900 Class 200 or C905 Class 235 PVC with ductile iron fittings. All fittings shall be adequately restrained using retainer glands, stainless steel rods, or see County Approved Product List, Appendix F. Transitional fittings, when approved by the County Manager or designee, shall be located as close to the point of conflict as possible. Air release assemblies shall be provided as specified in Subsection 2.7 herein, below. Gradual deflection of the water line in lieu of using fittings to clear the conflict shall not be permitted if cover exceeds five feet. A minimum vertical clearance of 18 inches shall be provided between the water main and bottom of conflict. A deviation form will not be required for separation of sewer laterals and potable water pipeline. Maximum depth of 48 inches below final grade is exempt when dipping under conflicts in which case the water main shall be returned to normal depth within 10 feet on either side of the conflict or as soon as possible using a fitting of 45 degrees or less.

2.3.1 Subaqueous Canal Crossings

Potable and non-potable subaqueous crossings shall be designed to a minimum depth of 36 inches below the design or actual bottom, whichever is deeper, of a canal and other dredged waterway or the natural bottom of streams, rivers, estuaries, bays, and other natural water bodies. If not practical to design the project with a minimum 36 inch cover, alternative construction features must be installed to ensure adequate protection of the pipeline.

All subaqueous crossings must be introduced/discussed at a plan Pre-Submittal Conference. It is important that representatives from the Water Department or Wastewater Department and GMD be present for approval at the plan Pre-Submittal Conference.

A permanent easement is needed when there is no room available in the ROW.

When crossing watercourses, the following shall be provided:

- A. The pipe shall be of special construction (HDPE), having welded (butt fusion) watertight joints;
- B. Valves shall be provided at both ends of the subaqueous crossing for isolation, testing, or repair of the line. The valves shall be easily accessible and not subject to flooding. The valve closest to the supply source shall be in a below grade vault as per FDEP requirements and constructed to meet FDOT standards. All welding shall be done above ground. Water, reclaimed water, and wastewater lines shall have two air release valves between the two valves;
- C. Permanent taps shall be made on each side of the valve within the manhole to allow insertion of a small meter to determine leakage and for sampling purposes. The taps will allow for a three quarter inch meter to be attached;
- D. The HDPE pipe shall be encased in HDPE DR11 casing;
- E. Pressure test according to Section 022501;
- F. Conform to HDPE Specifications, Section 330502.

Warning signs shall be placed along the banks of canals, streams, and rivers clearly identifying the nature and location of subaqueous crossings. The signs shall state the type of pipeline and the depth of pipeline below design or natural bottom of the water body. Warning sign shall be aluminum and have minimum dimensions of four feet wide by two feet high with a minimum of two inch lettering.

2.4 Fire Service Systems

All private fire service systems for sprinkler systems, wet standpipe systems, and privately-owned or controlled distribution systems shall be installed with an appropriate back flow prevention device with a leak detection meter. The backflow device shall be sized by the Developer's Engineer and shall be purchased, owned and maintained by the private service owner. The COUNTY requires all privately-owned backflow devices to be certified at the time of installation and on an annual basis by a Certified Backflow Tester (University of Florida, TREEO Center, or equivalent certification program). The results shall be submitted to the County Manager or designee. The County Manager or designee will require all privately owned metering devices to be certified for accuracy at the time of installation. Fire meter devices using a three quarter to two inch metering device shall be re-calibrated to manufacturer's specifications every five years, replaced every 10 years, or replaced immediately upon meter failure. Fire meter devices greater than two inches shall be re-calibrated to manufacturer's specifications every five years and replaced immediately upon meter failure. The County Manager or designee will inform the owner by mail prior to the due date. Private owner(s) shall submit certification results to the County Manager or designee within 60 days of the due date.

2.4.1 Fire Service Meters for Residential Systems

Residential projects such as, but not limited to, single family, multi-family condominiums, trailer parks, mobile home parks, etc. utilizing a master meter shall pass all fire flow through such meter. The meter shall be sized to pass the domestic coincident draft plus rated fire flow at the AWWA pressure loss specifications.

2.4.2 Fire Service Meters for Commercial and Other Non-residential Systems

Commercial projects such as, but not limited to, shopping centers, malls, retail, and industrial buildings shall pass all fire flow through a potable master meter or have a separate fire service connection to the water distribution main. The Fire Service meter and isolation valves shall be extended above final grade as shown in the Utilities Detail Drawings. For meter reading purposes, metering devices shall lie within a County Utility Easement (CUE) that shall be dedicated separately to the Board for the appropriate Water-Sewer District or in conjunction with the easements for any on-site utility system(s).

The Owner shall purchase and install an approved backflow device with a leak detection meter at no expense to the Water-Sewer District.

2.5 Connections to Collier County Facilities

Connections to existing COUNTY water mains shall be constructed as described in Section 2, Technical Specifications and shown in Section 3, Utilities Detail Drawings. These details shall apply to all connections to existing systems including, but not limited to, hot taps and extensions from existing dead end systems. A section of pipe shall be inserted into the gap to connect the

new construction to the existing systems for the purpose of accomplishing line flushing. Immediately upon completion of the flush, the connection shall be removed. A jumper shall be installed (see detail W-4) until final connection is authorized by the County Manager or designee and approved by the FDEP at the completion of construction and after satisfactory completion of all test procedures and bacterial clearance of the new water system or portion(s) thereof.

Steam condensate, cooling water from engine jackets, or water used in conjunction with heat exchangers shall not be returned to potable water mains.

2.6 Water Services

2.6.1 Service Pipelines

All building lots and parcels of land within a development shall be provided with a means for potable water service and non-potable irrigation water service by the developer. Accessibility to lands on the opposite side of a roadway shall be provided by the installation of water service conduits. Conduits shall be a minimum of four inch diameter PVC, with a minimum cover of 24 inches. Such pipelines shall extend at least five feet past the edge-of-pavement or back of curb where provided and shall run from lot corners on one side of the street to a lot corner on the opposite side and shall be capped and marked with an electronic marker (see County Approved Product List, Appendix F). Service pipelines shall be polyethylene of a minimum of one-and-one-half inches in diameter. Service pipelines under pavement shall be in conduits in all scenarios for County owned services.

2.6.2 Water Meters

Water meters shall be properly sized, based on the total calculated service demand for water, according to the Collier County Water Meter Sizing Form (Appendix B). The properly sized water meter shall be installed according to specifications and standards. Any deviation from the determined meter size shall require an approved Deviation Request.

All water meters larger than two inches shall be installed above ground. These meters shall be equipped with a backflow preventer and installed by the Contractor at his expense. The type of backflow device utilized shall be on the Water Department's list of Approved Backflow Devices (Appendix G).

All large potable meters shall be purchased by the owner and installed by the Developer's Contractor. The systems' master meter assemblies shall be built in accordance with the current design details shown in the Utilities Detail Drawings. Alternate designs may be permitted upon submission of design details for review and approval. The location of all meters (potable and non-potable) shall be clearly shown on the construction plans.

All potable water and/or non-potable irrigation water meters shall be equipped to accept the COUNTY's Automatic Meter Reading (AMR) units shown on the Utilities Detail Drawings. Two inch and smaller meter units will be installed by the COUNTY. On meters three inches and larger, contact the Water Distribution office to determine the necessary AMR equipment for the meters. All meters shall be turned over to the technician performing the full bore flush prior to the acceptance of the meter.

Temporary meters may be applied for by phoning the Water Distribution office between 7:30 a.m. and 4:00 p.m., Monday through Friday, under the conditions provided by the ordinance.

Temporary meters shall be installed for the purpose of supplying construction water to meet the COUNTY requirement for new water line construction as listed below and require a minimum of 48 hours advance notice. All backflow devices shall be reduced pressure type and shall be certified as required by the ordinance, provided by the Contractor, and be of an approved type.

Temporary meters shall be installed as shown in the Utilities Detail Drawings.

2.7 Air Release Assemblies

Air release assemblies shall be installed at all high points on all County owned mains where air will not be released through service lines, and on both sides of conflict crossings (unless it can be demonstrated by hydraulic analysis that air pockets will not accumulate at individual high points). In cases where reversal of flow is not expected, the air release assembly shall be provided at high points and on the upstream side of conflict crossings. A high point is defined by the hydraulic gradient and is considered the upper end of any pipe segment that slopes up to the hydraulic gradient or runs parallel to it. The design engineer shall review and apply the pertinent provisions of AWWA-C512 and AWWA Manual of Water Supply Practices M51, "Air-Release, Air Vacuum, and Combination Air Valves". Air valves shall be suitable for use with potable water or non-potable irrigation water. For all water or non-potable irrigation water mains 14 inches and smaller, see the County Approved Product List, Appendix F. For potable water or non-potable irrigation water mains 16 inches and greater, the design engineer shall be responsible for air valve selection and sizing. An isolating valve shall be provided below the air valve to allow removal of the valve assembly. All air release assemblies shall be installed as shown in the Utilities Detail Drawings.

2.8 Concrete Collars

All gate valve boxes, air release assemblies, and permanent sample points outside paved surfaces shall be provided with a concrete collar set to finish grade. Such collar(s) shall have a minimum thickness of six inches and the outside dimension of the pad shall be as shown in the Utilities Detail Drawings. Concrete shall have minimum compression strength of 3000 psi at 28 days.

2.9 Testing and Clearance Procedures

All water systems or portion(s) thereof shall be subjected to pressure testing and disinfection conforming to the AWWA Standards C600, C602, C605, and C606, or latest revision(s) thereof.

Under no circumstances shall any person other than an authorized COUNTY Water Department employee operate valves, make service taps or otherwise tamper with COUNTY Distribution system or portion(s) thereof. Failure to comply with these requirements will place such individual in jeopardy of legal action by the COUNTY pursuant to US Code, COUNTY Ordinances and/or Resolutions in effect at the time of the violation.

2.9.1 Pigging

All lines larger than 12 inches in diameter shall be pigged with a new pig to clear debris prior to flushing. Refer to specifications section 025400, 3.1.

2.9.2 Flushing

Full-bore flushing shall be coordinated with COUNTY Water Distribution personnel and shall require 48-hour notice to Water Distribution prior to performance. During flushing the Contractor will be permitted to install a spool piece to close the gap as shown in the Utilities Detail Drawings. Upon completion of such flushing, connection to the COUNTY's systems or portion(s) thereof shall be returned to the configuration shown in the Utilities Detail Drawings. Refer to specifications section 025400, 3.1.

2.9.3 Line Filling

Lines under construction shall be filled utilizing water supplied by the temporary meter and such filling shall be performed by the Contractor in accordance with required procedures including those outlined herein below.

2.9.4 Chlorination

Line chlorination shall be performed utilizing water supplied by the temporary meter for the purpose of chlorinating newly constructed potable water lines. Such procedure shall be performed by the Contractor, and shall require 48-hour notice to Water Distribution prior to performance.

2.9.5 Post-Chlorination Flushes

The Contractor using the temporary construction meter shall perform Post Chlorination Flushes. All chlorine injected into the system for disinfection shall be flushed from the system at least 24 hours prior to collection of Bacteriological Samples.

The initial flush volume equal to the volume of water main being flushed shall be captured and properly disposed of, such that no chlorinated water enters into a storm water system and/or is discharged to the ground; all regulatory requirements for the protection of the environment shall be met.

2.9.6 Bacteriological Samples

Bacteriological sample collection shall be performed utilizing water supplied by the temporary meter in order to supply pressure during sample collection of newly constructed potable water lines. Such procedure shall require 48-hour notice to Water Distribution prior to performance. These procedures shall be performed on Monday through Thursday, excluding holidays, unless otherwise directed by the County Manager or designee.

2.10 Laboratory Testing and Sample Collection

All new potable and raw water systems shall be subject to bacteriological sample collection and testing. Sample collection and laboratory analyses shall be performed by COUNTY certified laboratory technicians only. The Contractor or his agent shall provide the equipment required in Section 2, Technical Specifications, to supply a continuous sample at the points indicated on the engineer's construction drawings. Sample points having a one day total of 200 non-coliform bacteria or greater shall be considered as failed samples. Samples containing one coliform bacteria or greater shall be considered as a failed sample. All potable water piping up to and including 8-inches in diameter shall pass bacteriological tests within sixty (60) days of being

placed in service. All potable water piping greater than 8-inches shall pass bacteriological tests within forty-five (45) days of being placed in service.

Sample collection and sample laboratory analyses costs shall be borne by the developer. For Utilities Capital Projects that are run by the COUNTY for the COUNTY, one set of tests (including water costs) are provided by the COUNTY free of charge and the contractor shall pay for any additional tests.

PART 3 WASTEWATER COLLECTION AND TRANSMISSION SYSTEMS

All wastewater pipe, material, equipment and appurtenances shall be new, and shall conform to Section 2, Technical Specifications and Section 3, Utilities Detail Drawings.

Wastewater systems shall be designed to maintain adequate flows and standards as established by Florida Department of Environmental Protection (FDEP), using the equivalent residential connection (ERC) value of 250 gallons per day per residential unit (broken down to 100 gallons per day per person and 2.5 people per household) and F.A.C. 64E-6.008 for non-residential. The peak hour factor shall be determined using the equation:

$$\frac{(18+\sqrt{\text{population in thousands}})}{(4+\sqrt{\text{population in thousands}})}$$

Populations for non-residential units shall be derived using the estimated average daily flows calculated using Table 1 in Rule 64E-6.008 of the Florida Administrative Code, divided by the average daily flow per capita of 100 gallons.

All wastewater projects shall be designed to preclude the deliberate introduction of storm water, surface water, groundwater, roof runoff, subsurface drainage, swimming pool drainage, air conditioning system condensate water, non-contact cooling water, and sources of uncontaminated wastewater as specified in F.A.C. Chapter 62-610 and comply with Ordinance 2012-13 "Collier County Industrial Pretreatment Ordinance."

3.1 Gravity Sewer Systems

3.1.1 Pipe and Fitting Materials

Gravity sewer pipe and materials shall conform to Technical Specifications for polyvinyl chloride (PVC) pipe and fittings. All pipelines shall be green in color.

3.1.2 Design of Pipeline Size, Depth and Location

All gravity sewer mains constructed shall be a minimum of eight inches in diameter. The minimum depth of cover over all gravity sewers shall be 36 inches. All gravity sewer designs shall consider buoyancy of sewers, and appropriate construction techniques to prevent floatation of the pipe where high groundwater conditions are anticipated.

All gravity mains eight inches or larger are allowed to be core bored into existing manholes. The manhole must be restored as per Section 333913. An inspector from the Wastewater Collections Department must be present during manhole restoration.

Hydraulic Design Requirements - All gravity sewers shall be designed to give mean velocities, when flowing full or half-full of not less than two feet per second, based on Manning's formula. When calculating full-flow velocity, use a Manning's Roughness Coefficient of $n=0.013$. Design wastewater system with uniform slope between manholes. The following are the minimum allowable design slopes that may be provided for each pipe size listed:

Minimum Slope in Feet per One Hundred Feet (ft/100’):

Sewer Size	Slope (ft/100 ft)	Sewer Size	Slope (ft/100 ft)
8 inch	0.40	18 inch	0.12
10 inch	0.28	21 inch	0.10
12 inch	0.22	24 inch	0.08
15 inch	0.15		

Special attention shall be given to gravity lines that receive flows from wastewater transmission or re-pumping facilities. Due care shall be taken in these cases to ensure that no surcharge conditions occur downstream due to excessive flow rates. Under no conditions shall pipe of a diameter larger than that necessary for proper hydraulic design as determined by the COUNTY Growth Management Division or Public Utilities Engineering and Project Management Department be permitted for use on any project.

All sewers shall be designed to prevent superimposed loads.

3.1.3 Gravity Sewer Main Extension Stubs

All main-line extension stubs to future developments and/or parcels shall terminate in a stub-out if it is part of a phased project. The stub-out shall end with a bell or manhole.

3.1.4 Gravity Sewer Laterals

Laterals shall be extended to the property line or easement limit for all installations.

Laterals shall be a minimum of six inches in diameter. Lateral shall have a minimum depth of 30 inches and a maximum depth of 48 inches below finished grade. In locations where a minimum depth of 30 inches cannot be provided, laterals shall be C900, DR 14 PVC pipe. At no time shall the depth of a lateral be less than 24 inches. At no time shall a lateral be core bored into manholes. Upon installation, all lateral ends shall be plugged. A cleanout shall be provided at the end of each lateral prior to the end plug and a maximum of every 75 feet. Intermediate cleanouts shall be located on the back side of the curb or gutter (where available). Typical lateral and cleanout standards are shown in the Utilities Detail Drawings. The cleanout riser and cap shall be set 24 inches above finished grade. All COUNTY-owned sewer cleanouts shall be provided with an electronic marker and concrete collar as shown in Utilities Detail Drawings (see County Approved Product List, Appendix F). Electronic markers shall be placed 24 inches below final grade at the cleanout, for COUNTY inspector to see during final plumbing tie-in inspection. At no time shall the connection to the lateral be made to the cleanout riser or any part of the vertical assembly. Either a single six inch diameter or larger lateral to each property or a single six inch or larger lateral with a double wye shall be provided.

3.1.5 Manholes

Precast concrete manholes shall be installed at the end of each wastewater main, at all changes in grade, size, or horizontal alignment, and at all main pipe intersections, shall be spaced at distances not greater than 400 feet and shall be placed in pavement or equivalently stabilized surface (or future pavement). For sanitary sewers with a diameter greater than 15 inches, the maximum distance between manholes is 450 feet. All gravity collection mains shall terminate in a precast concrete manhole.

Minimum inside diameter of all manholes shall be four feet. The angle between the inlet and outlet pipe within manholes shall be no less than 90 degrees. A drop pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Drop manholes shall be constructed with an outside drop connection encased in concrete, as shown in the Utilities Detail Drawings. See FDEP Wastewater Checklist Form 62-604.300(8)(a), "Manholes" section, for further design requirements, as well as Specification Section 333913 and the Detail Drawings.

3.2 Force Mains

3.2.1 Pipe and Fitting Materials

Force main pipelines and fittings shall be a minimum of four inches in diameter. All force mains shall be constructed of PVC, HDPE, or ductile iron pipe and shall utilize pipe meeting the requirements of the Technical Specifications. The use of ductile iron pipe on force mains is restricted to aerial crossings and above ground flanged pipe only. A plug valve is required to delineate ownership between County owned and privately owned force mains.

All HDPE and PVC buried pipelines shall be color-coded as described in the Technical Specifications. Force main pipelines shall be green in color.

Buried force mains, except those installed by directional drill or jack-and-bore methods, shall be marked using metalized warning tape for PVC. The metalized warning tape shall be placed in the pipe trench at two feet below grade or one-half the depth of the pipe's bury, whichever is less, and labeled "WASTEWATER FORCE MAIN." Electronic markers (see County Approved Product List, Appendix F) shall be placed 24 inches below final grade, above the force main, at all bends or changes in alignment, valves, and every 250 feet. Horizontal directional drilling shall include installation of at least two locating tone wires as described in the Technical Specifications.

All force main aerial crossings shall be Pressure Class 350 flanged ductile iron pipe and shall be coated on the exterior using a suitable grade of Safety Green colored, field applied (or factory applied with field touch-up as required) epoxy coating. Specific color shall be subject to approval of the County Manager or designee. All nuts and bolts used in aerial crossings shall be stainless steel. All canal, river, or creek crossings shall be aerial, unless otherwise approved by the County Manager or designee. Aerial crossings shall be designed to incorporate valves or other flow regulation devices in accordance with F.A.C. 62-604.400(2)(k)5. Aerial crossings shall be designed to maintain existing or required navigational capabilities within the waterway and to reserve riparian rights of adjacent property Owners. Submit aerial pipe and flange computations, including support and anchor design, for review. The submittal must be signed and sealed by a Florida registered Licensed Professional Engineer.

3.2.2 Design of Pipeline Size and Location

Force mains shall be sized to provide a desired flushing velocity of two and one-half feet per second with a minimum allowable velocity of two feet per second. The maximum allowable velocity in wastewater force mains is six feet per second. The minimum size force main conveyed to the CCWSD shall be four inches in diameter. Approved mechanical thrust restraints are required at pipe joints where specified in the Utility Standards.

Minimum cover for force mains shall be 30 inches. Maximum cover shall be 48 inches after final project grading is complete except when dipping under conflicts in which case the force main shall be returned to normal depth within 10 feet on either side of the conflict or as soon as possible using a fitting of 45 degrees or less. The design engineer shall strive to minimize the number and frequency of dips (maintaining a horizontal run line through intermittent grade changes, by deviation). An air release valve is required at all dips. Engineers should evaluate possibilities of lowering storm drainage piping or dipping potable water and non-potable irrigation water main to avoid dips in the force main.

When force mains are interconnected with a gravity sewer system, for transmission purposes through that system, interconnection shall be as shown in the Utility Standard Drawings. No force main laterals shall be core bored into manholes.

3.2.3 Valves

All connections of privately-owned and maintained wastewater force mains to the Wastewater Department's force mains shall be connected through a check valve housed in a structure as shown in the Utilities Detail Drawings which shall allow performance of required maintenance, and shall be owned and maintained by the property owner.

Sufficient plug valves shall be provided to allow for zone isolation of wastewater transmission areas in order to limit the impact of line breaks. In-line plug valves shall be provided at no greater than 1,000 foot intervals per COUNTY requirements.

3.2.4 Force Main Extension Stubs

All main-line extension stubs to future developments and/or parcels shall terminate in a stub-out if it is part of a phased project. The stub-out shall end with a valve and cap/plug.

3.2.5 Air Release Assemblies

Air release assemblies shall be provided at all high points and on the upstream side of conflict crossings at which the force main passes under the conflict (unless it can be demonstrated by hydraulic analysis that air pockets will not accumulate at individual high points). A high point is defined by the hydraulic gradient and is considered the upper end of any pipe segment that slopes up to the hydraulic gradient or runs parallel to it. Air valves (see County Approved Product List, Appendix F) utilized on raw sewage facilities shall be designed and manufactured specifically for use with domestic sewage. The design engineer shall review and apply the pertinent provisions of AWWA-C512 and AWWA Manual of Water Supply Practices M51, "Air-Release, Air Vacuum, and Combination Air Valves". When installed, the air valve shall be provided with a shut-off valve to allow isolation and removal of the valve assembly. All air release assemblies shall be installed as shown in the Utilities Detail Drawings.

3.3 Wastewater Pump Stations

Wastewater pump stations shall be designed and constructed in accordance with FDEP regulatory requirements, Section 2 Technical Specifications, National Electrical Code (NEC) Requirements, and Section 3 Utilities Detail Drawings.

Pump Station wetwells shall be designed to withstand flotation forces with the assumption that the structures are empty and ground/flood water elevation is at the top of the structures. The design shall consider the potential for damage or interruption of operation due to flooding. Pump

station structures and electrical and mechanical equipment shall be designed to be protected from physical damage by the 100-year flood event. Pump stations shall be designed to remain fully operational and accessible during the 25-year flood event. Pump stations shall be designed to avoid operational problems from the accumulation of grit.

Pump stations shall be designed to be readily accessible by maintenance vehicles, including pumper trucks, during all weather conditions. Pump stations shall be designed and located on the site to minimize adverse effects from odors, noise, and lighting. Pump stations shall be located on the site to have a minimum separation of 20 feet from the edge of the CUE for the pump station to edge of a body of water and 15 feet from the edge of the CUE for the pump station to a residential structure (including appurtenances).

The effective volume of wet wells shall be based on design average flows and a filling time not to exceed 30 minutes unless the facility is designed to provide flow equalization. The pump manufacturer's duty cycle recommendations shall be utilized in selecting the minimum cycling time. Pump stations requiring a pump motor of twenty horsepower or greater shall operate by a VFD (variable frequency drive) that varies the operating speed of the pump based on wet well water levels. Pump stations shall have a compacted earth berm on three sides with 3:1 slopes to divert liquid toward the ROW. Top of berm shall be 12 inches wide and six inches higher than back of curb (with curb) or edge of pavement (without curb). Minimum berm height shall be six inches.

Emergency pumping capability shall be provided for all pump stations. A pump station that is connected directly to the County transmission force main from a development (Community Pump Station) and any pump station that receives flow from one or more upstream pump stations or discharges through a force main 12 inches or larger (see FAC 62-604.400 (2)(a)1) shall have uninterrupted pumping capability (standby Diesel pump or generator) with three days of fuel storage (compliant with Technical Specification 263213) and a concrete pad for a future odor control system.

Alternatively, emergency pumping capability may be achieved by connecting the pump station to at least two independent utility substations, each capable of starting and operating the pump station at its rated capacity. Regardless of the type of emergency standby system provided, a force main riser with rapid connection capabilities and appropriate valving shall be provided for connecting a portable pump. All pump stations shall conform to these standards and shall be conveyed to the Collier County Water-Sewer District in accordance with the utilities conveyance policies and procedures outlined in the Collier County Utilities Standards and Procedures Ordinance (Ord. No. 2004-31 as amended), unless approved for private ownership and maintenance by Deviation and in accordance with Section 3.3.1 below.

All pump stations shall be protected from lightning and transient voltage surges. All pump stations shall be located at least 100 feet from a public drinking water supply well and 75 feet from a private drinking water well. The design and siting of new private pumping stations shall minimize adverse effects resulting from odors, noise, and lighting.

All pump stations shall have water available to them. Available water means a water main is accessible in the adjacent ROW or CUE.

Landscaping is not required, per these standards, to be installed around wastewater pump stations. If landscaping is provided, it shall be maintained by the developer, homeowners association, or land owner and shall NOT be located in the CUE. Landscaping, if provided, shall be located as to not block access or interfere with operations. If plant material dies, it is the

responsibility of the landscaping owner to replace it. The landscaping shall be maintained to not block telemetry antenna line of site.

3.3.1 Private Pump Stations

Private pump stations shall not receive flow from any other pump station and shall only serve one property parcel. All private pump stations may be privately monitored and maintained by deviation. All new private pump stations shall be grinder pump stations. Positive or semi-positive displacement grinder pumps equipped with thermal overload protection shall be standard on all private grinder pump stations. All new private pump stations shall conform to the design criteria specified in Subsection 3.3 above, unless otherwise specified in this subsection, and shall be configured to facilitate routine maintenance without entering the wet well.

Except in the case of a simplex station serving a single-family residence, private pump stations shall have multiple pumps capable of handling peak flow with one pump out of service. Peak flow shall be calculated as the peak hour flow (per Part 3) divided by a factor of 0.7. This is based on peak hour flow typically being around 70 percent of the peak flow over a briefer (approximately 15-minute) time period¹. Where possible, pumps shall be selected so that the design operating range is within ten percent (10%) (on a flow basis) of the maximum efficiency point identified by the manufacturer. Otherwise, the pump model that would operate closest to its maximum efficiency point should be selected based on the average head condition.

Design flow shall be calculated in accordance with Part 3, except that average daily flow for a residential project shall be determined from Table I in paragraph 62-6.008(1)(b), F.A.C., based on the number of bedrooms and building area. An assumption of 350 gallons per day per residential unit shall be used if bedroom count and building area are unknown.

The table below defines volumetric terms used in this subsection based on the demarcating design elevations (e.g., storage volume is between the pump on and alarm elevations):

Elevation	Terms	
Top/Overflow		
Alarm	Reserve Volume	Reserve Capacity
	Storage Volume	
On	Effective Volume	
Off		

Residential private pump stations shall have a sufficient combination of storage volume and pump rate to avoid an alarm condition during a peak flow of 46 gallons over a 2-minute period, which represents simultaneous discharge from a bathtub and clothes washer with a high probability of occurrence², assuming the basin level is at the pump on elevation just prior to the peak flow occurring.

Non-residential private pump stations shall be designed for simultaneous discharge from multiple plumbing fixtures as determined by the plumbing system designer. Check pump station

¹ Water Pollution Control Federation. (1986). *Alternative Sewer Systems* (Manual of Practice No. FD-12, Facilities Development).

² American Society of Civil Engineers. (1969). *Combined Sewer Separation Using Pressure Sewers* (FWPCA Report ORD-4).

capacity using the equation, $Q = (V-S)/t$, where Q is the minimum pump discharge rate (gpm), V is the volume of peak flow (gal), S is storage volume (gal), and t is the time window (duration) of peak flow (minutes).

The minimum storage volume required to attenuate peak flows is 25 gallons. In no case shall the pump rate be less than 5 to 10 gpm, depending on the storage volume. If the storage volume is 25 gallons, the minimum for attenuation, the pump rate shall be no less than 10 gpm. For storage volumes equal to or greater than 50 gallons, the pump rate shall be no less than 5 gpm. Interpolate the minimum pump rate accordingly if the storage volume is between 25 and 50 gallons.

In-ground installation of a grinder pump station may require a ballast or concrete anchor of proper dimensions and weight to counteract the buoyant forces exerted on the station. Designers of privately-owned pump stations shall adhere to the manufacturer's guidelines and sound engineering practice for counteracting buoyancy.

Unless a standby power generator is connected to the pump station, every private pump station shall have a standard generator receptacle (see Appendix F) and a minimum reserve capacity of half the average daily flow volume, but no less than 50 gallons, as contingency for a power outage or equipment malfunction.

In instances where the reserve capacity (i.e., volume above the pump-on elevation) is less than double the peak hour flow, the private pump station shall be furnished with an external pump-out connection.

New private pumping stations shall be enclosed with a fence or otherwise designed with appropriate features to prohibit the entry of animals and unauthorized persons.

All private pump stations connected with the County's wastewater collection system are required to be inspected, maintained, and repaired on a routine basis. The station's owner shall continuously retain (contract with) an operator qualified under Florida laws, rules, and regulations to perform preventive maintenance and respond to any service interruption. In accordance with 62-604.400(2)(d), F.A.C., the operator's emergency telephone number shall be displayed on an unobstructed sign made of durable, weather-resistant material and posted at a location visible to the public.

3.4 Connections to Collier County Facilities

Connections to existing COUNTY wastewater mains shall be constructed as described in the Technical Specifications and shown in the Utilities Detail Drawings. These details shall apply to all connections to existing systems.

All projects shall be designed with no physical connections between a public or private potable water supply system and a sewer or force main and with no water mains passing through or coming into contact with any part of a sewer manhole.

3.5 Tests and Inspections

Tests and inspections of all wastewater systems or portion(s) thereof shall be performed in accordance with the Technical Specifications before acceptance of the systems or portions thereof by Collier County.

3.6 Wastewater Pump Station Asset Management

Asset management is required for proper use and maintenance of these wastewater facilities. State of Florida DEP regulations state: "...systems shall be operated and maintained so as to provide uninterrupted service..." To accomplish this obligation on privately owned wastewater pump stations, the owner(s) of each such station shall:

- A. Maintain a permanent fence with a sign mounted thereon, which sign shall include the correct name and phone number(s) of at least one emergency contact individual and the correct name(s) and phone number(s) of the station's operator as well as the station's owner(s). The text on the sign must be immediately updated if and when any of the information on the sign becomes outdated.
- B. The station's owner shall continuously retain (contract with) an operator qualified under Florida laws, rule or regulation, for operations, preventive maintenance, and to respond to each service interruption, if any, at that station.

The above requirements are mandated by the Florida Department of Environmental Protection regulations: Florida Administrative Code, Subsection 62-604.400(2)(d).

PART 4 ELECTRICAL AND CONTROL SYSTEMS

4.1 Electrical and Control System Material

All electrical devices such as motor starters, breakers, and control centers shall be manufactured to current NEMA standards. The construction of each device shall conform to the NEMA rating for the environment of that device.

All programmable logic controllers (PLC) shall be manufactured by Allen-Bradley. The PLC model for each specific application shall be coordinated with the Utilities Engineering Department.

END OF SECTION 1

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SECTION 2

TECHNICAL SPECIFICATIONS

For the latest revisions to the Technical Specifications, please visit:

**Collier County Public Utilities
Engineering and Project Management Resources Webpage.**

**COLLIER COUNTY WATER-SEWER DISTRICT
UTILITIES STANDARDS MANUAL**

SECTION 2

TECHNICAL SPECIFICATIONS

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263213.13 Standby Diesel Generators

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312316 Excavation – Earth and Rock
312319 Groundwater Control for Open Cut Excavation
312323 Backfilling
314000 Shoring, Sheeting and Bracing

DIVISION 32 - EXTERIOR IMPROVEMENT

320117 Pavement Repair and Restoration
321300 Sidewalks, Driveways and Curbs
323113 Chain Link Fencing and Gates
329200 Restoration by Sodding or Seeding

DIVISION 33 - UTILITIES

330130.16 Televising and Inspection of Gravity Sewer Systems
330201 Roadway Crossings by Open Cut
330502 High Density Polyethylene (HDPE) Pipe and Fittings
330503 Polyvinyl Chloride (PVC) Pipe and Fittings
330504 Ductile Iron Pipe (DIP) and Fittings
330518 Laying and Jointing Buried Pipelines
330520 Pipe Removal and Abandonment
330523.13 Horizontal Directional Drilling
330523.16 Jacking, Augering and Mining
331200 Water Valves and Appurtenances
331619 Hydrants
333200 Pump Stations
333313 Wastewater Valves and Appurtenances
333913 Sewer Manholes
334713 HDPE Irrigation Pond Liner

DIVISION 40 – PROCESS INTERCONNECTIONS

409500 Fiber Optic Communication Standards

SECTION 011000
SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description of Work
- B. CONTRACTOR's Use of Site
- C. Work Sequence
- D. COUNTY Occupancy

1.2 DESCRIPTION OF WORK

- A. General: The Work to be done under this Contract is shown on the drawings and specified in Contract Documents.
- B. The Work includes:
 - 1. Furnishing of all labor, material, superintendence, plant, power, light, heat, fuel, water, tools, appliances, equipment, supplies, services and other means of construction necessary or proper for performing and completing the Work.
 - 2. Sole responsibility for adequacy of plant and equipment.
 - 3. Maintaining the Work area and site in a clean and acceptable manner.
 - 4. Maintaining existing facilities in service at all times.
 - 5. Protection of finished and unfinished Work.
 - 6. Repair and restoration of Work or existing facilities damaged during construction.
 - 7. Furnishing as necessary proper equipment and machinery, of a sufficient capacity, to facilitate the Work and to handle all emergencies normally encountered in Work of this character.

8. Furnishing, installing, and protecting all necessary guides, track rails, bearing plates, anchor and attachment bolts, and all other appurtenances needed for the installation of the devices included in the equipment specified. Make anchor bolts of appropriate size, strength and material for the purpose intended. Furnish substantial templates and shop drawings for installation.
- C. Implied and Normally Required Work: It is the intent of these Specifications to provide the COUNTY with complete operable systems, subsystems and other items of Work. Any part or item of Work, which is reasonably implied or normally required to make each installation satisfactorily and completely operable, is deemed to be included in the Work and the Contract Amount. All miscellaneous appurtenances and other items of Work incidental to meeting the intent of these Specifications are included in the Work and the Contract Amount even though these appurtenances may not be specifically called for in these Specifications.
- D. Quality of Work: Regard the apparent silence of the Contract Documents as to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished as meaning that only the best general practice is to prevail and that only materials and workmanship of the best quality are to be used. Interpretation of these specifications will be made upon this basis.

1.3 CONTRACTOR'S USE OF SITE

- A. In addition to the requirements of the Supplemental Terms and Conditions, limit use of site and premises for work and storage to allow for the following:
1. Coordination of the Work under this CONTRACT with the work of the other contractors where Work under this CONTRACT encroaches on the Work of other contractors.
 2. COUNTY occupancy and access to operate existing facilities.
 3. Coordination of site use with ENGINEER.
 4. Responsibility for protection and safekeeping of products under this CONTRACT.
 5. Providing additional off site storage at no additional cost to the COUNTY as needed.

1.4 WORK SEQUENCE

- A. Construct Work in stages to accommodate the COUNTY's use of premises during construction period and in accordance with the limitations on the sequence of construction specified. Coordinate construction schedules and operations with ENGINEER.

- B. Coordinate Work of all subcontractors.

1.5 COUNTY OCCUPANCY

- A. The COUNTY will occupy premises during entire period of construction in order to maintain normal operations. Cooperate with the COUNTY's Manager or designee in all construction operations to minimize conflict, and to facilitate COUNTY usage.
- B. Conduct operations with the least inconvenience to the general public.

1.6 PROTECTION OF EXISTING UTILITIES

- A. In case of damage to existing utilities caused by construction activities, contact the owner of the utility or appropriate COUNTY department (Water or Wastewater) immediately. Repair any damage to existing utilities caused by construction activities in coordination with or as directed by the owner of the utility.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

- A. Starting Work: Start Work within 10 days following the date stated in the Notice to Proceed and execute with such progress as may be required to prevent delay to other contractors or to the general completion of the project. Execute Work at such items and in or on such parts of the project, and with such forces, material and equipment, as to complete the Work in the time established by the Contract. At all times, schedule and direct the Work so that it provides an orderly progression to completion within the specified time for completion.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 014127

NPDES REQUIREMENTS

FOR CONSTRUCTION ACTIVITIES IMPACTING MORE THAN ONE ACRE

PART 1 GENERAL

1.1 DESCRIPTION

- A. This Section describes the required documentation to be prepared and signed by the CONTRACTOR before conducting construction operations, in accordance with the terms and conditions of the National Pollutant Discharge Elimination System (NPDES) Stormwater Permit, as required by Florida Administrative Code (F.A.C.) Chapter 62-621.
- B. The CONTRACTOR shall be responsible for implementation, maintenance and inspection of stormwater pollution prevention control measures in accordance with F.A.C. Chapter 62-621 including, but not limited to, erosion and sediment control, stormwater management plans, waste collection and disposal, off-site vehicle tracking, and other practices shown on the Drawings and/or specified elsewhere in this or other specifications. The stormwater pollution prevention control measures shall include protection of offsite public and private stormsewer facilities potentially impacted during construction. Stormwater facilities include streets, inlets, pipes, ditches, swales, canals, culverts, control structures, and detention/retention areas.
- C. The CONTRACTOR shall prepare and review implementation of the Stormwater Pollution Prevention Plan (SWPPP) in a meeting with the County Manager or designee prior to start of construction.

1.2 UNIT PRICES

- A. Unless indicated in the Unit Price Schedule as a pay item, no separate payment will be made for work performed under this Section. Include cost of work to be performed under this Section in pay items of which this work is a component.

1.3 REFERENCE DOCUMENTS

- A. ASTM D3786 – Standard Test Method for Hydraulic Bursting Strength for Knitted Goods and Nonwoven Fabrics
- B. ASTM D4632 – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 NOTICE OF INTENT (NOI)

- A. Fill out, sign and date a Notice of Intent to Use Generic Permit for Stormwater Discharge from Large and Small Construction Activities, (FDEP Form 62-621.300(4)(b)). Submit the signed copy of the NOI to the County Manager or designee. The County Manager or designee will submit the completed form to the FDEP along with the required permit fee.

3.2 CERTIFICATION REQUIREMENTS

- A. On the attached OPERATOR'S INFORMATION form, fill out the name, address and telephone number for the CONTRACTOR, persons or firms responsible for maintenance and inspection of erosion and sediment control measures, and all Subcontractors.
- B. The CONTRACTOR and Subcontractors named in the Operator's Information form shall read, sign and date the attached CONTRACTOR'S/SUBCONTRACTOR'S CERTIFICATION form.
- C. The persons or firms responsible for maintenance and inspection of erosion and sediment control measures shall read, sign and date the attached EROSION CONTROL CONTRACTOR'S INSPECTION AND MAINTENANCE CERTIFICATION form.
- D. Submit all forms to the County Manager or designee before beginning construction.

3.3 RETENTION OF RECORDS

- A. Retain a copy of the SWPPP at the construction site and at the Contractor's office from the date that it became effective to the date of project completion.
- B. At project closeout, submit to the County Manager or designee all NPDES forms and certifications, as well as a copy of the SWPPP. Stormwater pollution prevention records will be retained by the County Manager or designee for a period of three (3) years from the date of project completion.

3.4 REQUIRED NOTICES

- A. The following notices shall be posted from the date that the SWPPP goes into effect until the date of final site stabilization:

1. A copy of the submitted NOI and a brief project description, as given in the SWPPP, shall be posted at the construction site and at the CONTRACTOR's office in a prominent place for public viewing.
2. Notice to drivers of equipment and vehicles, instructing them to stop, check and clean tires of debris and mud before driving onto traffic lanes. Post such notices at every stabilized construction exit area.
3. Post a notice of waste disposal procedures in an easily visible location on site.
4. Notice of hazardous material handling and emergency procedures shall be posted with the NOI on site. Keep copies of Material Safety Data Sheets at a location on site that is known to all personnel.
5. Keep a copy of each signed certification at the construction site and at the CONTRACTOR's office.

REQUIRED FORMS FOLLOW

OPERATOR'S INFORMATION

Owner's Name and Address:

Collier County Public Utilities Planning and Project Management Department

3301 East Tamiami Trail
Naples, Florida 34112
(239) 252-4285

Contractors' Names and Addresses:

General Contractor:

Telephone: _____

Site Superintendent:

Telephone: _____

Erosion Control and:
Maintenance Inspection

Telephone: _____

Subcontractors' Names and Addresses:

Phone: _____

Phone: _____

CONTRACTOR'S / SUBCONTRACTOR'S CERTIFICATION

I certify under penalty of law that I understand the terms and conditions of Florida's National Pollutant Discharge Elimination System (NPDES) Construction General Permit that authorizes storm water discharges associated with activity from the construction site identified as part of this certification, and that I have received a copy of the SWPPP.

Signature: _____

Name: (printed or typed) _____

Title: _____

Company: _____

Address: _____

Signature: _____

Name: (printed or typed) _____

Title: _____

Company: _____

Address: _____

Signature: _____

Name: (printed or typed) _____

Title: _____

Company: _____

Address: _____

**EROSION CONTROL CONTRACTOR'S
INSPECTION AND MAINTENANCE CERTIFICATION**

I certify under penalty of law that I understand the terms and conditions of Florida's National Pollutant Discharge Elimination System (NPDES) Construction General Permit that authorizes storm water discharges associated with activity from the construction site identified as part of this certification, and that I have received a copy of the SWPPP.

Signature: _____
Name: (printed or typed) _____
Title: _____
Company: _____
Address: _____
Date: _____

END OF SECTION

SECTION 014200

REFERENCES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Reference Abbreviations
- B. Abbreviations
- C. Reference Standards
- D. Definitions

1.2 RELATED SECTIONS

- A. Information provided in this section is used where applicable in individual Specification Sections.

1.3 REFERENCE ABBREVIATIONS

- A. Reference to a technical society, trade association or standards setting organization, may be made in the Specifications by abbreviations in accordance with the following list:

AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute
ADC	Air Diffusion Council
AFBMA	Anti-friction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHA	Association of Home Appliance Manufacturers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association, Inc.
ANSI	American National Standards Institute
APA	American Plywood Association
ARI	American Refrigeration Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers

ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders' Hardware Manufacturers Association
BIA	Brick Institute of American
CABO	Council of American Building Officials
CAGI	Compressed Air and Gas Institute
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers Association of America
CRD	U.S. Corps of Engineers Specifications
CRSI	Concrete Reinforcing Steel Institute
CTI	Cooling Tower Institute
DHI	Door and Hardware Institute
DOH	Department of Health
DOT	Department of Transportation
Fed. Spec.	Federal Specifications
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
HMI	Hoist Manufacturing Institute
HPMA	See HPVA
HPVA	Hardwood Plywood Veneer Association
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IFI	Industrial Fasteners Institute
MIL	Military Specifications
MSS	Manufacturer's Standardization Society
NAAMM	National Association of Architectural Metal Manufacturers
NACM	National Association of Chain Manufacturers
NBS	National Bureau of Standards, See NIST
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NETA	National Electrical Testing Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NFPA	National Fluid Power Association
NIST	National Institute of Standards and Technology
NLMA	National Lumber Manufacturers Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Act
PCI	Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
SAE	Society of Automotive Engineers
SCPRF	Structural Clay Products Research Foundation
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association

SPI	Society of the Plastics Industry
SSPC	Steel Structures Painting Council
STI	Steel Tank Institute
TCA	Tile Council of American
TIMA	Thermal Insulation Manufacturers' Association
UL	Underwriters' Laboratories, Inc.
USBR	U. S. Bureau of Reclamation
USBS	U. S. Bureau of Standards, See NIST

1.4 ABBREVIATIONS

- A. Abbreviations which may be used in individual Specification Sections are as follows:

alternating current..... ac	cubic foot (feet) cu ft
American wire gauge.....AWG	cubic inch(es) cu in
ampere(s)..... amp	cubic yard(s)..... cu yd
ampere-hour(s) AH	
annual ann	decibelsdB
Ampere Interrupting	decibels (A scale)..... dBa
Capacity AIC	degree(s) deg
atmosphere(s)..... atm	dewpoint temperature dpt
average avg	diameter dia
	direct current dc
biochemical oxygen demand..... BOD	dissolved oxygenDO
Board Foot FBM	dissolved solids..... DS
brake horsepower bhp	dry-bulb temperature..... dbt
Brinell Hardness BH	
British thermal unit(s)..... Btu	efficiency eff
	elevation el
calorie(s)cal	entering water temperature..... ewt
carbonaceous biochemical	entering air temperature eat
oxygen demand CBOD	equivalent direct radiation.....edr
Celsius (centigrade)..... C	
Center to Center C to C	face area fa
centimeter(s) cm	face to face..... f to f
chemical oxygen demand..... COD	Fahrenheit F
coefficient, valve flow..... C _v	feet per day fpd
condensate return..... CR	feet per hour..... fph
cubic cu	feet per minute fpm
cubic centimeter(s)cc	feet per second fps
cubic feet per day cfd	foot (feet) ft
cubic feet per hour..... cfh	foot-candle..... fc
cubic feet per minute cfm	foot-pound ft-lb
cubic feet per minute,	foot-pounds per minute..... ft-lb/min
standard conditions..... scfm	foot-pounds per second ft-lb/sec
cubic feet per secondcfs	formazin turbidity unit(s) FTU

frequency freq
 fuel oil FO
 fuel oil supply FOS
 fuel oil return FOR

 gallon(s) gal
 gallons per day gpd
 gallons per day per
 cubic foot..... gpd/cu ft
 gallons per day per
 square foot..... gpd/sq ft
 gallons per hour gph
 gallons per minute gpm
 gallons per second..... gps
 gas chromatography and
 mass spectrometry GC-MS
 gauge ga
 grain(s) gr
 gram(s) g
 grams per cubic centimeter gm/cc
 Heat Transfer Coefficient U
 height hgt
 Hertz..... Hz
 horsepower hp
 horsepower-hour..... hp-hr
 hour(s)..... hr
 humidity, relative..... rh
 hydrogen ion concentration pH

 inch(es) in
 inches per second..... ips
 inside diameter ID

 Jackson turbidity unit(s).....JTU

 kelvin K
 kiloamperes..... kA
 kilogram(s) kg
 kilometer(s) km
 kilovar (kilovolt-amperes
 reactive) kvar
 kilovolt(s)..... kV
 kilovolt-ampere(s) kVA
 kilowatt(s) kW
 kilowatt-hour(s) kWh

 linear foot (feet).....lin ft
 liter(s) L

megavolt-ampere(s)..... MVA
 meter(s) m
 micrograms per liter ug/L
 miles per hour mph
 milliamperes..... mA
 milligram(s)..... mg
 milligrams per liter mg/L
 milliliter(s) mL
 millimeter(s)..... mm
 million gallons..... MG
 million gallons per day mgd
 millisecond(s) ms
 millivolt(s) mV
 minute(s) min
 mixed liquor suspended
 solids MLSS
 nephelometric turbidity
 unit.....NTU
 net positive suction headNPSH
 noise criteria nc
 noise reduction coefficient NRC
 number no

 ounce(s) oz
 outside air..... oa
 outside diameter.....OD

 parts per billion..... ppb
 parts per million..... ppm
 percent pct
 phase (electrical)..... ph
 pound(s) lb
 pounds per cubic foot..... pcf
 pounds per cubic foot
 per hour pcf/hr
 pounds per day lbs/day
 pounds per day per
 cubic foot..... lbs/day/cu ft
 pounds per day per
 square foot lbs/day/sq ft
 pounds per square foot..... psf
 pounds per square foot
 per hour psf/hr
 pounds per square inch psi

 pounds per square inch
 absolute..... psia

pounds per square inch
gaugepsig
power factorPF
pressure drop or
difference dp
pressure, dynamic
(velocity)..... vp
pressure, vapor..... vap pr

quart(s)..... qt

Rankine R
relative humidity rh
resistance..... res
return air..... ra
revolution(s) rev
revolutions per minute rpm
revolutions per second rps
root mean squared..... rms

safety factor sf
second(s) sec
shading coefficient..... SC
sludge density index SDI

Sound Transmission
Coefficient STC
specific gravity sp gr
specific volume Sp Vol
sp ht at constant pressure Cp
square sq
square centimeter(s).....sq cm
square foot (feet) sq ft
square inch (es)sq in
square meter(s) sq m
square yard(s).....sq yd
standard std
static pressure st pr
supply air sa
suspended solids..... SS

temperature..... temp
temperature difference..... TD
temperature entering..... TE
temperature leaving TL
thousand Btu per hour Mbh
thousand circular mils kcmil
thousand cubic feet..... Mcf
threshold limit value TLV
tons of refrigeration tons
torque TRQ
total dissolved solids TDS
total dynamic head..... TDH
total kjeldahl nitrogen TKN
total oxygen demand..... TOD
total pressure TP
total solids TS
total suspended solids TSS
total volatile solids TVS
vacuum..... vac
viscosity visc
volatile organic chemical..... VOC
volatile solids..... VS
volatile suspended solids..... VSS
volt(s)..... V
volts-ampere(s) VA
volume vol
watt(s)..... W
watthour(s) Wh
watt-hour demand WHD
watt-hour demand meter..... WHDM
week(s)..... wk
weight wt
wet-bulb WB
wet bulb temperature WBT

yard(s) yd
year(s) yr

1.5 REFERENCE PUBLICATIONS

The following publications are incorporated into this Manual and are made a part of this Manual as is set out verbatim in this Manual. Violations of any provision of every such publication, as updated from time-to-time by Resolution(s) of the Board of County

Commissioners, shall be a violation of the Collier County Utilities Standards and Procedures Ordinance, as then amended.

- A. Water Environment Federation, Manual of Practice No. 8, Wastewater Treatment Plant Design, W.E.F., 601 Wythe Street, Alexandria, VA, 22314-1994.
- B. Water Environment Federation, Manual of Practice No. 9, Design and Construction of Sanitary and Storm Sewers, W.E.F., 601 Wythe Street, Alexandria, VA, 22314-1994.
- C. Great Lakes/Upper Mississippi River Board of State Sanitary Engineers. Recommended Standards for Sewage Works, Health Education Service, Inc., P.O. Box 7283, Albany, New York, 12224.
- D. Great Lakes/Upper Mississippi River Board of State Sanitary Engineers. Recommended Standards for Water Works, Health Education Service, Inc., P.O. Box 7283, Albany, New York, 12224.
- E. Rules of the Florida Department of Environmental Protection for Water, Wastewater, and Reclaimed Water Systems, latest revisions of F.A.C. Chapters 62-550, 62-555, 62-600, 62-604, 62-610, 64E-6, and 64E-8, 3900 Commonwealth Boulevard M.S. 49, Tallahassee, Florida, 32399.
- F. American Water Works Association, Inc., Water Treatment Plant Design, 6666 West Quincy Avenue, Denver, Colorado, 80235.
- G. American Water Works Association, Inc., Water Treatment Plant Design, AWWA Standards and Applicable Manuals, 6666 West Quincy Avenue, Denver, Colorado, 80235.
- H. Ductile Iron Pipe Research Association, Handbook, Ductile Iron Pipe/Cast Iron Pipe, Ductile Iron Pipe Research Association, 245 Riverchase Parkway East, Birmingham, Alabama, 35244.
- I. Uni-Bell Plastic Pipe Association, Handbook of PVC Pipe, Uni-Bell Plastic Pipe Association, 2655 Villa Creek Drive, Suite 164, Dallas, Texas, 75234.
- J. American National Standards Institute, latest revisions of applicable standards, 1819 L Street NW, Suite 600, Washington, D.C., 20036.
- K. American Society for Testing and Materials, latest revisions of applicable standards, ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, Pennsylvania, 19428-2959.
- L. National Water Research Institute, Treatment Technologies for Removal of MTBE. NWRI, 10500 Ellis Ave., P.O. Box 20865, Fountain Valley, CA, 92728.

- M. National Water Research Institute, Valuing Ground Water: Economic Concepts/Approaches. NWRI, 10500 Ellis Ave., P.O. Box 20865, Fountain Valley, CA, 92728.7.3.14.
- N. U.S. Environmental Protection Agency, Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability, Supplement to the Federal Guidelines for Design, Operation, and Maintenance of Wastewater Treatment Facilities, Technical Bulletin EPA-430-99-74-001, U.S. EPA, Office of Water Program Operations.
- O. Florida Department of Transportation, Standard Specifications for Road and Bridge Construction, Maps & Publications Sales, Mail Station 12, 605 Suwannee Street, Tallahassee, Florida 32399-0450.
- P. Plastics Pipe Institute, Handbook of Polyethylene Pipe, 1825 Connecticut Ave., NW, Suite 680, Washington, DC 20009.
- Q. National Fire Protection Association, 1995 Edition of NFPA 24 – Standard for the Installation of Private Fire Service Mains and Their Appurtenances, 1 Batterymarch Park, Quincy, MA 02169.
- R. Collier County Water-Sewer District Utilities Standards Manual.
- S. National Electrical Code, latest revisions of applicable requirements.
- T. Metcalf and Eddy, Wastewater Engineering Treatment and Reuse, 4th Edition, McGraw-Hill, 2002.
- U. Water Environment Federation, Manual of Practice No. 11, Operation of Municipal Wastewater Treatment Plants, 601 Wythe Street, Alexandria, VA 22314-1994.

1.6 REFERENCE STANDARDS

- A. Latest Edition: Construe references to furnishing materials or testing, which conform to the standards of a particular technical society, organization, or body, to mean the latest standard, code, or specification of that body, adopted and published as of the date of bidding this Contract. Standards referred to herein are made a part of these Specifications to the extent that is indicated or intended.
- B. Precedence: The duties and responsibilities of the COUNTY, CONTRACTOR or ENGINEER, or any of their consultants, agents or employees are set forth in the Contract Documents, and are not changed or altered by any provision of any referenced standard specifications, manuals or code, whether such standard manual or code is or is not specifically incorporated by reference in the Contract Documents. Any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority, to undertake responsibility contrary to the powers of the ENGINEER as set forth in the Contract Documents cannot be assigned to the ENGINEER or any of the ENGINEER's consultants, agents or employees.

1.7 DEFINITIONS

- A. In these Contract Documents the words furnish, install and provide are defined as follows:
1. Furnish (Materials): to supply and deliver to the project ready for installation and in operable condition.
 2. Install (services or labor): to place in final position, complete, anchored, connected in operable condition.
 3. Provide: to furnish and install complete. Includes the supply of specified services. When neither furnish, install or provide is stated, provided is implied.
 4. COUNTY: Collier County Board of Commissioners, County Government Center, 3301 East Tamiami Trail, Naples, Florida 34112, or authorized staff or representatives.
 5. ENGINEER: The terms Design Professional, Design Engineer, and Engineer are interchangeably used throughout the Contract Documents.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 014500
QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittals
- B. Inspection Services
- C. Inspection of Materials
- D. Quality Control
- E. Costs of Inspection
- F. Acceptance Tests
- G. Failure to Comply with Contract

1.2 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in the individual material sections.
- B. Certificate Submittals: Furnish the ENGINEER authoritative evidence in the form of Certificates of Manufacture that the materials and equipment to be used in the Work have been manufactured and tested in conformity with the Contract Documents. Include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product or on similar products of the manufacturer.

1.3 INSPECTION SERVICES

- A. COUNTY's Access: At all times during the progress of the Work, and until the date of final completion, afford the County Manager or designee and ENGINEER every reasonable, safe, and proper facility for inspecting the Work at the site. The observation and inspection of any work will not relieve the CONTRACTOR of any obligations to perform proper and satisfactory work as specified. Replace work rejected due to faulty design, inferior, or defective materials, poor workmanship, improper installation, excessive wear, or nonconformity with the requirements of the Contract Documents, with satisfactory work at no additional cost to the COUNTY. Replace as directed, finished or unfinished work found not

to be in strict accordance with the Contract, even though such work may have been previously approved and payment made therefor.

- B. Rejection: The County's Manager or designee has the right to reject materials and workmanship which are defective or require correction. Promptly remove rejected work and materials from the site.
- C. Inferior Work Discoveries: Failure or neglect on the part of the County Manager or designee to condemn or reject bad or inferior work or materials does not imply an acceptance of such work or materials. Neither is it to be construed as barring the County Manager or designee at any subsequent time from recovering damages or a sum of money needed to build anew all portions of the Work in which inferior work or improper materials were used.
- D. Removal for Examination: Should it be considered necessary or advisable by the County Manager or designee, at any time before final acceptance of the Work, to make examinations of portions of the Work already completed, by removing or tearing out such portions, promptly furnish all necessary facilities, labor, and material, to make such an examination. If such Work is found to be defective in any respect, defray all expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, the cost of examination and restoration of the Work will be considered a change in the Work to be paid for in accordance with applicable provisions of the Contract.
- E. Operation Responsibility: Assume full responsibility for the proper operation of equipment during tests and instruction periods. Make no claim, other than provided in the Contract Documents, for damage that may occur to equipment prior to the time when the County Manager or designee accepts the Work.
- F. Rejection Prior to Warranty Expiration: If at anytime prior to the expiration of any applicable warranties or guarantees, defective equipment is rejected by the County Manager or designee, repay to the COUNTY all sums of money received for the rejected equipment on progress certificates or otherwise on account of the Contract lump sum prices, and upon the receipt of the sum of money, County Manager or designee will execute and deliver a bill of sale of all its rights, title, and interest in and to the rejected equipment. Do not remove the equipment from the premises of the COUNTY until the County Manager or designee obtains from other sources, equipment to take the place of that rejected. The County Manager or designee hereby agrees to obtain other equipment within a reasonable time and the CONTRACTOR agrees that the COUNTY may use the equipment furnished by the CONTRACTOR without rental or other charge until the other new equipment is obtained.

1.4 INSPECTION OF MATERIALS

- A. Premanufacture Notification: Give notice in writing to the ENGINEER sufficiently in advance of the commencement of manufacture or preparation of materials

especially manufactured or prepared for use in or as part of the permanent construction. When required, notice to include a request for inspection, the date of commencement, and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, ENGINEER will arrange to have a representative present at such times during the manufacture or testing as may be necessary to inspect the materials, or will notify CONTRACTOR that the inspection will be made at a point other than the point of manufacture or testing, or that the inspection will be waived. Comply with these provisions before shipping any materials. Such inspection will not constitute a release from the responsibility for furnishing materials meeting the requirements of the Contract Documents.

- B. Testing Standards: Conduct tests of electrical and mechanical equipment and appliances in accordance with recognized, applicable test codes.

1.5 QUALITY CONTROL

A. Testing

1. Field and Laboratory

- a. Provide personnel to assist the ENGINEER in performing the following periodic observation and associated services.
 - (1) Soils: Observe and test excavations, placement and compaction of soils. Determine suitability of excavated material. Observe subgrade soils and foundations.
 - (2) Concrete: Observe forms and reinforcement; observe concrete placement; witness air entrainment tests, facilitate concrete cylinder preparation and assist with other tests performed by ENGINEER.
 - (3) Masonry: Sample and test mortar, bricks, blocks and grout; inspect brick and block samples and sample panels; inspect placement of reinforcement and grouting.
 - (4) Structural Steel: Verify that all welders are certified; visually inspect all structural steel welds; mechanically test high-tensile bolted connections.
- b. When specified in the Contract Documents, provide an independent laboratory testing facility to perform required testing. Qualify the laboratory as having performed previous satisfactory work. Prior to use, submit to the ENGINEER for approval.
- c. Cooperate with the ENGINEER and laboratory testing representatives. Provide at least 24 hours notice prior to when specified testing is

required. Provide labor and materials, and necessary facilities at the site as required by the ENGINEER and the testing laboratory.

- d. When an independent electrical testing agency is specified in the Contract Documents, provide a member of the National Electrical Testing Association to perform inspections and tests.
2. Equipment: Coordinate and demonstrate test procedures as specified in the Contract Documents and as required during the formal tests.
 3. Pipeline and Other Testing: Conform to test procedures and requirements specified in the appropriate Specification Section.
 4. Testing of Gravity Sanitary Sewer Lines
 - a. Watertight Construction: It is imperative that all sewers and force mains, manholes, and service connections be built watertight and that the CONTRACTOR adhere rigidly to the specifications for material and workmanship. Since all of the water and sewage in the lines will be treated at the treatment plant, special care and attention must be given to securing watertight construction. After completion, the sewers or sections thereof will be tested and gauged. If infiltration or exfiltration is above the limits specified, the sewer construction work will be rejected.
 - b. Cleaning: Exercise care during construction of the manhole to see that materials do not enter the sewer line. Keep the invert and shelf of the manhole clean of all mortar, broken brick, sand, or any other materials falling into the manhole. Immediately remove such material. Maintain this condition until final acceptance of the work. Prior to testing of gravity sanitary sewer lines, clean the lines using appropriate tools.
 - c. Gravity Sewers - Visual Inspections: On completion of each block or section of sewer, or at such other times as the County Manger or designee may direct, the block or section of sewer is to be cleaned, tested and inspected. Each section of the sewer is to show, on examination from either end, a full circle of light between manholes. Each manhole, or other appurtenance to the system, shall be of the specified size and form, be watertight, neatly and substantially constructed, with the rim set permanently to design position and grade. All repairs shown necessary by the inspection are to be made; broken or cracked pipe replaced, all deposits removed and the sewers left true to line and grade, entirely clean and ready for use.

- d. Infiltration Limits: Provide the equipment necessary to check the lines for infiltration or exfiltration as directed by the County Manager or designee, before they are put in service. Infiltration in excess of fifty (50) gallons per day inch-mile of sewer will result in having the CONTRACTOR go over the lines, ascertain where the leakage exists, and repair the lines to the extent necessary to bring the infiltration down within acceptable limits. Observable inflow is not permitted.
- e. Exfiltration Limits: The length of sewer subject to an exfiltration test shall be the distance between two (2) adjacent manholes. Close the inlets of the upstream and downstream manholes with watertight plugs and the test section filled with water until the elevation of the water in the upstream manhole is two (2) feet above the crown of the pipe in the line being tested, or two (2) feet above the existing groundwater in the trench, whichever is higher. A standpipe may be used instead of the upstream manhole for providing the pressure head when approved by the County Manager or designee. Measure exfiltration by determining the amount of water required to maintain the initial water elevation for one (1) hour period from the start of the test. The maximum allowable leakage, including manholes, shall be 50 gallon per inch for diameter per mile of pipe per day.
- f. Air Testing: Air testing shall be required if, in the opinion of the County Manager or designee, conditions are such that infiltration measurements may be inconclusive. Conduct the test in the presence of the County Manager or designee and conform to the following requirements:
 - (a) Test pressure shall be 3.5 psi increased by the groundwater pressure above the top of the sewer.
 - (b) Pressure loss from shall not exceed 0.5 psi during the required testing time.
 - (c) Testing time in minutes shall be calculated as $0.625 \times$ nominal pipe size (inches).
- g. Deformation Test
 - (a) Deformation tests shall be performed on all gravity sewer lines. The test shall be conducted after the final backfill has been in place at least 30 days to permit stabilization of the soil-pipe system.
 - (b) No pipe shall exceed a deformation of five percent (5%). If deformation exceeds 5%, mechanical methods to correct deformation may be used. If mechanical methods are unsuccessful, the pipe shall be excavated. Replacement

or correction shall be accomplished in accordance with requirements in the approved specifications.

- (c) The rigid ball or mandrel used for the deflection test shall have a diameter not less than 95 percent of the base inside diameter or average inside diameter of the pipe depending on which is specified in the ASTM Specification, including the appendix, to which the pipe is manufactured. The test shall be performed without mechanical pulling devices.

B. Reports

1. Certified Test Reports: Where transcripts or certified test reports are required by the Contract Documents, meet the following requirements:
 - a. Before delivery of materials or equipment submit and obtain approval of the ENGINEER for all required transcripts, certified test reports, certified copies of the reports of all tests required in referenced specifications or specified in the Contract Documents. Perform all testing in an approved independent laboratory or the manufacturer's laboratory. Submit for approval reports of shop equipment tests within thirty days of testing. Transcripts or test reports are to be accompanied by a notarized certificate in the form of a letter from the manufacturer or supplier certifying that tested material or equipment meets the specified requirements and the same type, quality, manufacture and make as specified. The certificate shall be signed by an officer of the manufacturer or the manufacturer's plant manager.
2. Certificate of Compliance: At the option of the ENGINEER, submit for approval a notarized Certificate of Compliance. The Certificates may be in the form of a letter stating the following:
 - a. Manufacturer has performed all required tests
 - b. Materials to be supplied meet all test requirements
 - c. Tests were performed not more than one year prior to submittal of the certificate
 - d. Materials and equipment subjected to the tests are of the same quality, manufacture and make as those specified
 - e. Identification of the materials

1.6 COSTS OF INSPECTION

- A. COUNTY's Obligation: Initial inspection and testing of materials furnished under this Contract will be performed by the County Manager or designee, or inspection bureaus without cost to the CONTRACTOR, unless otherwise expressly specified. If subsequent testing is necessary due to failure of the initial tests or because of rejection for noncompliance, reimburse the COUNTY for expenditures incurred in making such tests.
- B. CONTRACTOR's Obligation: Include in the Contract Price, the cost of all shop and field tests of equipment and other tests specifically called for in the Contract Documents, except those tests described above under "COUNTY's Obligation". The County Manager or designee may perform tests on any material or equipment furnished under this Contract at any time during the Contract. If tests performed by the County Manager or designee result in failure or rejection for noncompliance, reimburse the COUNTY for expenditures incurred in making such tests. Tests performed by the County Manager or designee shall prevail in determining compliance with Contract requirements.
- C. Reimbursements to the COUNTY:
 - 1. Materials and equipment submitted by the CONTRACTOR as the equivalent to those specifically named in the Contract may be tested by the County Manager or designee for compliance. Reimburse the COUNTY for expenditures incurred in making such tests on materials and equipment that are rejected for noncompliance.
 - 2. Reimburse the COUNTY for all costs associated with Witness Tests that exceed 5 Calendar Days per kind of equipment.

1.7 ACCEPTANCE TESTS

- A. Preliminary Field Tests: As soon as conditions permit, furnish all labor and materials and services to perform preliminary field tests of all equipment provided under this Contract. If the preliminary field tests disclose that any equipment furnished and installed under this Contract does not meet the requirements of the Contract Documents, make all changes, adjustments and replacements required prior to the acceptance tests.
- B. Final Field Tests: Upon completion of the Work and prior to final payment, subject all equipment, piping and appliances installed under this Contract to specified acceptance tests to demonstrate compliance with the Contract Documents.
 - 1. Furnish all labor, fuel, energy, water and other materials, equipment, instruments and services necessary for all acceptance tests.

2. Conduct field tests in the presence of the ENGINEER. Perform the field tests to demonstrate that under all conditions of operation each equipment item:
 - a. Has not been damaged by transportation or installation
 - b. Has been properly installed
 - c. Has been properly lubricated
 - d. Has no electrical or mechanical defects
 - e. Is in proper alignment
 - f. Has been properly connected
 - g. Is free of overheating of any parts
 - h. Is free of all objectionable vibration
 - i. Is free of overloading of any parts
 - j. Operates as intended
 3. Operate work or portions of work for a minimum of 100 hours or 14 days continuous service, whichever comes first. For those items of equipment that would normally operate on wastewater or sludge, plant effluent may be used if available when authorized by ENGINEER. If water cannot properly exercise equipment, conduct 100-hour test after plant startup. Conduct test on those systems that require load produced by weather (heating or cooling) exercise only when weather will produce proper load.
- C. Failure of Tests: If the acceptance tests reveal defects in material or equipment, or if the material or equipment in any way fails to comply with the requirements of the Contract Documents, then promptly correct such deficiencies. Failure or refusal to correct the deficiencies, or if the improved materials or equipment, when tested again, fail to meet the guarantees or specified requirements, the County Manager or designee, notwithstanding its partial payment for work and materials or equipment, may reject said materials or equipment and may order the CONTRACTOR to remove the defective work from the site at no addition to the Contract Price, and replace it with material or equipment which meets the Contract Documents.

1.8 FAILURE TO COMPLY WITH CONTRACT

- A. Unacceptable Materials: If it is ascertained by testing or inspection that the material or equipment does not comply with the Contract, do not deliver said material or equipment, or if delivered remove it promptly from the site or from the

Work and replace it with acceptable material without additional cost to the COUNTY. Fulfill all obligations under the terms and conditions of the Contract even though the County Manager or designee fail to ascertain noncompliance or notify the CONTRACTOR of noncompliance.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 015000

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General Requirements
- B. Related Sections
- C. Temporary Utilities
- D. Temporary Construction
- E. Barricades and Enclosures
- F. Fences
- G. Security
- H. Temporary Controls
- I. Traffic Regulation
- J. Field Offices and Sheds

1.2 RELATED SECTIONS

- A. Section 011000 - Summary of Work
- B. Section 015526 – Traffic Regulations and Public Safety
- C. Section 020500 – Connection to Existing Systems
- D. Section 312319 – Groundwater Control for Open Cut Excavation
- E. Section 320117 - Pavement Repair and Restoration
- F. Section 330518 –Laying and Jointing Buried Pipelines

1.3 GENERAL REQUIREMENTS

- A. Plant and Facilities: Furnish, install, maintain and remove all false work, scaffolding, ladders, hoistways, braces, pumping plants, shields, trestles,

roadways, sheeting, centering forms, barricades, drains, flumes, and the like, any of which may be needed in the construction of any part of the Work and which are not herein described or specified in detail. Accept responsibility for the safety and efficiency of such works and for any damage that may result from their failure or from their improper construction, maintenance or operation.

- B. First Aid: Maintain a readily accessible, completely equipped first aid kit at each location where work is in progress.
- C. Safety Responsibility: Accept sole responsibility for safety and security at the site. Indemnify and hold harmless the COUNTY and the County's Manager or designee, including the ENGINEER, for any safety violation, or noncompliance with governing bodies and their regulations, and for accidents, deaths, injuries, or damage at the site during occupancy or partial occupancy of the site by CONTRACTOR's forces while performing any part of the Work.
- D. Hazard Communication: Furnish two copies of the CONTRACTOR's Hazard Communication Program required under OSHA regulations before beginning on site activities. Furnish two copies of amendments to Hazard Communications Program as they are prepared.

1.4 TEMPORARY UTILITIES

- A. Water: Provide all necessary and required water without additional cost, unless otherwise specified. If necessary, provide and lay water lines to the place of use; secure all necessary permits; pay for all taps to water mains and hydrants and for all water used at the established rates.
- B. Light and Power: Provide without additional cost to the COUNTY temporary lighting and power facilities required for the proper construction and inspection of the Work. If, in the ENGINEER's opinion, these facilities are inadequate, do NOT proceed with any portion of the Work affected thereby. Maintain temporary lighting and power until the Work is accepted.
- C. Heat: Provide temporary heat, whenever required, for work being performed during cold weather to prevent freezing of concrete, water pipes, and other damage to the Work or existing facilities.
- D. Sanitary Facilities: Provide sufficient sanitary facilities for construction personnel. Prohibit and prevent nuisances on the site of the Work or on adjoining property. Discharge any employee who violates this rule. Abide by all environmental regulations or laws applicable to the Work.

1.5 TEMPORARY CONSTRUCTION

- A. Bridges: Design and place suitable temporary bridges where necessary for the maintenance of vehicular and pedestrian traffic. Assume responsibility for the

sufficiency and safety of all such temporary work or bridges and for any damage that may result from their failure or their improper construction, maintenance, or operation. Indemnify and save harmless the COUNTY and the COUNTY's representatives from all claims, suits or actions, and damages or costs of every description arising by reason of failure to comply with the above provisions.

1.6 BARRICADES, LIGHTS AND ENCLOSURES

- A. Protection of Workmen and Public: Effect and maintain at all times during the prosecution of the Work, barriers, lights and enclosures necessary for the protection of workmen and the public. Perform all work within the County right-of-way in strict accordance with the COUNTY Maintenance of Traffic Policy and other applicable statutory requirements.
- B. Provide suitable barricades, lights, signs and watchmen at excavation sites and all other places where the Work causes obstructions to normal traffic or constitutes in any way a hazard to the public.

1.7 FENCES

- A. Existing Fences: Obtain written permission from property owner(s) prior to relocating or dismantling fences that interfere with construction operations. Reach agreements with the fence owner as to the period the fence may be left relocated or dismantled. Install adequate gates where fencing must be maintained. Keep gates closed and locked at all times when not in use.
- B. Restoration: Restore all fences to their original or better condition and to their original location on completion of the Work.

1.8 SECURITY

- A. Preservation of Property:
 - 1. Preserve from damage, all property along the line of the Work, in the vicinity of or in any way affected by the Work, the removal or destruction of which is not called for by the Drawings. Preserve from damage, public utilities, trees, lawn areas, building monuments, fences, pipe and underground structures, and public streets. Note: Normal wear and tear of streets resulting from legitimate use by the CONTRACTOR are not considered as damage. Whenever damages occur to such property, immediately restore to its original condition. Costs for such repairs are incidental to the Contract.
 - 2. In case of failure on the part of the CONTRACTOR to restore property or make good on damage or injury, the County Manager or designee may, upon 24 hours written notice, proceed to repair, rebuild, or otherwise restore such property as may be deemed necessary, and the cost thereof will be deducted from any moneys due or which may become due the

CONTRACTOR under this Contract. If removal, repair or replacement of public or private property is made necessary by alteration of grade or alignment authorized by the County Manager or designee and not contemplated by the Contract Documents, the CONTRACTOR will be compensated, in accordance with the General Conditions, provided that such property has not been damaged through fault of the CONTRACTOR or the CONTRACTOR's employees.

B. Public Utility Installations and Structures:

1. Public utility installations and structures include all poles, tracks, pipes, wires, conduits, vaults, valves, hydrants, manholes, and other appurtenances and facilities, whether owned or controlled by public bodies or privately owned individuals, firms or corporations, used to serve the public with transportation, gas, electricity, telephone, storm and sanitary sewers, water, or other public or private utility services. Facilities appurtenant to public or private property that may be affected by the Work are deemed included hereunder.
2. The Contract Documents contain data relative to existing public utility installations and structures above and below the ground surface. Existing public utility installations and structures are indicated on the Drawings only to the extent such information was made available to, or found by, the ENGINEER in preparing the Drawings. These data are not guaranteed for completeness or accuracy, and the CONTRACTOR is responsible for making necessary investigations to become fully informed as to the character, condition, and extent of all public utility installations and structures that may be encountered and that may affect the construction operations.
3. Before starting construction, identify and mark all existing valves and maintain access to the valves at all times during construction.
4. Contact utility locating service sufficiently in advance of the start of construction to avoid damage to the utilities and delays to the completion date.
5. If existing utilities are damaged during the Work, immediately notify the owner of the affected utility. In coordination with or as directed by the owner, remove, replace, relocate, repair, rebuild, and secure any public utility installations and structures damaged as a direct or indirect result of the Work under this Contract. Costs for such work are incidental to the Contract. Be responsible and liable for any consequential damages done to or suffered by any public utility installations or structures. Assume and accept responsibility for any injury, damage, or loss that may result from or be consequent to interference with, or interruption or discontinuance of, any public utility service.

6. At all times in the performance of Work, employ proven methods and exercise reasonable care and skill to avoid unnecessary delay, injury, damage, or destruction to public utility installations and structures. Avoid unnecessary interference with, or interruption of, public utility services. Cooperate fully with the owners thereof to that end.
 7. Provide notice to the County Manager or designee of any proposed connections to existing utilities, interruptions of service or shutdowns in accordance with Section 020500. Give written notice to the owners of all public utility installations and structures affected by proposed construction operations sufficiently in advance of breaking ground in any area or on any unit of the Work, to obtain their permission before disrupting the lines and to allow them to take measures necessary to protect their interests. Advise the Transportation Operations Department, Fire and Rescue Services of any excavation in public streets or the temporary shut-off of any water main. Provide at least 48 hours notice to all affected property owners whenever service connections are taken out of service.
- C. Work on Private Property: Work on this project will require operations on private property, rights of way or easements. The County Manager or designee has secured the appropriate easements or rights of entry from the affected property owners. Comply with all easement or rights of entry provisions. Conduct operations along rights-of-way and easements through private property to avoid damage to the property and to minimize interference with its ordinary use. Upon completion of the Work through such property, restore the surface and all fences or other structures disturbed by the construction as nearly as possible to the preconstruction conditions. Do not remove any material from private property without the consent of the property owner or responsible party in charge of such property. Hold the COUNTY harmless from any claim or damage arising out of or in connection with the performance of work across and through private property.
- D. Miscellaneous Structures: Assume and accept responsibility for all injuries or damage to culverts, building foundations and walls, retaining walls, or other structures of any kind met with during the prosecution of the Work. Assume and accept liability for damages to public or private property resulting therefrom. Adequately protect against freezing all pipes carrying liquid.
- E. Protection of Trees and Lawn Areas:
1. Protect with boxes, trees and shrubs, except those ordered to be removed. Do not place excavated material so as to cause injury to such trees or shrubs. Replace trees or shrubs destroyed by accident or negligence of the CONTRACTOR or CONTRACTOR's employees with new stock of similar size and age, at the proper season, at no additional cost to the COUNTY. If required by Contract Documents, provide preconstruction audio-video recording of project in accordance with the Technical Specifications.

2. Leave lawn areas in as good condition as before the start of the Work. Restore areas where sod has been removed by seeding or sodding.

1.9 TEMPORARY CONTROLS

A. During Construction:

1. Keep the site of the Work and adjacent premises free from construction materials, debris, and rubbish. Remove this material from any portion of the site if such material, debris, or rubbish constitutes a nuisance or is objectionable.
2. Remove from the site all surplus materials and temporary structures when they are no longer needed.
3. Neatly stack construction materials such as concrete forms and scaffolding when not in use. Store pipe to be incorporated into the Work in accordance with AWWA standards. Promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from surfaces to prevent marring or other damage.
4. Properly store volatile wastes in covered metal containers and remove from the site daily.
5. Do not bury or burn on the site or dispose of into storm drains, sanitary sewers, streams, or waterways, any waste material. Remove all wastes from the site and dispose of in a manner complying with applicable ordinances and laws.

B. Smoke Prevention:

1. Strictly observe all air pollution control regulations.
2. Open fires will be allowed only if permitted under current ordinances.

C. Noises:

1. In accordance with the COUNTY's Noise Ordinance, maintain acceptable noise levels in the vicinity of the Work. Limit noise production to acceptable levels by using special mufflers, barriers, enclosures, equipment positioning, and other approved methods.
2. Supply written notification to the County Manager or designee sufficiently in advance of the start of any work that violates this provision. Proceed only when all applicable authorizations and variances have been obtained in writing.

D. Hours of Operation:

1. Operation of construction equipment is only permitted Monday through Saturday, 7:00 AM to 7:00 PM. Obtain written consent from the County Manager or designee for operation of construction equipment during any other period.
2. Do not carry out non-emergency work, including equipment moves, on Sundays without prior written authorization by the County Manager or designee.

E. Dust Control:

1. Take measures to prevent unnecessary dust. Keep earth surfaces exposed to dusting moist with water or a chemical dust suppressant. Cover materials in piles or while in transit to prevent blowing or spreading dust.
2. Adequately protect buildings or operating facilities that may be affected adversely by dust. Protect machinery, motors, instrument panels, or similar equipment by suitable dust screens. Include proper ventilation with dust screens.

F. Temporary Drainage Provisions:

1. Provide for the drainage of stormwater and any water applied or discharged on the site in performance of the Work. Provide adequate drainage facilities to prevent damage to the Work, the site, and adjacent property.
2. Supplement existing drainage channels and conduits as necessary to carry all increased runoff from construction operations. Construct dikes as necessary to divert increased runoff from entering adjacent property (except in natural channels), to protect the COUNTY's facilities and the Work, and to direct water to drainage channels or conduits. Provide ponding as necessary to prevent downstream flooding.
3. Maintain excavations free of water. Provide, operate, and maintain pumping equipment. Dewater trenches in accordance with Sections 312319 and 330518.

- G. Pollution: Prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris, and other substances resulting from construction activities. Do not permit sanitary wastes to enter any drain or watercourse other than sanitary sewers. Do not permit sediment, debris, or other substances to enter sanitary sewers. Take reasonable measures to prevent such materials from entering any drain or watercourse.

1.10 TRAFFIC REGULATION

- A. **Parking:** Provide and maintain suitable parking areas for the use of all construction workers and others performing work or furnishing services in connection with the Contract, to avoid any need for parking personal vehicles where they may interfere with public traffic or construction activities.

- B. **Access:** Conduct Work to interfere as little as possible with public travel, whether vehicular or pedestrian. Provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of public and private travel. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, give reasonable notice to owners of private drives before interfering with them. Such maintenance of traffic will not be required when the CONTRACTOR has obtained permission from the owner or tenant of private property, or from the authority having jurisdiction over the public property involved, to obstruct traffic at the designated point.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 015526

TRAFFIC REGULATION AND PUBLIC SAFETY

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. General Requirements
- B. Traffic Control
- C. Public Safety

1.2 RELATED SECTIONS

- A. Section 015000 – Construction Facilities and Temporary Controls
- B. Section 320117 – Pavement Repair and Restoration
- C. Section 330201 – Roadway Crossings by Open Cut

1.3 GENERAL REQUIREMENTS

- A. Perform all work within COUNTY rights-of-way in strict accordance with the County's Maintenance of Traffic Policy and other applicable statutory requirements to protect the public safety.
- B. Be responsible for providing safe and expeditious movement of traffic through construction zones. A construction zone is defined as the immediate areas of actual construction and all abutting areas which are used by the CONTRACTOR and which interfere with the driving or walking public.
- C. Remove temporary equipment and facilities when no longer required. Restore grounds to original or specified conditions.
- D. The requirements specified herein are in addition to the plan for Maintenance of Traffic as specified in Section 330201.

1.4 TRAFFIC CONTROL

- A. Include as necessary precautions, not to be limited to, such items as proper construction warning signs, signals, lighting devices, marking, barricades, channelization, and hand signaling devices. Be responsible for installation and maintenance of all devices and requirements for the duration of the Construction period.

- B. Provide notice, at least five (5) working days prior to construction, to the State or County Department of Transportation of the necessity to close any portion of a roadway carrying vehicles or pedestrians so that the final approval of such closings can be obtained at least 48 hours in advance. At no time will more than one (1) lane of roadway be closed to vehicles and pedestrians. With any such closings make adequate provision for the safe expeditious movement of each.
- C. Be responsible for notifying Transportation Operations Department, Police, Fire, and other Emergency Departments whenever construction is within roadways and of the alternate routes.
- D. Be responsible for removal, relocation, or replacement of any traffic control device in the construction area that exists as part of the normal pre-construction traffic control scheme.
- E. Immediately notify the County Manager or designee of any vehicular or pedestrian safety or efficiency problems incurred as a result of the construction of the project.
- F. Be responsible for notifying all residents of any road construction and limited access at least 72 hours in advance.

1.5 PUBLIC SAFETY (DURING CONSTRUCTION, ALTERATION OR REPAIR)

- A. In areas of high vehicular traffic, provide a safe walkway around the work area.
- B. Use barricades or other barriers to prevent any possibility of injury to the public caused by the CONTRACTOR's work.
- C. Keep walk areas around the work areas clean of sand, stones, and any other material that could cause a pedestrian accident.
- D. Barricade work areas left overnight. Install flashing warning lights in areas required by the COUNTY.
- E. Unless an approved detour is provided at any open cut crossings, a minimum of one-way traffic will be maintained during the daylight hours and two-way traffic at night. All traffic detours will be restricted to limits of the Right-of-Way with necessary flagmen and/or marking devices. These detours shall be approved by the COUNTY. Detour of traffic outside of the Right-of-Way will be considered with the approval of local governmental agencies and private concerns involved.
- F. Crossing and Intersections: Do not isolate residences and places of business. Provide access to all residences and places of business whenever construction interferes with existing means of access. Maintain access at all times. If pavement is disturbed, a cold mix must be applied at the end of the day.

G. Detours

1. Construct and maintain detour facilities wherever it becomes necessary to divert traffic from any existing roadway or bridge, or wherever construction operations block the flow of traffic. The location of all detours will require prior approval of the COUNTY.
2. Furnishing of Devices and Barriers: Furnish all traffic control devices (including signs), warning devices and barriers. Costs of such devices shall be incidental to construction and included in unit prices bid.
3. Maintenance of Devices and Barriers: Keep traffic control devices, warning devices and barriers in the correct position, properly directed, clearly visible and clean, at all times. Immediately repair replace or clean damaged, defaced or dirty devices or barriers as necessary.

H. Flagmen: Provide certified flagmen (flaggers) to direct traffic where one-way operation in a single lane is in effect and in other situations as may be required. Radios may be required if flagmen cannot maintain contact with each other.

I. Utilize all necessary signs, flagmen, and other safety devices during construction.

J. Perform all work with the requirements set forth by the Occupational Safety Health Administration.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 015713

TEMPORARY EROSION AND SEDIMENTATION CONTROL FOR CONSTRUCTION ACTIVITIES IMPACTING LESS THAN ONE ACRE, INCLUDING CONSTRUCTION REQUIRING DEWATERING

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work specified in this Section consists of designing, providing, maintaining and removing temporary erosion and sedimentation controls as necessary.
- B. Temporary erosion controls include, but are not limited to rip rap channels, road stabilization, grassing, mulching, setting, watering, and reseeding onsite surfaces and spoil and borrow area surfaces and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the COUNTY.
- C. Temporary sedimentation controls include, but are not limited to; silt dams, traps, barriers, public and private on- and off-site storm sewer inlets protectors, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the COUNTY.
- D. If required by regulation or COUNTY, CONTRACTOR is responsible for providing an approved Erosion Control Plan for effective temporary erosion and sediment control measures during construction or until final controls become effective.

1.2 REFERENCE DOCUMENTS

- A. South Florida Building Code and Standard Building Code.

PART 2 PRODUCTS

2.1 EROSION CONTROL

- A. Sodding and Seeding is specified in Section 329200.
- B. Rip Rap Channel.
- C. Road Stabilization.

- D. Netting - fabricated of material acceptable to the County Manager or designee.

2.2 SEDIMENTATION CONTROL

- A. Temporary Sediment Trap.
- B. Sediment Fence.
- C. Bales - clean, seed free pine needle or cereal hay type.
- D. Netting - fabricated of material acceptable to the County Manager or designee.
- E. Filter Stone - crushed stone conforming to Florida Department of Transportation specifications.
- F. Concrete Block - hollow, non-load-bearing type.
- G. Concrete - exterior grade not less than one inch thick.

PART 3 EXECUTION

3.1 EROSION CONTROL

- A. Minimum procedures for grassing are:
 - 1. Scarify slopes to a depth of not less than six inches and remove large clods, rock, stumps, roots larger than 1/2 inch in diameter and debris.
 - 2. Sow seed within twenty-four (24) hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
 - 3. Apply mulch loosely and to a thickness of between 3/4 inch and 1-1/2 inches.
 - 4. Apply netting over mulched areas on sloped surfaces.
 - 5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas that exhibit unsatisfactory growth (less than 70 percent coverage). Backfill and seed eroded areas, removing eroded material from effected drainage facilities.
- B. Minimum procedures for rip rap channel are:
 - 1. Clear the foundation of all trees, stumps, and roots.

2. Excavate the bottom and sides of the channel 30 inches below grade at all points to allow for the placement of riprap as shown in the typical cross-section in the Standard Details.
3. Install extra strength filter fabric on the bottom and sides of the channel foundation, placing the upstream fabric over the downstream fabric with at least a 1 foot overlap on all joints. The fabric is to be securely held in place with metal pins.
4. Place riprap evenly to the lines and grades shown on the drawings and staked in the field. Place riprap immediately following the installation of the filter fabric.
5. Riprap shall meet the specification for F.D.O.T. Class 2 Riprap.
6. Restore all disturbed areas in accordance with a vegetation plan submitted in advance and approved by the County Manager or designee.

C. Minimum Procedures for road stabilization are:

1. Clear roadbed and parking areas of all vegetation, roots and other objectionable material.
2. Provide surface drainage.
3. Spread 6 inch course of lime rock evenly over the full width of road and parking area and smooth to avoid depressions.
4. After grading, seed or resod all disturbed areas adjoining roads and parking areas conforming to existing conditions prior to construction.

3.2 SEDIMENTATION CONTROL

- A. Install and maintain silt dams, traps, barriers, and appurtenances as required. Replace deteriorated hay bales and dislodged filter stone.
- B. Minimum requirements for sediment trap:
 1. Clear, grub and strip the area under the embankment of all vegetation and root mat.
 2. Clear retention area to elevation as approved by the County Manager or designee.
 3. Use fill material free of roots, woody vegetation and organic matter. Place fill in lifts not to exceed 9 inches and machine compact.

4. Construct dam and stone spillway to dimensions, slopes and elevations shown.
5. Ensure that the spillway crest is level and at least 18 inches below the top of the dam at all points.
6. Stone used for spillway section - Class "B" erosion control stone.
7. Stone used on inside spillway face to control drainage - #67 washed stone.
8. Extend stone outlet section to vegetated road ditch on zero grade with top elevation of stone level with bottom of drain.
9. Ensure that the top of the dam at all points is 6 inches above natural surrounding ground.
10. Stabilize the embankment and all disturbed area above the sediment pools as shown in the vegetation plan.

C. Minimum requirements for sediment fence:

1. Construct sediment fence on low side of topsoil stockpile to prevent sediment from being washed into the drainage system. Fence to extend around approximately 70 percent of the perimeter of the stockpile. Fence must be unobstructed so as to maintain a minimum of 75 percent of its design flow rate.
2. Locate posts down slope of fabric to help support fencing.
3. Bury toe of fence approximately 8 inches deep to prevent undercutting.
4. When joints are necessary, securely fasten the fabric at a support post with overlap to the next post.
5. Filter fabric shall be of nylon, polyester, propylene or ethylene yarn with extra strength – 50 pounds per linear inch (minimum) - and with a flow rate of at least 0.30 gallons per foot per minute. Fabric should contain ultraviolet ray inhibitors and stabilizers.
6. Post to be 4-inch diameter pine with a minimum length of 4 feet.

D. Minimum Requirement for stormwater facilities protection:

1. Public and private stormsewer facilities, both on and offsite, shall be protected at all inlets affected by construction. Stormsewer facilities include streets, inlets, pipes, ditches, swales, canals, culverts, control structures, and detention/retention areas.
2. Grated drop inlets shall be rapped with filter fabric in a manner that allows removal of accumulated sediment from the fabric before removing the grate.
3. Curb inlets shall be protected from sediment, turbid water from stormwater or dewatering activities; also construction debris, concrete mix and rinsate, and any other pollution.
4. Stormwater runoff entering such stormsewer inlets and stormwater detention/retention facilities with a turbidity greater than 50 NTU shall be considered to be in non-compliance with these regulations.

3.3 PERFORMANCE

- A. Should any of the temporary erosion and sediment control measures employed fail to produce results which comply with the requirements of the State of Florida, immediately take steps necessary to correct the deficiency at no expense to the COUNTY. Sedimentation or turbid water violations to stormwater facilities on or offsite shall require the contractor to remove all sediment from the affected facilities.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 016100
MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description
- B. Substitutions
- C. Manufacturer's Written Instructions
- D. Transportation and Handling
- E. Storage, Protection and Maintenance
- F. Manufacturer's Field Quality Control Services
- G. Post Startup Services
- H. Special Tools and Lubricating Equipment
- I. Lubrication

1.2 DESCRIPTION

- A. Proposed Manufacturers List: Within 15 calendar days of the date of the Notice to Proceed, submit to the ENGINEER a list of the names of proposed manufacturers, material men, suppliers and subcontractors, obtain approval of this list by the County Manager or designee prior to submission of any working drawings. Upon request submit evidence to ENGINEER that each proposed manufacturer has manufactured a similar product to the one specified and that it has previously been used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance.
- B. All material and equipment designed or used in connection with a potable (drinking) water system shall conform to the requirements of the National Sanitation Foundation (NSF) Standard 61, "Drinking Water System Components – Health Effects."
- C. Furnish and install Material and Equipment which meets the following:
 - 1. Conforms to applicable specifications and standards.

2. Complies with size, make, type, and quality specified or as specifically approved, in writing, by ENGINEER.
3. Will fit into the space provided with sufficient room for operation and maintenance access and for properly connecting piping, ducts and services, as applicable. Make the clear spaces that will be available for operation and maintenance access and connections equal to or greater than those shown and meeting all the manufacturers' requirements. If adequate space is not available, the CONTRACTOR shall advise the ENGINEER for resolution.
4. Manufactured and fabricated in accordance with the following:
 - a. Design, fabricate, and assemble in accordance with best engineering and shop practices.
 - b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
 - c. Provide two or more items of same kind identical, by same manufacturer.
 - d. Provide materials and equipment suitable for service conditions.
 - e. Adhere to equipment capabilities, sizes, and dimensions shown or specified unless variations are specifically approved, in writing, in accordance with the Contract Documents.
 - f. Adapt equipment to best economy in power consumption and maintenance. Proportion parts and components for stresses that may occur during continuous or intermittent operation, and for any additional stresses that may occur during fabrication or installation.
 - g. Working parts are readily accessible for inspection and repair, easily duplicated and replaced.
5. Use material or equipment only for the purpose for which it is designed or specified.

1.3 SUBSTITUTIONS

A. Substitutions:

1. Make any CONTRACTOR's requests for changes in equipment and materials from those required by the Contract Documents in writing, for approval by the COUNTY. Such requests are considered requests for substitutions and are subject to CONTRACTOR's representations and review provisions of the Contract Documents when one of following conditions are satisfied:

- a. Where request is directly related to an "or County approved equal" clause or other language of same effect in Specifications.
- b. Where required equipment or material cannot be provided within Contract Time, but not as result of CONTRACTOR's failure to pursue Work promptly or to coordinate various activities properly.
- c. Where required equipment or material cannot be provided in manner compatible with other materials of Work, or cannot be properly coordinated therewith.

2. CONTRACTOR'S Options:

- a. Where more than one choice is available as options for CONTRACTOR's selection of equipment or material, select option compatible with other equipment and materials already selected (which may have been from among options for other equipment and materials).
- b. Where compliance with specified standard, code or regulation is required, select from among products that comply with requirements of those standards, codes, and regulations.
- c. Or County approved Equal: For equipment or materials specified by naming one or more equipment manufacturer(s) and "or County approved equal", submit request for substitution for any equipment or manufacturer not specifically named.

B. Conditions Which are Not Substitution:

1. Requirements for substitutions do not apply to CONTRACTOR options on materials and equipment provided for in the Specifications.
2. Revisions to Contract Documents, where requested by the County Manager or designee or ENGINEER, are "changes" not "substitutions".
3. CONTRACTOR's determination of and compliance with governing regulations and orders issued by governing authorities do not constitute substitutions and do not constitute basis for a Change Order, except as provided for in Contract Documents.

1.4 MANUFACTURER'S WRITTEN INSTRUCTIONS

- A. Instruction Distribution: When the Contract Documents require that installation, storage, maintenance and handling of equipment and materials comply with manufacturer's written instructions, obtain and distribute printed copies of such instructions to parties involved in installation, including six copies to ENGINEER.

1. Maintain one set of complete instructions at jobsite during storage and installation, and until completion of work.
- B. Manufacturer's Requirements: Store, maintain, handle, install, connect, clean, condition, and adjust products in accordance with manufacturer's written instructions and in conformity with Specifications.
1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult ENGINEER for further instructions.
 2. Do not proceed with work without written instructions.
- C. Performance Procedures: Perform work in accordance with manufacturer's written instructions. Do not omit preparatory steps or installation procedures, unless specifically modified or exempted by Contract Documents.

1.5 TRANSPORTATION AND HANDLING

- A. Coordination with Schedule: Arrange deliveries of materials and equipment in accordance with Construction Progress Schedules. Coordinate to avoid conflict with work and conditions at site.
1. Deliver materials and equipment in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
 2. Protect bright machined surfaces, such as shafts and valve faces, with a heavy coat of grease prior to shipment.
 3. Immediately upon delivery, inspect shipments to determine compliance with requirements of Contract Documents and approved submittals and that material and equipment are protected and undamaged.
- B. Handling: Provide equipment and personnel to handle material and equipment by methods recommended by manufacturer to prevent soiling or damage to materials and equipment or packaging.

1.6 STORAGE, PROTECTION, AND MAINTENANCE

- A. On-site storage areas and buildings:
1. Conform storage buildings to requirements of Section 015000.
 2. Coordinate location of storage areas with ENGINEER and the COUNTY.
 3. Arrange on site storage areas for proper protection and segregation of stored materials and equipment with proper drainage. Provide for safe

travel around storage areas and safe access to stored materials and equipment.

4. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
5. Store materials such as pipe, reinforcing and structural steel, and equipment on pallets, blocks or racks, off ground.
6. PVC Pipe may be damaged by prolonged exposure to direct sunlight, take necessary precautions during storage and installation to avoid this damage. Store pipe under cover, and install with sufficient backfill to shield it from the sun.
7. Store fabricated materials and equipment above ground, on blocking or skids, to prevent soiling or staining. Cover materials and equipment that are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.

B. Interior Storage:

1. Store materials and equipment in accordance with manufacturer's instructions, with seals and labels intact and legible.
2. Store materials and equipment, subject to damage by elements, in weathertight enclosures.
3. Maintain temperature and humidity within ranges required by manufacturer's instructions.

C. Accessible Storage: Arrange storage in a manner to provide easy access for inspection and inventory. Make periodic inspections of stored materials or equipment to assure that materials or equipment are maintained under specified conditions and free from damage or deterioration.

1. Perform maintenance on stored materials of equipment in accordance with manufacturer's instructions, in presence of the County Manager or designee or ENGINEER.
2. Submit a report of completed maintenance to ENGINEER with each Application for Payment.
3. Failure to perform maintenance, to notify ENGINEER of intent to perform maintenance or to submit maintenance report may result in rejection of material or equipment.

- D. COUNTY's Responsibility: The COUNTY assumes no responsibility for materials or equipment stored in buildings or on-site. CONTRACTOR assumes full responsibility for damage due to storage of materials or equipment.
- E. CONTRACTOR's Responsibility: For COUNTY Capital Improvement Projects, the CONTRACTOR assumes full responsibility for protection of completed construction until facilities (or portions of facilities) are accepted for operation and placed in service. Repair and restore damage to completed Work equal to its original condition.
- F. Special Equipment: Use only rubber tired wheelbarrows, buggies, trucks, or dollies to wheel loads over finished floors, regardless if the floor has been protected or not. This applies to finished floors and to exposed concrete floors as well as those covered with composition tile or other applied surfacing.
- G. Surface Damage: Where structural concrete is also the finished surface, take care to avoid marking or damaging surface.

1.7 MANUFACTURER'S FIELD QUALITY CONTROL SERVICES

- A. General:
 - 1. Provide manufacturer's field services in accordance with this subsection for those tasks specified in other sections.
 - 2. Include and pay all costs for suppliers' and manufacturers' services, including, but not limited to, those specified.
- B. Installation Instruction: Provide instruction by competent and experienced technical representatives of equipment manufacturers or system suppliers as necessary to resolve assembly or installation procedures that are attributable to, or associated with, the equipment furnished.
- C. Installation Inspection, Adjustments and Startup Participation:
 - 1. Provide competent and experienced technical representatives of equipment manufacturers or system suppliers to inspect the completed installation as follows.
 - a. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or for other conditions that may cause damage.
 - b. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

- c. Verify that wiring and support components for equipment are complete.
 - d. Verify that equipment or system is installed in accordance with the manufacturer's recommendations, approved shop drawings and the Contract Documents.
 - e. Verify that nothing in the installation voids any warranty.
2. Provide manufacturer's representatives to perform initial equipment and system adjustment and calibration conforming to the manufacturer's recommendations and instructions, approved shop drawings and the Contract Documents.
3. Start-up of Equipment: Provide prior written notice of proposed start-up to the County Manager or designee and ENGINEER. Obtain ENGINEER's approval before start-up of equipment. COUNTY's departmental representative must be on-site during start-up. Execute start-up under supervision of applicable manufacturer's representative in accordance with manufacturers' instructions.
4. Furnish ENGINEER with three copies of the following. When training is specified, furnish the copies at least 48 hours prior to training.
 - a. "Certificate of Installation, Inspection and Start-up Services" by manufacturers' representatives for each piece of equipment and each system specified, certifying:
 - (1) That equipment is installed in accordance with the manufacturers' recommendations, approved shop drawings, and the Contract Documents.
 - (2) That nothing in the installation voids any warranty.
 - (3) That equipment has been operated in the presence of the manufacturer's representative.
 - (4) That equipment, as installed, is ready to be operated by others.
 - b. Detailed report by manufacturers' representatives, for review by ENGINEER of the installation, inspection and start-up services performed, including:
 - (1) Description of calibration and adjustments if made; if not in Operation and Maintenance Manuals, attach copy.
 - (2) Description of any parts replaced and why replaced.

- (3) Type, brand name, and quantity of lubrication used, if any.
- (4) General condition of equipment.
- (5) Description of problems encountered, and corrective action taken.
- (6) Any special instructions left with CONTRACTOR or ENGINEER.

- D. Field Test Participation: Provide competent and experienced technical representatives of all equipment manufacturers and system suppliers as necessary to participate in field testing of the equipment specified in Section 014500.
- E. Trouble-Free Operation: Provide competent and experienced technical representatives of all equipment manufacturers and system suppliers as necessary to place the equipment in trouble-free operation after completion of start-up and field tests.

1.8 SPECIAL TOOLS AND LUBRICATING EQUIPMENT

- A. General: Furnish, per manufacturer's recommendations, special tools required for checking, testing, parts replacement, and maintenance. (Special tools are those which have been specially designed or adapted for use on parts of the equipment, and which are not customarily and routinely carried by maintenance mechanics.)
- B. Time of Delivery: Deliver special tools and lubricating equipment to the COUNTY when unit is placed into operation and after operating personnel have been properly instructed in operation, repair, and maintenance of equipment.
- C. Quality: Provide tools and lubricating equipment of a quality meeting equipment manufacturer's requirements.

1.9 LUBRICATION

- A. General: Where lubrication is required for proper operation of equipment, incorporate in the equipment the necessary and proper provisions in accordance with manufacturer's requirements. Where possible, make lubrication automated and positive.
- B. Oil Reservoirs: Where oil is used, supply reservoir of sufficient capacity to lubricate unit for a 24-hour period.

1.10 WARRANTY

- A. Provide copies of any warranties of materials or equipment to the County Manager or designee with documentation showing compliance with warranty requirements.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

CERTIFICATE OF INSTALLATION, INSPECTION AND START-UP SERVICES

Project _____

Equipment _____

Specification Section _____

Contract _____

I hereby certify that the named equipment has been inspected, adjusted and operated by the Manufacturers' Representative and further certify:

1. That the equipment is installed in accordance with the manufacturer's recommendations, approved shop drawings, and the Contract Documents.
2. That nothing in the installation voids any warranty.
3. That equipment has been operated in the presence of the manufacturer's representative.
4. That equipment, as installed, is ready to be operated by others.

MANUFACTURERS' REPRESENTATIVE

Signature _____ Date _____

Name (print) _____

Title _____

Representing _____

CONTRACTOR

Signature _____ Date _____

Name (print) _____

Title _____

Attach the detailed report called for by Specification Section 016100.

Complete and submit three copies of this form with the detailed report to ENGINEER as specified.

CERTIFICATE OF POST START-UP SERVICES

Project _____

Equipment _____

Specification Section _____

Contract _____

I hereby certify the Manufacturers' Representative has inspected this equipment, made adjustments and calibrations, and that it is operating in conformance with the design, specifications, and manufacturer's requirements. Detailed notation of improper operation with corresponding recommendations, if any, are made and attached to this form.

MANUFACTURERS' REPRESENTATIVE

Signature _____ Date _____

Name (print) _____

Title _____

Representing _____

CONTRACTOR

Signature _____ Date _____

Name (print) _____

Title _____

ENGINEER

Signature _____ Date _____

Name (print) _____

Title _____

Complete and submit three copies of this form to the County Manager or designee upon completion of 6 to 11 months reinspection as required by Specification Section 016100.

END OF SECTION

SECTION 017300

MISCELLANEOUS WORK AND CLEANUP

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. This Section includes operations that cannot be specified in detail as separate items but can be sufficiently described as to the kind and extent of work involved. Furnish all labor, materials, equipment and incidentals to complete the work under this Section.
- B. The work of this Section includes, but is not limited to, the following:
 - 1. Restoring of sidewalks, driveways, curbing and gutters.
 - 2. Crossing utilities.
 - 3. Relocation of existing water lines, low pressure, gas lines, telephone lines, electric lines, cable TV lines and storm drains as necessary, all as shown on the drawings.
 - 4. Restoring easements and rights-of-ways.
 - 5. Cleaning up.
 - 6. Incidental work.

1.2 WORK SPECIFIED UNDER OTHER SECTIONS

- A. Complete all work in a workmanlike manner by competent workmen in full compliance with all applicable sections of these Specifications.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Materials required for this Section shall be of at least the same type and quality as materials that are to be restored. Where possible, reuse existing materials that are removed and then replaced, with the exception of paving.

PART 3 EXECUTION

3.1 RESTORING OF CURBING, FENCES, AND GUARD RAILS

- A. Protect existing curbing. If necessary, remove curbing from joint to joint and replace after backfilling. Replace curbing that is damaged during construction with curbing of equal quality and dimension.

3.2 CROSSING UTILITIES

- A. This item shall include any extra work required in crossing culverts, water courses, drains, water mains, and other utilities, including all sheeting and bracing, extra excavation and backfill, or any other work required for the crossing, whether or not shown on the drawings.

3.3 RELOCATIONS OR REPLACEMENT OF EXISTING GAS LINES, TELEPHONE LINES, ELECTRIC LINES, CABLE TV LINES AND DRAINAGE CULVERT

- A. Notify the proper authority of the utility involved when relocation or replacement of these lines is required. Coordinate all work by the utility so that the progress of construction will not be hampered.
- B. Reference all side drains, side ditches, swales, and storm sewers as to grade and location prior to construction, maintain them during construction, and repair them as necessary after construction. Where drainage structures are disturbed and must be replaced, the minimum size replacement shall be twelve inches (12"). All drainage culverts installed shall have mitered ends in conformance with the Collier County Standard Details. Place the culvert to the specified elevations and regrade or reshape the swale and road shoulders that have been disturbed or damaged during construction.

3.4 PROTECTION AND RESTORATION OF PROPERTY

- A. Protection and Restoration of Property: During the course of construction, take special care and provide adequate protection in order to minimize damage to vegetation, surfaced areas, and structures within the construction right-of-way, easement or site, and take full responsibility for the replacement or repair thereof. Immediately repair any damage to private property created by encroachment thereon. Should the removal or trimming of valuable trees, shrubs, or grass be required to facilitate the installation within the designated construction area, this work shall be done in cooperation with the County and/or local communities which the work takes place. Said valuable vegetation, removed or damaged, shall be replanted, if possible, or replaced by items of equal quality, and maintained until growth is re-established. Topsoil damaged in the course of work shall be replaced in kind with suitable material, graded to match existing grade. Following construction completion, the work area along the route of the installation shall be finish grade to elevations compatible with the adjacent surface, with grassing or hand raking required within developed areas.

- B. Existing lawn surfaces damaged by construction shall be re-graded and re-sodded or re-seeded. These areas shall be maintained until all work under this Contract has been completed and accepted.

3.5 CLEANING UP

- A. Remove all construction material, excess excavation, buildings, equipment and other debris remaining on the job as a result of construction operations and shall render the site of the work in a neat and orderly condition.
- B. Work site clean-up shall follow construction operations without delay and in accordance with Section 017423.

3.6 INCIDENTAL WORK

- A. Do all incidental work not otherwise specified, but obviously necessary for the proper completion of the Contract as specified and as shown on the drawings.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 017416

SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for clearing of all areas within the Contract limits and other areas shown, including work designated in permits and other agreements, in accordance with the requirements of Division 1.
- B. Related Work Specified in Other Sections Includes:
 - 1. Section 024100 – Demolition
 - 2. Section 312316 - Excavation - Earth and Rock
 - 3. Section 312323 – Backfilling
 - 4. Section 329200 – Restoration by Sodding or Seeding

1.2 DEFINITIONS

- A. Clearing: Clearing is the removal from the ground surface and disposal, within the designated areas, of trees, brush, shrubs, down timber, decayed wood, other vegetation, rubbish and debris as well as the removal of fences.
- B. Grubbing: Grubbing is the removal and disposal of all stumps, buried logs, roots larger than 1-1/2 inches, matted roots and organic materials.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PROTECTION OF EXISTING UTILITIES

- A. Prior to site clearing, locate and mark all existing utilities in coordination with the COUNTY and other affected owners. Protect all existing utilities and markings from damage. In case of damage to existing utilities caused by construction activities, contact the owner of the utility or appropriate COUNTY department (Water or Wastewater) immediately. Repair any damage to existing utilities or markings caused by construction activities in coordination with or as directed by the owner of the utility.

3.2 TREE REMOVAL

- A. Tree Removal Within Right-of-Way Limits: Remove trees and shrubs within the right-of-way unless otherwise indicated.
 - 1. Remove trees and shrubs to avoid damage to trees and shrubs designated to remain.
 - 2. Grub and remove tree stumps and shrubs felled within the right-of-way to an authorized disposal site. Fill depressions created by such removal with material suitable for backfill as specified in Section 312323.
- B. Tree Removal Outside Right-of-Way Limits: Do not cut or damage trees outside the right-of-way unless plans show trees to be removed or unless written permission has been obtained from the property owner. Furnish three copies of the written permission before removal operations commence.
- C. If the landowner desires the timber or small trees, cut and neatly pile it in 4 foot lengths for removal by the owner; otherwise, dispose of it by hauling it away from the project site. If hauled timber is of merchantable quality, credit shall accrue to the CONTRACTOR.

3.3 TREES AND SHRUBS TO BE SAVED

- A. Protection: Protect trees and shrubs within the work limits that are so delineated or are marked in the field to be saved from defacement, injury and destruction.
 - 1. Work within the limits of the tree drip line with extreme care using either hand tools or equipment that will not cause damage to trees.
 - a. Do not disturb or cut roots unnecessarily. Do not cut roots 1-1/2 inches and larger unless approved.
 - b. Immediately backfill around tree roots after completion of construction in the vicinity of trees.
 - c. Do not operate any wheeled or tracked equipment within drip line.
 - 2. Protect vegetation from damage caused by emissions from engine-powered equipment.
 - 3. During working operations, protect the trunk, foliage and root system of all trees to be saved with boards or other guards placed as shown and as required to prevent damage, injury and defacement.
 - a. Do not pile excavated materials within the drip line or adjacent to the trunk of trees.

- b. Do not allow runoff to accumulate around trunk of trees.
 - c. Do not fasten or attach ropes, cables, or guy wires to trees without permission. When such permission is granted, protect the tree before making fastening or attachments by providing burlap wrapping and softwood cleats.
 - d. The use of axes or climbing spurs for trimming will not be permitted.
 - e. Provide climbing ropes during trimming.
4. Remove shrubs to be saved, taking a sufficient earth ball with the roots to maintain the shrub.
- a. Temporarily replant if required, and replace at the completion of construction in a condition equaling that which existed prior to removal.
 - b. Replace in kind if the transplant fails.
5. Have any tree and shrub repair performed by a tree surgeon properly licensed by the State of Florida and within 24 hours after damage occurred.

3.4 CLEARING AND GRUBBING

- A. Clearing: Clear all items specified to the limits shown and remove cleared and grubbed materials from the site.
- 1. Do not start earthwork operations in areas where clearing and grubbing is not complete, except that stumps and large roots may be removed concurrent with excavation.
 - 2. Comply with erosion, sediment control and storm management measures as specified in Division 1.
- B. Grubbing: Clear and grub areas to be excavated, areas receiving less than 3 feet of fill and areas upon which structures are to be constructed.
- 1. Remove stumps and root mats in these areas to a depth of not less than 18 inches below the subgrade of sloped surfaces.
 - 2. Fill all depressions made by the removal of stumps or roots with material suitable for backfill as specified in Section 312323.
- C. Limited Clearing: Clear areas receiving more than 3 feet of fill by cutting trees and shrubs as close as practical to the existing ground. Grubbing will not be required.

- D. Dispose of all material and debris from the clearing and grubbing operation by hauling such material and debris away to an approved dump. The cost of disposal (including hauling) of cleared and grubbed material and debris shall be considered a subsidiary obligation of the CONTRACTOR; include the cost in the bid for the various classes of work.

3.5 TOPSOIL

- A. Stripping: Strip existing topsoil from areas that will be excavated or graded prior to commencement of excavating or grading and place in well-drained stockpiles in approved locations.

END OF SECTION

SECTION 017423

CLEANING

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. General Requirements
- B. Disposal Requirements

1.2 GENERAL REQUIREMENTS

- A. Execute cleaning during progress of the work and at completion of the work.

1.3 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 DURING CONSTRUCTION

- A. Execute daily cleaning to keep the work, the site, and adjacent properties free from accumulations of waste materials, rubbish, and windblown debris, resulting from construction operations.
- B. Provide onsite containers for the collection of waste materials, debris and rubbish. All waste materials including containers, food debris and other miscellaneous materials must be disposed of daily in onsite containers.
- C. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

3.2 FINAL CLEANING

- A. Requirements: At the completion of work and immediately prior to final inspection, clean the entire project as follows:
 - 1. Thoroughly clean, sweep, wash, and polish all work and equipment provided under the Contract, including finishes. Leave the structures and site in a complete and finished condition to the satisfaction of the ENGINEER.
 - 2. Direct all subcontractors to similarly perform, at the same time, an equivalent thorough cleaning of all work and equipment provided under their contracts.
 - 3. Remove all temporary structures and all debris, including dirt, sand, gravel, rubbish and waste material.
 - 4. Should the CONTRACTOR not remove rubbish or debris or not clean the buildings and site as specified above, the OWNER reserves the right to have the cleaning done at the expense of the CONTRACTOR.
- B. Employ experienced workers, or professional cleaners, for final cleaning.
- C. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- D. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.
- E. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces. Polish surfaces so designated to shine finish.
- F. Repair, patch, and touch up marred surfaces to specified finish, to match adjacent surfaces.
- G. Replace air-handling filters if units were operated during construction.
- H. Clean ducts, blowers, and coils, if air-handling units were operated without filters during construction.
- I. Vacuum clean all interior spaces, including inside cabinets.
- J. Handle materials in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.
- K. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly-painted surfaces.

- L. Clean interior of all panel cabinets, pull boxes, and other equipment enclosures.
- M. Wash and wipe clean all lighting fixtures, lamps, and other electrical equipment that may have become soiled during installation.
- N. Perform touch-up painting.
- O. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
- P. Remove erection plant, tools, temporary structures and other materials.
- Q. Remove and dispose of all water, dirt, rubbish or any other foreign substances.

3.3 FINAL INSPECTION

- A. After cleaning is complete the final inspection may be scheduled. The inspection will be done with the OWNER and ENGINEER.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 017823

OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description
- B. Quality Assurance
- C. Format and Contents

1.2 DESCRIPTION

- A. Scope: Furnish to the ENGINEER three (3) printed copies and one (1) electronic copy of an Operation and Maintenance Manual for all equipment and associated control systems furnished and installed.

1.3 QUALITY ASSURANCE

- A. Reference Codes and Specifications: No current government or commercial specifications or documents apply.

1.4 FORMAT AND CONTENTS

- A. Prepare and arrange each copy of the manual as follows:
 - 1. One copy of an equipment data summary (see sample form) for each item of equipment.
 - 2. One copy of an equipment preventive maintenance data summary (see sample form) for each item of equipment.
 - 3. One copy of the manufacturer's operating and maintenance instructions. Operating instructions include equipment start-up, normal operation, shutdown, emergency operation and troubleshooting. Maintenance instructions include equipment installation, calibration and adjustment, preventive and repair maintenance, lubrication, troubleshooting, parts list and recommended spare parts. Include Manufacturer's telephone numbers for Technical Support.
 - 4. List of electrical relay settings and control and alarm contact settings.
 - 5. Electrical interconnection wiring diagram for equipment furnished including all control and lighting systems.

6. One valve schedule giving valve number, location, fluid, and fluid destination for each valve installed. Group all valves in same piping systems together in the schedule. Obtain a sample of the valve numbering system from the ENGINEER.
 7. Furnish all O&M Manual material on 8-1/2 by 11 commercially printed or typed forms or an acceptable alternative format.
- B. Organize each manual into sections paralleling the equipment specifications. Identify each section using heavy section dividers with reinforced holes and numbered plastic index tabs. Use 3-ring, hard-back binders. Punch all loose data for binding. Arrange composition and printing so that punching does not obliterate any data. Print on the cover and binding edge of each manual the project title, and manual title, as furnished and approved by the ENGINEER.
 - C. Leave all operating and maintenance material that comes bound by the equipment manufacturer in its original bound state. Cross-reference the appropriate sections of the CONTRACTOR's O&M manual to the manufacturers' bound manuals.
 - D. Label binders Volume 1, 2, and so on, where more than one binder is required. Include the table of contents for the entire set, identified by volume number, in each binder.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

Collier County Utilities

Equipment Data Summary

Equipment Name:		Specification Reference:	
Manufacturer:			
	Name:		
	Address:		
	Telephone:		
Number Supplied:		Location/Service:	
Model No:		Serial No:	
Type:			
Size/Speed/Capacity/Range (as applicable):			
Power Requirement (Phase/Volts/Hertz):			
Local Representative:			
	Name:		
	Address:		
	Telephone:		
NOTES:			

Collier County Utilities

Preventive Maintenance Summary

Equipment Name:		Location:	
Manufacturer:			
Name:			
Address:			
Telephone:			
Model No:		Serial No:	
Maintenance Task	Lubricant/Part	D W M Q SA A	O&M Manual Reference
NOTES:			

*D-Daily W-Weekly M-Monthly Q-Quarterly SA-Semi-Annual A-Annual

SECTION 017839

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

Requirements for preparation, maintenance and submittal of project record documents. The Contractor's attention is specifically directed to Part 3.2.B. of this Section, which requires use of a Florida licensed surveyor to sign and seal all record drawings.

1.2 RELATED SECTIONS

- A. Section 014500 – Quality Control
- B. Section 022100 – Lines and Grades

1.3 SUBMITTALS

- A. General: Provide all submittals as specified.
- B. At Contract close out, three (3) sets of signed and sealed Record Drawings for the potable water OR non-potable irrigation water OR wastewater systems to be conveyed shall be submitted to the County or District. If potable water AND wastewater, AND/OR non-potable irrigation water systems or portion(s) thereof are being conveyed, five (5) sets of signed and sealed Record Drawings shall be submitted to the County.
- C. Provide electronic submittal as specified in Part 3.2.B of this Section.

1.4 REQUIREMENTS (For County Capital Projects Only)

Contractor shall maintain at the site for the County one record copy of:

- A. Drawings
- B. Specifications
- C. Addenda
- D. Change orders and other modifications to the Contract
- E. Design Engineer's field orders or written instructions
- F. Approved shop drawings, working drawings and samples
- G. Field test records

PART 2 PRODUCTS (not used)

PART 3 EXECUTION

3.1 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Project record documents shall be stored in Contractor’s field office or other location approved by the County apart from documents used for construction
- B. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
- C. Make documents and samples available at all times for inspection by the County.

3.2 RECORDING

A. General

- 1. Record Drawings shall accurately depict the constructed configuration of all potable water, non-potable irrigation water and/or wastewater systems or portion(s) thereof. All revisions to County staff approved construction drawings shall be precisely identified and illustrated on the Record Drawings. All Record Drawings of utility systems or portion(s) thereof that are not being conveyed to the Board shall bear, on the cover sheet, a prominently displayed DISCLAIMER, in bold lettering at least one-quarter (1/4) inch high, stating: "All on-site potable water, non-potable irrigation and/or wastewater systems shall be owned, operated and maintained by the private owner(s) and/or the master condominium/homeowners’ association, successors or assigns" (or other comparable private ownership).
- 2. Label each document “PROJECT RECORD” or similar text in neat, large printed letters.
- 3. Survey information can be obtained as needed by the use of 2-inch PVC labeled pipes installed over underground improvements by the contractor during construction. This method is an adequate process for obtaining record information.
- 4. Record information in red ink.

B. Record Drawings

- 1. The Record Drawings require signed and sealed as-built information, including above and below ground improvements including underground piping, valves and ductbanks, by a Florida Licensed Land Surveyor.
- 2. The Record Drawings shall identify the entity that provided the record data.
- 3. Drawings shall be referenced to and tie-in with the state plane coordinate system, with a Florida East Projection, and a North American Datum 1983/1990 (NAD 83/90 datum), and with United States Survey Feet (USFEET) units, and North American Vertical Datum 1988 (NAVD 88), as established by a registered Florida surveyor and mapper.

4. Files shall be also submitted in two digital file formats, specifically Drawing File (DWG) format in AutoCAD Release 2004 or later version as well as PDF format (latest version).
5. Record drawings shall be submitted to the County staff within 60 days of the final construction completion date.
6. The following items shall be accurately depicted in vertical and horizontal directions on the Record Drawings:
 - a) All associated rights-of-way and utility easements whether shown on the Contract Drawings, found during construction or added during the Work.
 - b) Sewer system inverts, pipe slopes, manhole rims and run lengths.
 - c) Sewer lateral locations stationed from the nearest downstream manhole.
 - d) Sewer main stub extension inverts at both ends, pipe slope, run length and location.
 - e) Tie-ins to all valves, air release assemblies, fire hydrants, manholes, blowoffs, etc.
 - f) Top elevations of treatment plant structures and tanks.
 - g) Manhole center for sanitary sewers and storm sewers as related to utility improvements.
 - h) Pipe changes in direction or slope.
 - i) Buried valves, tees and fittings.
 - j) Pipe invert, or centerline, elevations at crossing with other pipe.
 - k) Invert, or centerline, elevations and coordinates of existing exposed pipe at crossing with underground pipe installed under this project.
 - l) Other horizontal and vertical record data pertinent to completed Work.
 - m) Water meter box locations.
 - n) Locations of direct bury, conduits, handholes, junction boxes and vaults for buried electric and communication cables that will be conveyed to the County shall be depicted.
7. Each pipe elevation shall be clearly identified as to whether it is top of pipe, centerline of pipe or invert of pipe.
8. For County Capital Projects only, Record Drawings shall indicate all deviations from Contract Drawings including:
 - a) Field changes.
 - b) Changes made by Change Order.
 - c) Details, utilities, piping or structures not on original Contract Drawings.
 - d) Equipment and piping relocations.

C. Specifications and Addenda (For County Capital Projects Only)

Legibly mark each Section to record:

1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
2. Changes made by Field Order or Change Order.

D. Shop Drawings (For County Capital Projects Only)

1. Keep one copy of the final, approved shop drawing with the Record Documents.
2. Record documents should include all shop drawing information submitted. Additional information submitted during the review process should be filed with the appropriate submittal.

END OF SECTION

SECTION 020500

CONNECTIONS TO EXISTING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General Requirements
- B. Submittals
- C. Scheduling of Shutdown

1.2 RELATED SECTIONS

- A. Section 011000 – Summary of Work
- B. Section 015000 – Construction Facilities and Temporary Controls
- C. Section 015526 – Traffic Regulations and Public Safety
- D. Section 320117 – Pavement Repair and Restoration

1.3 GENERAL REQUIREMENTS

- A. Be responsible for all connection to existing systems, cutting, fitting and patching, including attendant excavation and backfill, required to complete the work or to:
 - 1. Make its several parts fit together properly.
 - 2. Uncover portions of the work to provide for installation of ill-timed work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to requirements of Contract Documents.
- B. Coordination: Before connection is performed, verify and provide for any pipe restraint that may be required for the new connection. Perform all cutting, fitting or patching of the Work that may be required to make the several parts thereof join in accordance with the Contract Documents. Perform restoration with competent workmen skilled in the trade.
- C. If changes to a “looped” water distribution system occurring during construction result in dead ends to any new or relocated water mains, connect such dead

ends to the nearest water main. In cases where no nearby water main is available, provide a flushing device in coordination with the COUNTY at no additional cost to the COUNTY.

- D. Improperly Timed Work: Perform all cutting and patching required to install improperly timed work, to remove samples of installed materials for testing, and to provide for alteration of existing facilities or for the installation of new Work in the existing construction.
- E. Limitations: Except when the cutting or removal of existing construction is specified or indicated, do not undertake any cutting or demolition, which may affect the structural stability of the Work or existing facilities without the ENGINEER's concurrence.
- F. Collier County Damage Prevention Policy:
 - 1. This policy has been put in place to avoid damage to Collier County underground utilities. A minimum distance of five feet (5') horizontally and eighteen inches (18") vertically must be maintained away from Collier County utilities (in accordance with pipe separation criteria located in the Design Criteria section). Any and all variations from this order must be approved by the Water or Wastewater Department.
 - 2. **Before commencement of any excavation, the existing underground utilities in the area affected by the work must be marked by Sunshine One Call, in accordance with State Statute Chapter 556 "Underground Facility Damage Prevention and Safety", after proper notification to them by either calling 811 in Florida or toll free at 1-800-432-4770. Visit www.sunshine811.com for more information. Before commencing excavation for the work, potholing of all potential conflicts must be performed.**
 - 3. All lines in conflict must be physically located by the contractor. Any conflict shall be reported to the utility and Collier County Public Utilities. Utilities under concrete or pavement may require soft dig vacuum locates which also is the contractor's responsibility to perform. All utilities will be field marked per Sunshine State One Call's statutes and guidelines. For line verification or any other information concerning locates, please call the Locate Department at 239-252-5922 during normal business hours. For line verification or emergency locates after hours, call emergency number 239-825-1444. **In the event the potholing and/or vacuum soft dig does not locate the marked utility, work must be stopped and the affected utility owner contacted.** Failure to comply with this policy and obtain required signature(s) may result in revocation of existing right-of-way permits.

1.4 SUBMITTALS

- A. Submit a written request to the ENGINEER well in advance of executing any cutting or alteration which affects:
 - 1. Work of the COUNTY or any separate contractor.
 - 2. Structural value or integrity of any element of the project or work.
 - 3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 - 4. Efficiency, operational life, maintenance or safety of operational elements.
 - 5. Visual qualities of sight-exposed elements.
- B. Include in request:
 - 1. Identification of the work.
 - 2. Description of affected work.
 - 3. The necessity for cutting, alteration or excavation.
 - 4. Effect on work of the COUNTY or any separate contract, or on structural or weatherproof integrity of work.
 - 5. Description of proposed work:
 - a. Scope of cutting, patching, alteration, or excavation.
 - b. Trades who will execute the work.
 - c. Products proposed to be used.
 - d. Extent of refinishing to be done.
 - 6. Alternatives to cutting and patching.
 - 7. Cost proposal, when applicable.
 - 8. Written permission of any separate contractor whose work will be affected.
- C. SUBMIT WRITTEN NOTICE TO THE ENGINEER DESIGNATING THE DATE AND THE TIME THE WORK WILL BE UNCOVERED.

1.5 SCHEDULING OF SHUTDOWN

- A. Connections to Existing Facilities: If any connections, replacement, or other work

requiring the shutdown of an existing facility is necessary, schedule such work at times when the impact on the COUNTY's normal operation is minimal. If shutdown involves the water distribution or transmission system, provide notice to the COUNTY Water Department at least two (2) weeks prior to the proposed shutdown, including date, time and anticipated length of interruption of service. Overtime, night and weekend work without additional compensation from the COUNTY, may be required to make these connections, especially if the connections are made at times other than those specified. The connection of new or existing pipelines is prohibited from starting until CONTRACTOR assures that the system can receive the new flow.

- B. Interruptions of Service: Perform cut-ins into lines at a time approved in writing by the County Manager or designee. Whenever it is required to turn off valves which may interrupt the water supply of residents or businesses, notify all concerned parties or agencies with personal contact, door hangers or written notice at least forty-eight (48) hours in advance of such cut-off, after having obtained the approval of the County Manager or designee. Provide a copy of the written notice to the Water Distribution Section by fax. ONLY COUNTY PERSONNEL MAY OPERATE COUNTY-OWNED VALVES. Maintain water service to existing connections during construction, under any and all conditions and at no additional cost to the COUNTY. Thoroughly clean and swab all pipe and fittings for cut-ins with a concentrated solution of calcium hypochlorite.
- C. Request for Water System Shutdowns: When plans call for connection to existing water distribution facilities or the CONTRACTOR plans to shut down existing utilities or where damage to such facilities is likely in order to complete construction of items under this contract, furnish the County Manager or designee with a written request for connection. The COUNTY Water Distribution Section will identify the locations of all water valves needed to isolate the point of connection in the event that the existing facilities are damaged while making the connection. Identify in the request means which the CONTRACTOR proposes to use in order to provide effective shutdown of the system. Include in a connection and shutdown schedule details of shutdown time and duration. No connections to existing utilities – or construction where shutdown of, or damage to, existing utilities may occur – shall commence prior to County Manager or designee approval of the connection and shutdown plan and schedule.
- D. Request for Wastewater Diversion: Submit a request for each diversion necessary during construction to the County Manager or designee and the ENGINEER sufficiently in advance of any required diversion. Identify in the request the valves, bypass piping, portable pumper trucks or any other means which the CONTRACTOR proposes to use in order to provide effective shutdown of the system. Include in a connection and shutdown schedule details of shutdown time and duration. No connections to existing utilities – or construction where shutdown of, or damage to, existing utilities may occur – shall commence prior to County Manager or designee approval of the connection and shutdown plan and schedule.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Comply with specifications and standards for each specific product involved.

PART 3 EXECUTION

3.1 INSPECTION

- A. Inspect existing conditions of projects, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of products, or performance of the work.
- C. Report unsatisfactory or questionable conditions to the ENGINEER in writing; do not proceed with work until the ENGINEER has provided further instructions.

3.2 PREPARATION

- A. In cases where service to utility customers is interrupted, provide adequate equipment with backup onsite to assure prompt restoration of service.
- B. Provide adequate temporary support as necessary to assure structural value or integrity or affected portion of work.
- C. Provide devices and methods to protect other portions of project from damage.
- D. Provide protection from elements for that portion of the project that may be exposed by cutting and patching work, and maintain excavations free from water.
- E. Material Removal: Cut and remove all materials to the extent shown or as required to complete the work. Remove materials in a careful manner with no damage to adjacent facilities. Remove materials that are not salvageable from the site.

3.3 PERFORMANCE

- A. Execute cutting and demolition by methods that will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.
- B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.
- C. Employ original installer or fabricator to perform cutting and patching for:
 - 1. Weather-exposed or moisture-resistant elements.
 - 2. Sight-exposed finished surfaces.

- D. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.
- E. Restore work, which has been cut or removed; install new products to provide completed work in accord with requirements of contract documents.
- F. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For an assembly, refinish entire unit.

3.4 PAVEMENT RESTORATION

- A. Restore all pavement or roadway surfaces in accordance with Section 320117 – Pavement Repair and Restoration.
- B. Restore, replace or rebuild existing street paving, including underdrains, if any are encountered, where damaged, using the same type of construction as was in the original. Be responsible for restoring all such work, including subgrade, base courses, curb and gutter or other appurtenances where present. The County Manager or designee will obtain the permits listed in the Contract Documents. Obtain and pay for at CONTRACTOR's expense any additional local or other governmental permits as may be required for the opening of streets and be satisfied as to any requirements other than those herein set forth which may affect the type, quality and manner of carrying on the restoration of surfaces by reason of jurisdiction of such governmental bodies.
- C. This section does not describe the construction of new road surfaces or the complete resurfacing of existing pavements.
- D. In all cases, the CONTRACTOR will be required to maintain, without additional compensation, all permanent replacement of street paving, done by him under this Contract for a period of 12 months after the acceptance of the Contract, including the removal and replacement of such work wherever surface depressions or underlying cavities result from settlement of trench backfill.
- E. Perform all the final resurfacing or repaving of streets or roads, over the excavations made and be responsible for relaying paving surfaces of roads that have failed or been damaged at any time before the termination of the maintenance period on account of work done by him. Resurface or repave over any tunnel jacking, or boring excavation that settles or breaks the surface, repave to the satisfaction of the County Manager or designee and at the CONTRACTOR's expense. Conform backfilling of trenches and the preparation of subgrades to the requirements of excavation and backfilling of pipeline trenches.

- F. Where pipeline construction crosses paved streets, driveways or sidewalks, the CONTRACTOR may elect, at no additional cost to the COUNTY, to place the pipe by the jacking and boring, horizontal direction drilling, or tunneling method in lieu of cutting and patching of the paved surfaces. Such work shall be accomplished in accordance with all applicable sections of the Contract Documents.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 022100
LINES AND GRADES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General
- B. Surveys
- C. Datum Plane
- D. Protection of Survey Data

1.2 GENERAL

- A. Construct all work in accordance with the lines and grades shown on the Drawings. Assume full responsibility for keeping all alignment and grade.

1.3 SURVEYS

- A. Reference Points: The COUNTY will provide reference points for the work as described in the General Conditions. Base horizontal and vertical control points will be designated by the ENGINEER and used as datum for the Work. Perform all additional survey, layout, and measurement work.
 - 1. Keep ENGINEER informed, sufficiently in advance, of the times and places at which work is to be performed so that base horizontal and vertical control points may be established and any checking deemed necessary by ENGINEER may be done, with minimum inconvenience to the ENGINEER and at no delay to CONTRACTOR. It is the intention not to impede the Work for the establishment of control points and the checking of lines and grades set by the CONTRACTOR. When necessary, however, suspend working operations for such reasonable time as the ENGINEER may require for this purpose. Costs associated with such suspension are deemed to be included in the Contract Price, and no time extension or additional costs will be allowed.
 - 2. Provide an experienced survey crew including an instrument operator, competent assistants, and any instruments, tools, stakes, and other materials required to complete the survey, layout, and measurement of work performed by the CONTRACTOR.

1.4 DATUM PLANE

- A. All elevations indicated or specified refer to the North American Vertical Datum 1988 (NAVD 88), of the United States Coast and Geodetic Survey and are expressed in feet and decimal parts thereof, or in feet and inches.

1.5 PROTECTION OF SURVEY DATA

- A. General: Safeguard all points, stakes, grade marks, known property corners, monuments, and benchmarks made or established for the Work. Reestablish them if disturbed, and bear the entire expense of checking reestablished marks and rectifying work improperly installed.
- B. Records: Keep neat and legible notes of measurements and calculations made in connection with the layout of the Work. Furnish copies of such data to the ENGINEER for use in checking the CONTRACTOR's layout. Data considered of value to the County Manager or designee will be transmitted to the County Manager or designee by the ENGINEER with other records on completion of the Work.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 022200

PRE-CONSTRUCTION AUDIO-VIDEO RECORDING

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

- A. The work specified in this section includes the requirements for pre-construction audio-video recordings necessary to document existing conditions on public and private property.

PART 2 PRODUCTS

2.1 CONTRACTOR REQUIREMENTS

- A. The Contractor shall provide color videos showing pre-construction site conditions of all public and private property within the scope of construction. The videos shall be on DVD and electronic format indicating on the beginning and front of each DVD, the date, job title and location where the video was taken. The videos shall be clear and shall thoroughly document all existing structures and landscaping.
- B. Two copies of the DVD and one electronic copy (on a USB flash drive or other appropriate device) shall be delivered to the County Manager or designee for review.

PART 3 EXECUTION

3.1 INSPECTION

- A. Construction on private property shall not commence until the County Manager or designee has reviewed and approved the audio-video recording.

3.2 PERFORMANCE

- A. The Contractor may be required to restore private properties to conditions better than existing, at no additional cost to the COUNTY, if the Contractor fails to sufficiently document existing conditions.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 022501

LEAKAGE TESTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Testing for any signs of leakage in all pipelines and structures required to be watertight.
 - 1. Test gravity sewers and drain lines by infiltration/exfiltration testing.
 - 2. Test all other pipelines with water under the specified pressures.
- B. Operation of Existing Facilities: Conduct all tests in a manner to minimize as much as possible any interference with the day-to-day operations of existing facilities or other contractors working on the site.

1.2 PERFORMANCE REQUIREMENTS

- A. Written Notification of Testing: Provide written notice when the work is ready for testing, and make the tests as soon thereafter as possible.
 - 1. Personnel for reading meters, gauges, or other measuring devices, will be furnished.
 - 2. Furnish all other labor, equipment, air, water and materials, including meters, gauges, smoke producers, blower, pumps, compressors, fuel, water, bulkheads and accessory equipment.

1.3 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. AWWA C 600 - Installation of Ductile-Iron Water Mains and Their Appurtenances

1.4 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Testing Report: Prior to placing the sewer system in service submit for review and approval a detailed report summarizing the leakage test data, describing the test procedure and showing the calculations on which the leakage test data is based.
 - 1. Reference Sewer Line Data

- a. For Low Pressure Testing
 - (1) The length and diameter of the section of line tested (MH to MH), including any laterals.
 - (2) A complete description of the test procedure, including:
 - (a) Trench backfilling and sewer cleaning status
 - (b) Type of plugs used and where
 - (c) Depth of sewer, and ground water pressure over sewer pipe
 - (d) Stabilization time period and air pressure
 - (e) Actual air test pressures used if ground water is present
 - (f) The time allowed by specifications
 - (g) The actual test time
 - (h) The air pressure at beginning and end of test
 - (3) The name of the inspector/tester and the date(s) and time(s) of all testing performed, including any retesting.
 - (4) A description of any repairs made.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 LEAKAGE TESTING

- A. All new sewer and water pipelines installed shall be tested for leakage. The test used will be Hydrostatic Testing for pressure lines and Infiltration/Exfiltration Testing for gravity lines. Tests to be performed will be indicated by the ENGINEER and witnessed by the ENGINEER and the County Manager or designee.

- 1. Flushing

- a. Full-bore flush all mains to remove all sand and other foreign matter. Flushing shall be terminated at the direction of the ENGINEER. Dispose of the flushing water without causing nuisance or property damage. Full bore flushes on force mains shall only be required where sufficiently sized water mains are present.
- b. Install temporary flush out connections on all dead end water mains at the locations shown on plans and in accordance with the Collier County Standard Details.

2. Hydrostatic Testing for DIP and PVC Pipelines:

Perform hydrostatic testing of the system as set forth in the following, and conduct said tests in the presence of the County Manager or designee and other authorized agencies, with 48 hours advance notice provided.

Piping and appurtenances to be tested shall be within sections between valves unless alternate methods have received prior approval from the County Manager or designee. Testing shall not proceed until concrete thrust blocks are in place and cured, or other restraining devices installed. Thoroughly clean and flush all piping prior to testing to clear the lines of all foreign matter. While the piping is being filled with water care shall be exercised to permit the escape of air from extremities of the test section, with additional release cocks provided if required.

Perform hydrostatic testing with a sustained minimum pressure of 150 psi for a period of not less than two (2) hours. If sustained pressure goes 5 psi above or below 150 psi during the first two (2) hours, the test fails (AWWA regulation). After two (2) hours, use the AWWA formula if less than 5 psi to determine whether test fails. Testing shall be in accordance with the applicable provisions as set forth in the most recent edition of AWWA Standards C600 for Ductile Iron Pipe and C605 for PVC Pipe. The allowable rate of leakage shall be less than the number of gallons per hour determined by the following formula:

$$L = \frac{SD (P)^{1/2}}{133,200}$$

Where,

- L = Allowable leakage in gallons per hour;
- S = Length of pipe tested in feet;
- D = Nominal diameter of pipe in inches;
- P = Average test pressure maintained during the leakage test in pounds per square inch

For 150 psi, $L = (9.195 \times 10^{-5}) SD$

The testing procedure shall include the continued application of the specified pressure to the test system, for the one-hour period, by way of a pump taking supply from a container suitable for measuring water loss. The amount of loss shall be determined by measuring the volume displaced for the said container.

Should the test fail, repair the fault and repeat the test until results are within the established limits. Furnish the necessary labor, water, pumps, and gauges at specified location(s) and all other items required to conduct the required testing and perform necessary repairs.

General - All sanitary sewers and associated service lines shall be constructed watertight to prevent infiltration and/or exfiltration.

3. Hydrostatic Testing for HDPE Pipelines:

Perform hydrostatic testing of all HDPE pipelines as set forth in the following, and conduct said tests in the presence of the County Manager or designee and other authorized agencies, with 48 hours advance notice provided.

Provide all labor, equipment and material required for testing the pipeline upon completion of installation, pipe laying and backfilling operations, and placement of any required temporary roadway surfacing.

Disinfect all HDPE potable water mains prior to testing in accordance with the requirements of Section 025400 – Disinfection.

Test pipelines at 150 psi.

Field test all HDPE pipelines for leakage in accordance with manufacturer's recommendations for the size and class of pipeline installed. Unless other procedures recommended by the manufacturer are approved by the County Manager or designee, pressure test the pipeline as follows:

- a. Fill pipeline slowly with water. Maintain flow velocity less than two (2) feet per second.
- b. Expel air completely from the line during filling and again before applying test pressure. Expel air by means of taps at points of highest elevation.
- c. Apply initial test pressure and allow to stand without makeup pressure for two (2) to three (3) hours, to allow for diametric expansion or pipe stretching to stabilize.

- d. After this equilibrium period, apply the specified test pressure and turn the pump off. The final test pressure shall be held for not less than two (2) hours.
- e. Upon completion of the test, the pressure shall be bled off from the location other than the point where the pressure is monitored. The pressure drop shall be witnessed by the County Manager or designee at the point where the pressure is being monitored.

Allowable amount of makeup water for expansion of the pipeline during the pressure test shall conform to Table III, Test Phase Make-up Amount, contained in the manual "Inspections, Test and Safety Considerations" published by the Plastics Pipe Institute, Inc.

If any test of pipeline installed exceeds the amount of makeup water as allowed above, locate and repair the cause of leakage and retest the pipeline, without additional cost to the COUNTY. Repair all visible leaks regardless of the amount of leakage.

- 4. Force Main Pressure Testing: All force mains shall be subject to pressure testing at 150 PSI.

Allowable leakage on force mains shall be computed utilizing the standards for water loss in conformance with AWWA C600, the latest revision thereof.

- 5. Infiltration/Exfiltration Testing for Gravity Lines

The allowable limits of infiltration or exfiltration for the entire system, or any portion thereof, shall not exceed a rate of 50 gallons per inch of inside pipe diameter per mile of pipe per 24 hours. No additional allowance shall be made for house service lines. Any part of or all of the system shall be tested for infiltration or exfiltration, as directed by the ENGINEER or as required by the County Manager or designee. The procedures and limitations for conducting infiltration/exfiltration tests shall be established at the pre-construction conference on a project-by-project basis. Air testing of gravity sewer mains may be required. All testing shall be run continuously for 24 hours, unless the County Inspector can visually verify that this test duration is not required due to the observed infiltration/exfiltration rate. The amounts of infiltration or exfiltration shall be determined by pumping water into or out of calibrated drums, or by other methods approved by the Public Utilities Division, such as in-line V-notch weirs. Where infiltration or exfiltration exceeds the allowable limits specified herein, locate and repair the defective pipe, joints or other faulty construction at no additional cost to the COUNTY. If the defective portions cannot be located, remove and reconstruct as much of the work as is necessary in order to conform to the specified allowable limits. All visible leaks shall be repaired regardless of the amount of leakage. Provide all labor, equipment and materials required and conduct all testing required under the direction of the ENGINEER.

- a. Infiltration: Prior to testing for infiltration, the system shall be pumped out so that normal infiltration conditions exist at the time of testing. The cumulative results of the entire collection system results shall not be a satisfactory method for gauging infiltration compliance. Each sewer section between manholes must permit infiltration no greater than the maximum allowable, as specified above.
- b. Exfiltration: The exfiltration test, when required due to groundwater levels, will be conducted by filling the portion of the system being tested with water to a level 2 feet above the uppermost manhole invert in the section being tested. The cumulative results of the entire collection system results shall not be a satisfactory method for gauging exfiltration compliance. Each sewer section between manholes must permit exfiltration no greater than the maximum allowable, as specified above.

6. Low Pressure Air Testing

Contractor shall conduct air testing in accordance with ASTM specifications:

- a. ASTM C-828 – for clay pipes.
- b. ASTM C-924 – for concrete pipes.
- c. ASTM F-1417 – for plastic pipes.

When low pressure air testing of gravity sewer mains is specifically required, all testing shall be run continuously for 24 hours, unless the County Inspector can visually verify that this test duration is not required due to the observed infiltration/exfiltration rate.

When air testing is specifically required, after completing backfill of a section of gravity sewer line, conduct a Line Acceptance Test using low pressure air. The test shall be performed using the below stated equipment, according to state procedures and under the supervision of the ENGINEER and in the presence of the County Manager or designee, with 48 hours advanced notice.

- d. Equipment:
 - (1) Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be inspected.
 - (2) Pneumatic plugs shall resist internal bracing or blocking.
 - (3) All air used shall pass through a single control panel.

- (4) Three individual hoses shall be used for the following connections:
 - (a) From control panel to pneumatic plugs for inflation.
 - (b) From control panel to sealed line for introducing the low-pressure air.
 - (c) From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

e. Procedure:

All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked. Air shall be introduced into the plugs to 25 psi. The sealed pipe shall be pressurized to 5 psi. The plugs shall hold against this pressure without bracing and without movement of the plugs out of the pipe.

After a manhole-to-manhole reach of pipe has been backfilled and cleaned and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psi. Low-pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psi greater than the average back pressure of any ground water that may be over the pipe. At least two (2) minutes shall be allowed for the air pressure to stabilize. After the stabilization period (3.5 psi minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of the line being tested shall be termed "Acceptable", if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psi (greater than the average back pressure of any ground water that may be over the pipe) is greater than the time shown for the given diameters in the following table:

<u>Pipe Diameter In Inches</u>	<u>Minutes</u>
8	4.0
10	5.0
12	5.5
16	7.5
18	8.5
24	11.5

Time in Minutes = 0.472 D
D = Diameter of pipe in inches

In areas where ground water is known to exist, install capped pipe adjacent to the top of the sewer lines. This shall be done at the time of the sewer line is installed. Immediately prior to the performance of the Line Acceptance Test, the ground water shall be determined by removing the pipe cap, and a measurement of the height in feet of water over the invert of the pipe shall be taken. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. (For example, if the height of water is 11-1/2 feet, then the added pressure will be 5 psi. This increases the 3.5 psi to 8.5 psi, and the 2.5 psi to 7.5 psi. The allowable drop of one pound and the timing remain the same).

If the installation fails to meet this requirement, determine the source of the leakage and repair or replace all defective materials and/or workmanship, all at no additional cost to the COUNTY.

- B. DEP approval is required to use reclaimed (IQ) water for flushing and pressure testing of irrigation mains and potable water mains. The requirements for submitting a request to DEP are available from the County PUED.

3.2 LEAKAGE TESTS FOR STRUCTURES

- A. Structure Leakage Testing: Perform leakage tests of manholes, wet wells, tanks, vaults and similar purpose structures before backfilling, by filling the structure with water to the overflow water level and observing the water surface level for the following 24 hours.
 1. Make an inspection for leakage of the exterior surface of the structure, especially in areas around construction joints.
 2. If visible leaks appear, repair the structure by removing and replacing the leaking portions of the structure, waterproofing the inside, or by other methods approved.

3. Water for testing will be provided by the COUNTY at the CONTRACTOR's expense.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 024100

DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: All work necessary for the removal and disposal of structures, foundations, piping, equipment and roadways, or any part thereof including masonry, steel, reinforced concrete, plain concrete, electrical facilities, and any other material or equipment shown or specified to be removed.
- B. Basic Procedures and Schedule: Carry out demolition so that adjacent structures, which are to remain, are not endangered. Schedule the work so as not to interfere with the day-to-day operation of the existing facilities. Do not block doorways or passageways in existing facilities.
- C. Additional Requirements: Provide dust control and make provisions for safety.
- D. Related Work Specified in Other Sections Includes:
 - 1. Section 017416 – Site Clearing
 - 2. Section 020500 – Connection to Existing Systems

1.2 SUBMITTALS

- A. Provide all submittals, including the following, as specified in Division 1.
- B. Site Inspection: Visit the site and inspect all existing structures. Observe and record any defects that may exist in buildings or structures adjacent to but not directly affected by the demolition work. Provide the County Manager or designee with a copy of this inspection record and obtain the ENGINEER's and the County's Manager or designee approval prior to commencing the demolition.

1.3 QUALITY ASSURANCE

- A. Limits: Exercise care to break concrete well for removal in reasonably small masses. Where only parts of a structure are to be removed, cut the concrete along limiting lines with a suitable saw so that damage to the remaining structure is held to a minimum.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 EXAMINATION OF EXISTING DRAWINGS

- A. Available drawings of existing structures and equipment will be available for inspection at the office of the ENGINEER.

3.2 PROTECTION

- A. General Safety: Provide warning signs, protective barriers, and warning lights as necessary adjacent to the work as approved or required. Maintain these items during the demolition period.
- B. Existing Services: Undertake no demolition work until all mechanical and electrical services affected by the work have been properly disconnected. Cap, reroute or reconnect interconnecting piping or electrical services that are to remain in service either permanently or temporarily in a manner that will not interfere with the operation of the remaining facilities.
- C. Hazards: Perform testing and air purging where the presence of hazardous chemicals, gases, flammable materials or other dangerous substances is apparent or suspected, and eliminate the hazard before demolition is started.

3.3 DEMOLITION REQUIREMENTS

- A. Explosives: The use of explosives will not be permitted.
- B. Protection: Carefully protect all mechanical and electrical equipment against dust and debris.
- C. Removal: Remove all debris from the structures during demolition and do not allow debris to accumulate in piles.
- D. Abandoned Pipelines: Fill all abandoned pipelines using grout in accordance with Section 033100.
- E. Access: Provide safe access to and egress from all working areas at all times with adequate protection from falling material.
- F. Protection: Provide adequate scaffolding, shoring, bracing railings, toe boards and protective covering during demolition to protect personnel and equipment against injury or damage. Cover floor openings not used for material drops with material substantial enough to support any loads placed on it. Properly secure the covers to prevent accidental movement.
- G. Lighting: Provide adequate lighting at all times during demolition.

- H. Closed Areas: Close areas below demolition work to anyone while removal is in progress.
- I. Material Drops: Do not drop any material to any point lying outside the exterior walls of the structure unless the area is effectively protected.
- J. Chemicals: All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with manufacturer's instructions or government regulations as applicable.

3.4 ASBESTOS-CONCRETE (AC) PIPE

- A. If existing asbestos-cement pipe is encountered during the course of construction, remove the AC pipe and replace it with C900 PVC pipe having a pressure rating as required elsewhere in these specifications. Replace the AC pipe with PVC pipe for a distance of 10 feet each way from the centerline of the pipe under construction or 5 feet beyond the length of AC pipe exposed by trench excavation, whichever is greater. A change order will be issued for required replacement of AC pipe not shown on the drawings.
- B. Coordinate the shutdown of the AC pipeline with the County Manager or designee in accordance with Section 020500, including proper notice to the County Manager or designee and any customers that may be affected by the shutdown as required by these specifications and/or current Water Department policy. In the event of an unanticipated encounter with AC pipe, immediately recover and protect the pipe and notify the COUNTY Water Department.
- C. Perform cutting of AC pipe by means of cutting wheels mounted in a chain wrapped around the pipe barrel. Do not use power driven saws with abrasive discs or any other means that produce concentrations of airborne asbestos dust.

3.5 DISPOSAL OF MATERIALS

- A. Final Removal: Dispose of AC pipe in accordance with COUNTY special handling requirements and coordination with Collier County Solid Waste Management Department. Remove all other debris, rubbish, scrap pieces, equipment, and materials resulting from the demolition. Take title to all demolished materials and remove such items from the site.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 025400

DISINFECTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Disinfection of all pipelines, tanks, structures, conduits and equipment that are to store, handle or carry potable water. Furnish all labor, water, chemicals and equipment, including taps, corporation stops, temporary pumps and other items necessary to perform the Work, except as otherwise specified.

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. AWWA C651 - Disinfecting Water Mains
 - 2. AWWA C652 - Disinfection of Water-Storage Facilities

1.3 QUALITY ASSURANCE

- A. Disinfection Standards: Disinfect in accordance with AWWA C651 for water mains and AWWA C652 for water storage facilities and equipment.
- B. Chlorinated Water Disposal: Dispose of old highly chlorinated water in accordance with applicable regulations.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 FLUSHING

- A. After coordination with the COUNTY Water Distribution Section, perform all flushes, pigging or swabbing, disinfection and post flushes in the presence of Water department personnel. Fill all water lines with potable water, pig or swab and perform a line flushing. All lines larger than 12 inches in diameter shall be pigged to clear debris prior to flushing. Use a swab-type pig for HDPE pipe. Use a 5- to 7-lb. density poly-jacketed bullet style pig for all other pipe material. Under no circumstances is a pig or swab considered reusable. A section of pipe shall be

inserted in the gap specified in the jumper shown in the Standard Details to connect the new construction to the existing facilities for the purpose of accomplishing the full-bore flush. Immediately after completion of the flush, remove the connection. The facilities shall be capped and returned to the jumper connection shown in the Standard Details until final connection is permitted by County Manager or designee at the completion of construction and after finalization of all test procedures and bacterial clearance for new water facilities.

3.2 WATER MAIN DISINFECTION

- A. Following acceptable pressure testing, disinfect all sections of the water distribution system and receive approval thereof from the appropriate agencies, prior to placing in service. Provide advance notice of 48 hours to the County Manager or designee before disinfecting procedures start. The disinfection shall be accomplished in accordance with the applicable provisions of AWWA Standard C651, "Disinfecting Water Mains" and all appropriate approval agencies.
- B. The disinfecting agent shall be free chlorine in aqueous solution with sustained concentration for 48 hours of not less than 50 parts per million. After 48 hours, if chlorine solution contains at least 25 parts per million of chlorine, the line may then be flushed and samples taken at various points. Chlorine may be derived from Chlorine gas, or 70% (high test) calcium hypochlorite (HTH or Perchloron, or equal). Administration may be by any of the several methods described in AWWA Standard C651 as proposed by the CONTRACTOR and approved by the ENGINEER. Proposals as to method must be made prior to commencement of the disinfection process.
- C. Following contact with chlorine solution, the system shall be thoroughly flushed out. Schedule water sampling in coordination with the COUNTY Water Distribution Section. The COUNTY Water Department will obtain all water samples for analysis.
- D. If samples do not demonstrate satisfactory results, the line shall be flushed and a resample taken. If the samples fail on the second attempt, redisinfection per AWWA standards must be repeated until two satisfactory samples are obtained. The period between samples must be a minimum of 24 hours.
- E. After approval of the samples, and before placing the system in service, perform another flushing of the water lines to remove any stagnant water.

3.3 WATER MAIN DISINFECTION (FOR FIRE LINE CONNECTIONS WITH NO TEMPORARY JUMPER)

- A. In configurations where 20 feet or less of new pipe is installed between the existing COUNTY water main and the permanent above ground fire assembly, the temporary gap configuration assembly may be omitted if the following requirements are met:

1. The full interior of all new pipe between the existing COUNTY water main and the permanent above ground fire assembly shall be swabbed and disinfected using a chlorine solution with a concentration of not less than 200 parts per million.
2. The pipe must be flushed and bacteriological samples must be collected in accordance with this specification.
3. The tapping valve on the COUNTY water main shall remain closed until bacteriological clearance is achieved.

3.4 DISINFECTION PROCEDURES FOR TANKS

- A. Disinfect potable water storage tanks and equipment in accordance with AWWA C652, Method 2 or 3, using sodium hypochlorite.
 1. In Method 2, spray method, spray the entire interior surface of the tank with chlorinated water containing 200 mg/l of available chlorine. After spraying, allow the tank to stand at least two hours before filling with fresh water.
- B. After disinfection, allow the tanks and equipment to overflow until the chlorine residual is approximately 2 mg/l.

3.5 BACTERIAL SAMPLE POINTS

- A. For the purpose of new water main construction, bacterial sampling points shall be positioned at the beginning of each new system, at 1000-foot intervals and all dead ends unless otherwise directed. These sampling points will be utilized by Utilities personnel for water main bacterial clearance procedures. At the completion of the project, when authorization is given by the County Manager or designee, permanent sampling points shall remain every 3000 feet or one at 2/3 of the length from the point of connection to the COUNTY system if the line is less than 3000 feet long. All others shall be removed down to the main and properly capped by the CONTRACTOR. The permanent sampling points shall be constructed as shown in the Utility Detail Drawings. Collier County staff will review the permanent sampling point locations during final plans review.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 031100
CONCRETE FORMWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Provide concrete formwork for architectural concrete and structural concrete as specified to form concrete to profiles shown.
 - 1. Provide concrete with smooth rubbed finish.
 - 2. Structural concrete is defined as all concrete that is not architectural concrete.
- B. Related Work Specified in Other Sections Includes:
 - 1. Section 03200 - Concrete Reinforcement

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. ACI 318 - Building Code Requirements for Reinforced Concrete
 - 2. ACI SP-4 - Formwork for Concrete

1.3 SUBMITTALS

- A. Provide all submittals, including the following, as specified in Division 1.
 - 1. CONTRACTORS Shop Drawings: Proposed form layout drawings and tie pattern layout drawings for Concrete. Review of these drawings does not relieve the CONTRACTOR of responsibility for adequately designing and constructing forms.
 - 2. Samples: Pieces of each type of sheeting, chamfer strips, form ties, form liners and rustication strips

1.4 QUALITY ASSURANCE

- A. Formwork Compliance: Use formwork complying with ACI SP-4, ACI 347 and ACI 303R.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. For acceptable manufacturers of concrete release agent, concrete form coating, concrete form liners, or concrete rustications see County Approved Product List, Appendix F.

2.2 MATERIALS

- A. Structural Concrete: Provide structural concrete form materials as follows:
 - 1. Obtain approval for form material before construction of the forms.
 - 2. Use a barrier type form release agent.
 - 3. Use form ties, hangers, and clamps of such type that, after removal of the forms, no metal will be closer than one inch from concrete surface. Wire ties will not be permitted.
 - 4. Provide ties with swaged washers or other suitable devices to prevent seepage of moisture along the ties. Leave the ties in place.
 - 5. Use lugs, cones, washers, or other devices that do not leave holes or depressions greater than 7/8-inch in diameter.

PART 3 EXECUTION

3.1 DESIGN

- A. Design Responsibility: Be responsible for the design, engineering and construction of the architectural concrete formwork and the structural concrete formwork. Conform the work to the recommendations of ACI SP-4 and ACI 303R.
- B. Setting Time and Slag Use: The presence of fly ash or ground granulated blast furnace slag in the concrete mix for architectural concrete and structural concrete will delay the setting time. Take this into consideration in the design and removal of the forms.
- C. Responsibility During Placement: Assume and take sole responsibility for adequate design of all form elements for support of the wet concrete mixtures specified and delivered.
- D. Consistency: Design forms to produce concrete members identical in shape, lines and dimensions to members shown.

3.2 CONSTRUCTION DETAILS FOR FORMWORK

- A. Structural Concrete Details: Follow the following details for all structural concrete:
1. Provide forms that are substantial, properly braced, and tied together to maintain position and shape and to resist all pressures to which they may be subjected. Make forms sufficiently tight to prevent leakage of concrete.
 2. Determine the size and spacing of studs and wales by the nature of the work and the height to which concrete is placed. Make forms adequate to produce true, smooth surfaces with not more than 1/8-inch variation in either direction from a geometrical plane. Provide horizontal joints that are level, and vertical joints, which are plumb.
 3. Supply forms for repeated use in sufficient number to ensure the required rate of progress.
 4. Thoroughly clean all forms before reuse and inspect forms immediately before concrete is placed. Remove deformed, broken, or defective forms from the work.
 5. Provide temporary openings in forms at convenient locations to facilitate cleaning and inspection.
 6. Coat the entire inside surfaces of forms with a suitable form release agent just prior to placing concrete. Form release agent is not permitted on the reinforcing steel.
 7. Assume and take responsibility for the adequacy of all forms and remedying any defects resulting from their use.

3.3 FORM REMOVAL

- A. Structural Concrete Form Removal: Do not remove forms for structural concrete until the concrete has hardened sufficiently to support its own load safely, plus any superimposed load that might be placed thereon.

3.4 TOLERANCES

- A. Tolerance Limits: Design, construct and maintain concrete form and place the concrete to provide completed concrete work within the tolerance limits set forth in ACI SP-4.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 032000
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for providing concrete reinforcement as shown and specified herein. Reinforcement includes all steel bars, wire and welded wire fabric as shown and specified.
- B. Related Work Specified in Other Sections Includes:
 - 1. Section 031100 - Concrete Formwork
 - 2. Section 034100 - Precast Concrete Structures

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. ACI SP66 - ACI Detailing Manual
 - 2. ACI 318 - Latest edition "Building Code Requirements for Reinforced Concrete"
 - 3. ASTM A 185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
 - 4. ASTM A 615/A615M - Deformed and Plains Billet-Steel Bars for Concrete
 - 5. ASTM A 706/A706M - Low Alloy Steel Deformed Bars for Concrete Reinforcement
 - 6. ASTM A 775/A775M - Epoxy Coated Reinforcing Steel Bars
 - 7. AWS D1.4 - Structural Welding Code - Reinforcing Steel

1.3 SUBMITTALS

- A. Provide all submittals, including the following, as specified in Division 1.
 - 1. Product Data and Information: Submit manufacturers literature with product data, and material description of fusion bonded epoxy coating for reinforcement and reinforcement accessories, including manufacturer's

recommendations for field touch-up of mars and cut ends when epoxy coated reinforcement is specified to be used.

2. CONTRACTORS' Shop Drawings: Submit checked Working Drawings, including bar lists, schedules, bending details, placing details and placing plans and elevations for fabrication and placing reinforcing steel conforming to "ACI Detailing Manual SP-66".
 - a. Do not bill wall and slab reinforcing in sections. Show complete elevations of all walls and complete plans of all slabs, except that, when more than one wall or slab are identical, only one such elevation or plan is required. These plans and elevations need not be true views of the walls or slabs shown. Bill every reinforcing bar in a slab on a plan. Bill every reinforcing bar in a wall on an elevation. Take sections to clarify the arrangement of the steel reinforcement. Identify all bars, but do not bill on such sections.
 - b. For all reinforcing bars, unless the location of a bar is clear, give the location of such bar or bars by a dimension to some structural feature that will be readily distinguishable at the time bars are placed.
 - c. Make the reinforcing steel placing drawings complete for placing reinforcement including the location of support bars and chairs, without reference to the design drawings.
 - d. Submit Detailer certification that every reinforcing steel placing drawing and bar list is completely checked and corrected before submittal for approval.
 - e. If, after reinforcing steel placing drawings and bar lists have been submitted for approval, a review reveals that the drawings and lists obviously have not been checked and corrected they will be returned for checking and correcting by the Detailer.
3. Samples: Submit the following samples when epoxy coated reinforcement is specified to be used.
 - a. 12-inch long epoxy-coated steel reinforcing bar, of any size typical to this Project
 - b. One of each type of epoxy-coated reinforcement accessory used on this Project
 - c. 12-inch long, nylon coated tie wire
4. Certificates: Test certificates of the chemical and physical properties covering each shipment of reinforcing steel bars. Test for bars 3/4 inches in diameter and larger shall consist of the bar being bent cold to 90 degrees

around a pin 3 times the diameter of the test bar without evidence of cracking.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle all products and materials as specified in Division 1 (and as follows:)
 - 1. Delivery Requirements: Have reinforcing steel delivered to the work in strongly tied bundles. Identify each group of both bent and straight bars with a metal tag giving the identifying number corresponding to the reinforcing steel placing drawings and bar lists.
 - 2. Storage: Properly store all bars in an orderly manner, with all bars completely off the ground. Keep bars clean after delivery to the site of the work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. The brand of manufacturer shall be legibly rolled on all bars, and when loaded for mill shipment, all bars shall be properly separated and tagged with manufacturer's test identification number.
- B. For acceptable manufacturers of mechanical connections see County Approved Product List, Appendix F.

2.2 MATERIALS

- A. Steel Bars: Use new billet steel bars, deformed bars, meeting the requirements of ASTM A615/A625M Grade 60 for reinforcing steel bars.
 - 1. Roll all reinforcing steel bars with special deformations or identifying marks indicating the ASTM Specification and Grade.
 - 2. Use bars free from defects, kinks and from bends that cannot be readily and fully straightened in the field.
 - 3. Supply reinforcing bars in lengths that will allow convenient placement in the work and provide the required length of at least 40 diameters of lap of joints as shown. Provide dowels of proper length, size and shape for tying walls, beams, floors, and the like together.
- B. Epoxy Coating: Conform fusion bonded epoxy coated reinforcing steel bars to ASTM A775/A775M when used. Leave portions of the reinforcing steel bars uncoated where mechanical connections are shown.

- C. Welded Wire Fabric: Use welded wire fabric of the electrically welded type, with wires arranged in rectangular patterns, of the sizes shown or specified and meeting the requirements of ASTM A185.
- D. Supports and Accessories: Provide bar supports and other accessories and, if necessary, additional supports to hold bars in proper position while concrete is being placed.
 - 1. Use side form spacers against vertical or sloping forms to maintain prescribed side cover and cross position of bars.
 - 2. Use individual hi-chairs with welded cross ties or circular hoops to support top bars in slabs thicker than 8 inches.
 - 3. Bolsters, chairs and other accessories:
 - a. Use hot-dipped galvanized or provide plastic coated legs when in contact with forms for surfaces of concrete other than architectural surfaces.
 - b. Use stainless steel when in contact with forms for architecturally exposed surfaces.
 - c. Use epoxy coated bolsters, chairs and accessories including wire ties for epoxy coated reinforcing bars.
 - d. Use chairs of an approved type and space them properly to support and hold reinforcing bars in position in all beams and slabs including slabs placed directly on the subgrade or work mat. Do not use continuous hi-chairs for supporting of top bars in slabs over 8 inches in thickness.
- E. Mechanical Connections: Provide mechanical connections that develop at least 125 percent of the specified yield strength of the bar in tension.
- F. Stirrups and Ties: Provide stirrups and ties as shown and specified and meeting the requirements of ASTM A185.

2.3 FABRICATION

- A. Drawing Review Prior to Fabrication: Do not fabricate any material before final review and approval of shop drawings.
- B. Bending and Cutting: Cut bars to required length and bend accurately before placing. Bend bars in the shop unless written approval for field bending is obtained. If field bending is permitted, do it only when the air temperature, where

the bending operation is performed, is above 30 degrees F. Do not field bend bars that have been partially embedded in concrete.

- C. Splices: Use lapped splices for tension and compression splices unless otherwise noted.
- D. Cleaning: Clean and bend reinforcement in accordance with ACI 315 and ACI 318.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Placement: Place all bars in accordance with CRSI "Recommended Practice for Placing Reinforcing Bars".
- B. Tolerances: Place bars used for top reinforcement in slabs to a vertical tolerance of plus or minus 1/4-inch. Place all other reinforcement to the tolerances given to ACI 318.
- C. Cleaning: Have reinforcing steel delivered without rust other than that accumulated during transportation to the work. At all times, fully protect reinforcing steel from moisture, grease, dirt, mortar and concrete. Before being placed in position, thoroughly clean reinforcing steel of all loose mill scale and rust and of any dirt, oil, grease coatings, or other material that might reduce the bond. If there is a delay in depositing concrete, inspect and satisfactorily clean the steel immediately before the concrete is placed.
- D. Bar Positioning: Place bars in the exact positions shown with the required spacing and cross wire bars securely in position at intersections to prevent displacement during the placing of the concrete. Fasten the bars with annealed wire of not less than 17 gauge or other approved devices.
- E. Bar Extension Beyond Formwork: On any section of the work where horizontal bars extend beyond the length of the forms, perforate the form or head against which the work ends or at the proper places to allow the bars to project through a distance at least equal to the lap specified.
- F. Unacceptable Materials: Do not place reinforcing steel with damaged, unsuitably bonded epoxy coating or rusting. If approved, mars, exposed threads of mechanical connections and cut ends may be field coated with approved epoxy coating material.
- G. Review of Placement: Have reinforcing placement reviewed by the ENGINEER before concrete is placed.

- H. Welding - Not Approved: Do not use reinforcing bar assemblies made by welding of any kind, or accessories of any kind which require field welding to reinforcing bars.
- I. Welding - Approved: Where welding of reinforcing steel is shown, AWS D1.4 "Structural Welding Code - Reinforcing Steel" applies.
- J. Tension and Compression Lap Splices: Conform tension and compression lap splices to ACI 318 with all supplements. Avoid splices at points of maximum tensile stress wherever possible. Provide temperature bars with the clear spacing shown. Stagger all bar splices in hoop tension bars in circular tanks with not more than 50 percent of the bars spliced in any one direction. Have welded splices made by certified welders in accordance with AWS D1.4.
- K. Welded Wire Fabric: Place welded wire fabric in the positions shown, specified or required to fit the work. Furnish and place suitable spacing chairs or supports, as specified for bars, to maintain the fabric in the correct location. Where a flat surface of fabric is required, provide flat sheets, when available. Otherwise reverse roll the fabric or straighten to make a perfectly flat surface before placing. Obtain approval for the length of laps not indicated.
- L. Concrete Cover: Place reinforcing steel and welded wire fabric and hold in position so that the concrete cover, as measured from the surface of the bar or wire to the surface of the concrete, is as shown or specified.

END OF SECTION

SECTION 033100

CONCRETE, MASONRY MORTAR AND GROUT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Cement, sand, aggregate admixtures and water for use in concrete, masonry mortar and grout.

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. ASTM C 91 – Masonry Cement
 - 2. ASTM C 144 – Aggregate for Masonry Mortar
 - 3. ASTM C 150 – Portland Cement
 - 4. ASTM C 207 – Hydrated Lime for Masonry Purposes
 - 5. ASTM C 270 – Mortar for Unit Masonry
 - 6. ASTM C 231 – Air Content of Freshly Mixed Concrete
 - 7. ASTM C 404 – Aggregate for Masonry Grout
 - 8. ASTM C 476 – Grout for Masonry
 - 9. ASTM C 780 – Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
 - 10. ASTM C 1019 – Sampling and Testing Grout
 - 11. CRD C-619 – Specification for Grout Fluidifier.
 - 12. CRD C-621 – Specification for Non-Shrink Grout.
 - 13. Brick Institute of America Research Report No. 15
 - 14. ACI 530.1/ASCE 6-92 – Specifications for Masonry Structures

1.3 SUBMITTALS

- A. Provide all submittals, including the following, as specified in Division 1.

B. Product Data and Information: Submit the following:

1. Furnish notarized certificates of manufacture as evidence that the cement conforms to the specified requirements. Include mill-test reports on the cement.
2. Furnish notarized certificates to verify that the hydrated lime and aggregates meet the specified requirements.
3. Furnish laboratory tests as evidence that the air content and masonry mortar compressive strength meet the requirements of ASTM 270 Type N and that the efflorescence tendency meets the requirements of the wick test in Brick Institute of America Research Report No. 15.
4. Furnish laboratory tests as evidence that the masonry grout compressive strength is equal to or greater than 2,500 psi at 28 days.

1.4 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all mortar and grout materials as recommended by the manufacturers and as specified in Division 1 (and as follows:)
- B. Cement: Store cement in weathertight buildings that will exclude moisture and contaminants. Do not use cement that has deteriorated from storage.
- C. Hydrated Lime: Store hydrated lime in weathertight buildings which will exclude moisture and contaminants.
- D. Aggregates: Keep aggregates clean and free from all other materials during transportation and handling. Stockpile aggregate in a manner to prevent segregation.

PART 2 PRODUCTS

2.1 CEMENT

- A. Portland Cement shall be of a standard brand and shall conform to the requirements of ASTM C150-latest edition, except as hereinafter stated. One bag of cement shall be considered as weighing 94 pounds. Type I shall be used unless higher cement is specified, in which event Type III shall be used. For Type I, the maximum amount of tricalcium silicate shall be 60 percent. Cement may be shipped either in paper or cloth sacks and the package shall have the brand and name of manufacturer plainly marked on the outside. All cement shall be stored in weatherproof buildings in such a manner as will prevent absorption of moisture by the lower layers. Shipment shall be segregated by lot for identification. Type I

cement which has been in storage more than 90 days shall be re-tested before use. Where carload shipments are used, a certificate from an approved testing laboratory shall be submitted prior to use of such cement on the job.

2.2 AGGREGATE

A. Fine Aggregate:

1. Composition: Fine aggregate shall consist of natural sand and shall be graded from coarse to fine within the following limits shown in the table below. Sand failing to meet the minimum requirement for material passing the Number 50 and/or Number 100 Sieve may be used, provided other satisfactory inorganic fine materials are added. If two sands are used, each must be mixed, after separate weighing, in proportions approved by the County Manager or designee.

U.S. Standard Square Opening Sieve	Percent of Total By Weight Passing	
	Minimum	Maximum
No. 4	97	100
No. 8	80	100
No. 30	25	75
No. 50	10	30
No. 100	2	10
No. 200 (By Washing)	0	4

2. Stockpiling: Fine aggregate shall be stored on a well-drained site, which has been cleared, grubbed and cleaned. Stockpiles shall be built up so as to prevent segregation of large and small particles.
3. Unsuitable Materials in Fine Aggregate: Not more than one percent (1%) by weight of clay lumps or soft, disintegrated or coated grains shall be present in the fine aggregate. It shall also be free from foreign material such as dirt, wood, paper, burlap, or other unsuitable material. When tested in accordance with AASHTO T-21-27, it shall show a color not darker than standard. When tested for mortar strength in accordance with AASHTO T-71-38, the fine aggregate shall have a tensile strength at three (3) days (Type III), or at seven (7) days, (Type I); not less than 95 percent of that developed by mortar having the same water-cement ratio and consistency, made of the same cement and graded Ottawa Sand having a fineness modulus of 2.40, plus or minus 0.05.

B. Coarse Aggregate:

1. Composition: Coarse aggregate shall consist of crushed stone. It shall be washed to remove clay, loam and dust. At his/her discretion, the County Manager or designee may waive the washing requirement for stone having a loss of not more than 30 percent when tested in accordance with the provisions of AASHTO T-96-38.
2. Unsuitable Material in Coarse Aggregate: The coarse aggregate shall not contain more than the following percentages of deleterious material:

Soft Fibrous, Disintegrated Particles (Weight)	3.0%
Clay Lump (Weight)	0.2%
Finer Than No. 200 Sieve (Weight)	0.5%
Flat or Elongated Particles (Count)	10.0%

When subjected to AASHTO Test T-96-38, the aggregate shall have a loss not greater than 65 percent. Aggregate shall be free from loam, wood, leaves, or other foreign material.

3. Gradation: For unreinforced foundations, for paving or for other unreinforced mass concrete, the gradation of coarse aggregate shall be as shown in Table 1. For reinforced footings, reinforced walls over 6" in thickness, ordinary floor slabs and similar structures, the gradation shall be as shown on Table 2. For handrails, reinforced walls, thin reinforced floor slabs electrical conduit encasement, and similar construction, the gradation shall be as shown on Table 3.

Table 1	
Percent Passing Square Opening Sieve	Percent By Weight
2-1/2 inch	100
2 inch	95 – 100
1 inch	35 – 70
1/2 inch	10 – 30
No. 4	0 – 5

Table 2	
Percent Passing Square Opening Sieve	Percent By Weight
1-1/2 inch	100
1 inch	90 – 100
1/2 inch	25 – 60
No. 4	0 – 10
No. 8	0 – 5

Table 3

Percent Passing Square Opening Sieve	Percent By Weight
1 inch	100
¾ inch	90 – 100
3/8 inch	20 – 55
No. 4	0 – 10
No. 8	0 – 5

4. Stockpiles: Stockpiles shall be constructed in layers not exceeding three feet (3') in height, and material shall be deposited in such manner as to prevent segregation of coarse and fine materials. Each type of aggregate shall be placed in a separate stockpile. Stockpile sites shall be cleared, grubbed and drained before using.

2.3 HYDRATED LIME

- A. Provide hydrated lime meeting the requirements of ASTM C 207.

2.4 WATER

- A. Water shall be clean and free from salt, oil or organic substances. Laboratory tests shall be made to determine suitability of any water for use in concrete unless it is secured from a public water supply.

PART 3 EXECUTION

3.1 CONCRETE PROPORTIONING

- A. Concrete aggregate shall be proportioned by weight. When the sources of supply shall have been determined by the CONTRACTOR and approved by the County Manager or designee, the mix shall be set by an approved testing laboratory. Mix shall be designed for a "slump" suitable for the character of structure in which the concrete is to be incorporated. All concrete shall be as specified herein.
- B. After a suitable design mix has been approved by the County Manager or designee, it shall not be changed so long as materials of the same characteristics are used in the mix. Within the limits of the various cement factors shown above, the mix shall be varied until the homogenous workable mixture, suitable for the class of structure intended, has been obtained.

3.2 CONCRETE MIXING

- A. Concrete mixing shall be by means of a modern batch mixer equipped with accurately operating water measuring device and an automatic time locking device.

- B. Where a central batching plant is not operated, each mixer must have available an approved portable weighing device for use in proportioning. Each batch shall be mixed for one and one-half (1½) minutes after charging has been completed, and during such mixing period, that drum shall operate with a peripheral speed of not less than one-hundred and fifty-three (153), nor more than two-hundred and twenty-five (225) feet per minute. The number of revolutions per minute shall be between fourteen (14) and twenty (20). Retempering concrete or use of concrete in which initial set has taken place will not be allowed. Transit mixed concrete from an approved batching plant and suitable truck mixer may be approved by the County Manager or designee.

3.3 PIPE GROUT

- A. Mix lean grout for backfilling the space surrounding the pipe sections in tunnel or other areas as specified or directed in the proportion of 1 part Portland cement to 12 parts sand by volume.
- B. Mix grout to a consistency that can be pumped into the pipe. Use a grout fluidifier to reduce water quantity and improve workability.

3.4 TESTING

- A. Masonry Mortar: Make and test specimens for preconstruction and construction evaluation of masonry mortar in accordance with the requirements of ASTM C 780.
- B. Masonry Grout: Make and test specimens for preconstruction and construction evaluation of masonry grout in accordance with the requirements of ASTM C 1019.
- C. Concrete shall contain cement, coarse aggregate, and fine aggregate meeting the Specifications contained in previous paragraphs of this Part. Unless otherwise specified or shown in the plans, the design strength of the several elements included in the plans shall be:
 - 1. Four thousand (4,000) pounds minimum compressive strength per square inch at 28 days for all piers, reinforced walls, floors, slabs, precast structures and other special sections where specifically shown on the plans or Standard Details.
 - 2. Two thousand five hundred (2,500) pounds minimum compressive strength per square inch at 28 days for all blocking, reinforced footings, for retaining walls not subject to hydrostatic pressure, or where specifically shown on the plans or shown in the Standard Details.

END OF SECTION

SECTION 034100

PRECAST CONCRETE STRUCTURES

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Furnish all materials, labor, and equipment and construct manholes, wet wells, valve pits, meter pits, and accessory items, consisting of precast sections as shown on the Drawings and as specified herein.
- B. The forms, dimensions, concrete, and construction methods shall be approved by the ENGINEER in advance of construction.
- C. These specifications are intended to give a general description of what is required, but do not purport to cover all of the structural design details which will vary in accordance with the requirements of the equipment as offered. It is, however, intended to cover the furnishing, shop testing, delivery, and complete installation of all precast structures whether specifically mentioned in these specifications or not.
- D. The supplier of the precast manholes, wet wells, valve pits, meter pits, and accessory items shall coordinate his work with that of the CONTRACTOR to the end that the unit will be delivered and installed in the excavation provided by the CONTRACTOR, in accordance with the CONTRACTOR's construction schedule.
- E. Coordinate the precast structures fabrication with the equipment supplied to achieve the proper structural top slab openings, spacings, and related dimensions for the selected equipment frames and covers. The top slabs, frames, covers, and subsurface structures shall be capable of supporting a live load of 150 pounds per square foot.

1.2 SUBMITTALS

- A. Submit to the ENGINEER, as provided in the General Conditions, shop drawings showing details of construction, reinforcing and joints.
- B. Shop Drawings
 - 1. Content
 - a. Dimensions and finishes
 - b. Estimated camber

- c. Reinforcing and connection details
 - d. Anchors
 - e. Lifting and erection inserts
 - f. Other items cast into members
2. Show location of unit by same identification mark placed on member.
 3. Include design calculations.
- C. Manufacturer's Literature: Manufacturer's recommended installation instructions.
 - D. Manufacturer's certificates of material conformance with specifications.
 - E. Test Reports: Reports of tests on concrete.
 - F. Testing
 1. Manholes and Valve Vaults: Four (4) concrete test cylinders shall be taken for every 50 cubic yards (cu. yds) for each type of precast structure.
 2. Pump Stations: Four (4) concrete test cylinders shall be taken for each pump station wet well. Four (4) concrete test cylinders shall be taken for each pump station's top and bottom slabs.
 3. Certification: The supplier shall provide the certified results of testing (7 day, 28 day) for the test cylinders stated herein. Random test cylinders may be taken at any time by the ENGINEER at the COUNTY's expense.

1.3 INSPECTION

- A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the ENGINEER, or the County Manager or designee. Such inspection may be made at the place of manufacture, or at the site after delivery, or at both places, and the sections shall be subject to rejection at any time on account of failure to meet any of the Specification requirements; even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All sections which have been damaged after delivery will be rejected, and if already installed, shall be repaired, if permitted and accepted by ENGINEER, or removed and replaced, entirely at the CONTRACTOR's expense.
- B. At the time of inspection, the sections will be carefully examined for compliance with ASTM C478 designation and these Specifications, and with the approved

manufacturer's drawings. All sections shall be inspected for general appearance, dimension, "scratch-strength", blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.

- C. Imperfections may be repaired, subject to the approval of the ENGINEER, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at the end of 7 days and 5,000 psi at the end of 28 days, Epoxy mortar may be utilized for repairs subject to the approval of the ENGINEER.

PART 2 PRODUCTS

2.1 PRECAST CONCRETE WET WELLS AND VALVE VAULTS

- A. Precast submersible pump station wet wells shall consist of precast base, precast wet well sections, and top cover slab. Precast valve vaults shall consist of precast base, sidewalls and top slab. Concrete shall be air entrained at the time of delivery and shall have a minimum compressive strength of 4,000 psi at the end of 28 days.
- B. Joints between precast concrete sections shall be set by plastic shims and fitted with non-metallic non-shrink grout as shown on the drawings.
- C. The top slab sections shall be fitted with watertight hatches. The frames and covers will be sized for the openings shown on the drawings.
- D. The various precast sections should have the inside dimensions and minimum thickness of concrete as indicated on the drawings. All precast and cast-in-place concrete members shall conform to the Building Code Requirements for Reinforced Concrete ACI 318.
- E. A vent pipe shall be furnished and installed as shown on the drawings.
- F. Fillets shall be provided and installed in the wet wells as shown on the drawings.
- G. Precast structures shall be constructed to the dimensions as shown on the drawings and as specified in these Specifications.
- H. Type II cement shall be used except as otherwise approved.
- I. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section.
- J. Sections shall be cured by an approved method and shall not be shipped until the minimum 7-day compressive strength has been attained.

- K. Each pre-cast section manufactured in accordance with the drawings shall be clearly marked to indicate the intended pump station installation location. The CONTRACTOR shall be responsible for the installation of the correct pre-cast sections in their designated pump station locations.
- L. Paint all exterior surfaces with two coats of coal tar bitumastic, each coat to be 9 mils each. All interior surfaces of valve vaults shall be coated with two coats of coal tar epoxy (9 mils each).

2.2 PRECAST CONCRETE SECTIONS FOR CIRCULAR WET WELLS

- A. Wet wells shall meet the requirements of ASTM C478, Specification for Precast Reinforced Concrete Manhole Sections, with the exclusion of Section 10(a), except as modified herein. Cement shall meet the requirements of ASTM C150-74, Specification for Portland Cement, Type II. Concrete shall meet the minimum requirement for 4000 psi concrete. Minimum wall thickness shall be 8 inches or 1/8 the inside manhole diameter as shown, whichever is greater. The required minimum strength of concrete shall be confirmed by making and testing three standard cylinders at seven days. Rings shall be custom made with openings to meet indicated pipe alignment conditions and invert elevations. Submit shop drawings, consisting of manufacturers' standard details of various sections for approval prior to placing order for wet wells. Drawings of individual wet wells showing invert elevations, pipe sizes and similar details will not be required.

- B. Joints

Form joint contact surfaces with machined castings. Surfaces shall be exactly parallel with nominal 1/16 inch clearing and the tongue equipped with a proper recess for the installation of an O-ring rubber gasket. Gaskets shall meet the requirements of Specification for Joint for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets. "RAM-NEK" sealing compound conforming to Federal Specification SSS-00210 (GSA-FSS), Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints may be used in lieu of O-ring rubber gaskets. If joints are sealed with "RAM-NEK" sealing compound the recess in the tongue for an O-ring gasket may be omitted.

- C. Wet Well Liners and Coatings

Coat or line (see internal protection on County Approved Product List, Appendix F) the interior of all wet wells.

Furnish, install, test and inspect liners and coating in accordance with manufacturer's recommendations, and in accordance with Section 099723 "Concrete Coatings". Extend coating and liner and seal onto wet well hatch frame, around pipe openings and other protrusions to prevent contact of wet well surface

with corrosive sewer gases. Provide factory or field applied bituminous or epoxy sealer exterior coatings. If exterior coating is factory applied, CONTRACTOR shall provide field touch-up as required.

D. STEEL REINFORCED POLYMER CONCRETE STRUCTURES

As an alternative to the concrete coatings and linings described above, steel reinforced polymer concrete structures may be furnished and installed for pump station wet wells. All steel reinforced polymer concrete structures shall be supplied by a qualified company with a minimum of 5 years' experience manufacturing polymer concrete. All steel reinforced polymer concrete structures shall be manufactured and installed in accordance with the applicable requirements of ASTM C76, C478, C443, D6783, C33, C267, A82, A165, A496, A497, A615, and A615M.

2.3 PIPE CONNECTIONS AT STRUCTURES

- A. Where pipes are to extend into or through structures from the exterior, provide flexible connections (mechanical or push-on type joints) at the exterior wall face.
- B. For pipes passing through structural walls, install wall pipes with water stops where the location is below the surface of the ground or at any point where fluid levels will exceed that elevation. Neoprene sleeves with watertight caulking and 316 Series SS stainless steel clamps will be suitable at other locations.
- C. All of the following conditions apply to any proposed pipe penetration into an existing sanitary manhole:
 - 1. The opening for the penetration must be core bored and fitted with a neoprene sleeve as specified above.
 - 2. The core boring or penetration shall not affect a structural joint, and the boring edge must be no closer than six inches to an existing structural joint.
 - 3. The proposed piping within the manhole must comply with all other provisions of these Utilities Standards.
 - 4. Connections requiring drop pipes shall be constructed in accordance with these Utilities Standards and shall require two penetrations.
 - 5. The existing manhole flume or invert must be modified as required to accept the discharge from the proposed pipe.
 - 6. The interior lining of the existing structure including flume or invert shall be repaired by an approved applicator for the lining system.

7. Any damage to the exterior coating of the existing structure shall be repaired with two coats of coal tar epoxy (9 mils each) in accordance with the manufacturer's recommendations.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Control ground water to provide firm, dry subgrade for the structure, and prevent water rising on new poured in place concrete or grouted joint sections within 24 hours after placing. Guard against flotation or other damage resulting from ground water or flooding.
- B. Place a 12-inch layer (minimum thickness) of crushed stone or shell as specified under Section 312323 as a foundation for the wet well base slabs, valve pits, and meter pits.
- C. Provide backfill material around the wet well and above the pipe bedding as specified in Section 312323.
- D. Precast bases, conforming to all requirements of ASTM C478 and above listed requirements for precast sections, may be used. Set the base in place on a thoroughly compacted crushed stone sub-base and adjust grade for the correct structure elevation.
- E. Do not set the station into the excavation until the installation procedure and excavation have been approved by the County Manager or designee.
- F. The base may be cast-in-place concrete as specified in Division 3, placed on a thoroughly compacted crushed stone sub-base. Shape the tops of the cast-in-place bases to mate with the precast barrel section, and adjust in grade so that the top slab section is at the approximately correct elevation.
- G. Set the precast concrete structure sections so as to be vertical and with sections in true alignment with a 3 inch maximum tolerance to be allowed. Fill the outside and inside joint with a non-shrink grout and finish flush with the adjoining surfaces. Allow joints to set for 24 hours before backfilling. Backfill in a careful manner, bringing the fill up evenly on all sides. If leaks appear in the structures, caulk the inside joints with lead wool to the satisfaction of the ENGINEER. Install the precast sections in a manner that will result in a watertight joint.
- H. Plug holes in the concrete sections required for handling or other purposes with a non-shrinking grout or by grout in combination with concrete plugs.

SECTION 055600
METAL CASTINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Miscellaneous ferrous and nonferrous castings.
1. This classification includes wheel guards, valve boxes, manhole frames and covers, manhole steps, stop plank grooves, brackets and supports for piping and gutter inlets, floor drains, cleanouts and special malleable iron castings and inserts.

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
1. ASTM A 27/A27M - Specification for Steel Castings, Carbon for General Applications
 2. ASTM A 47 - Specification for Ferric Malleable Iron Castings
 3. ASTM A 48 - Specifications for Gray Cast Iron Castings
 4. ASTM A 148/A148M - Specifications for Steel Castings
 5. ASTM A 536 - Specifications for Ductile Iron Castings
 6. ASTM B 26/B26M - Aluminum
 7. ASTM B 148 - Aluminum Bronze Sand Castings
 8. ASTM B 584 - Manganese Bronze

PART 2 PRODUCTS

2.1 WORKMANSHIP

- A. Provide castings accurately made to the approved dimensions, and plane or grind castings where marked or where otherwise necessary to secure flat and true surfaces. Make allowance in the patterns so that the specified thickness is not reduced. Provide manhole covers which conform to the details shown and which are true and seat at all points. Supply castings showing the name of the manufacturer and the country of manufacture. No plugging or welding of defective castings will be permitted.

2.2 WEIGHTS

- A. Reject castings with a weight which is less than the theoretical weight based on required dimensions by more than 5 percent. Provide facilities at the site for weighing castings in the presence of the ENGINEER, or furnish invoices showing true weights, certified by the supplier.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Erect all castings to accurate grades and alignment, and when placing in concrete carefully support castings to prevent movement during concreting.

3.2 PAINTING

- A. Deliver all manhole castings to the job site unpainted. If painting is specified, clean metal castings thoroughly before painting. Give manhole frames and covers and valve boxes one coat of primer and two coats of an approved asphaltum varnish or other approved coating at the point of manufacture. Paint all other castings as specified in the Collier County Standard Details.

END OF SECTION

SECTION 099723

CONCRETE COATINGS

PART 1 SEWPERCOAT LINING SYSTEM / IET COATING SYSTEM / RAVEN 405 LINING SYSTEM

1.1 SCOPE OF WORK

- A. This section provides details for furnishing and installing the SewperCoat lining system where shown on the drawings for protection of concrete structures against hydrogen sulfide corrosion. Perform installation by workers experienced in the application of the lining system to be used.
- B. This section provides details for furnishing and installing the Integrated Environmental Technologies (IET) coating system where shown on the drawings for protection of concrete structures against hydrogen sulfide corrosion. Perform installation by workers experienced in the application of the coating to be used.
- C. This section provides details for furnishing and installing the Raven 405 coating system where shown on the drawings for protection of concrete structures against hydrogen sulfide corrosion. Perform installation by workers experienced in the application of the coating system to be used.
- D. For sanitary sewer wet wells and manholes, steel reinforced polymer concrete structures may be provided in lieu of concrete coatings and linings as described in this section. See Sections 034100 and 333913 for further details and requirements.

PART 2 PRODUCTS

2.1 SEWPERCOAT LINING SYSTEM

- A. The SewperCoat (calcium aluminate) lining system shall be as manufactured by Lafarge Calcium Aluminates, Chesapeake, VA.
- B. Pure-fused Calcium Aluminate Cement Lining: The cement lining material shall be a pure fused calcium aluminate mortar with pure fused calcium aluminate aggregate equal to SewperCoat as manufactured by Lafarge Calcium Aluminates, Inc. The material shall be spray applied in accordance with the manufacturer's specifications.
 - 1. The material shall be packaged from the manufacturer so as not to require field mixing of mortar and aggregate to obtain recommended composition.
 - 2. The material shall form a mechanical and chemical bond to the wetwell surface with zero shrinkage. The material shall have a minimum 28-day compressive strength of 9000 psi.

3. The material shall be suitable for use in a severe hydrogen sulfide (H₂S) environment.
4. Provide documentation that the material has a minimum 5-year history in the reconstruction of sanitary sewer structures.

2.2 IET COATING SYSTEM

- A. The IET Coating System shall be as manufactured by Integrated Environmental Technologies, Santa Barbara, CA.
- B. Polymorphic Resin shall be a 100% solids, two-component, highly modified polyester resin system, exhibiting no adhesion-interfering shrinkage upon curing. Resin shall cure rapidly within fifteen minutes to one hour without the use of heat or cooling at surface temperatures ranging from -30 degrees Fahrenheit to over +150 degrees. Excellent resistance to a broad range of corrosive chemicals, including sulfuric acid created by hydrogen sulfide gas as well as other chemicals typically found in sanitary sewers, and impact and abrasion attack shall be provided.

2.3 RAVEN 405 COATING SYSTEM

- A. The RAVEN 405 coating system shall be as manufactured by Raven Lining Systems, Broken Arrow, OK.
- B. Raven 405 coating shall be 100% solids, solvent-free ultra high-build epoxy system exhibiting the following characteristics:
 1. Product Type: amine cured epoxy
 2. VOC Content (ASTM D2584): 0%
 3. Compressive Strength, (ASTM D695): 18,000 psi
 4. Tensile Strength, (ASTM D638): 7,600 psi
 5. Flexural Modulus, (ASTM D790): 700,000 psi
 6. Adhesion to Concrete, (ASTM D4541/7234): >200 psi with substrate (concrete) failure
 7. Chemical Resistance (ASTM D543/G20) immersion service for:
 - a. Municipal sanitary sewer environment
 - b. Sulfuric Acid, 30%
 - c. Sodium Hydroxide, 10%

- d. Sodium Hypochlorite, 3%
- 8. Successful Pass: Sanitation District of L.A. County Coating Evaluation Study and SSPWC 210.2.3.3 (Greenbook "Pickle Jar" Chemical Resistance test)

2.4 STEEL REINFORCED POLYMER CONCRETE STRUCTURES

- A. As an alternative to the concrete coatings and linings described above, steel reinforced polymer concrete structures may be furnished and installed. All steel reinforced polymer concrete structures shall be supplied by a qualified company with a minimum of 5 years' experience manufacturing polymer concrete.
- B. All steel reinforced polymer concrete structures shall be manufactured and installed in accordance with the applicable requirements of ASTM C76, C478, C443, D6783, C33, C267, A82, A165, A496, A497, A615, and A615M.
- C. Approved manufacturers: See County Approved Product List, Appendix F.

PART 3 EXECUTION

3.1 SEWPERCOAT LINING

- A. Plug or bypass all pipes in service before any work is started on the structure. No debris is to be flushed down the line.
- B. Anyone entering the structure must conform to all OSHA requirements for "Confined Space Entry" equipment and permitting.
- C. Prepare surface in accordance with the requirements of SewperCoat Data Sheets on Concrete Preparation. Interior surfaces of wetwell shall be sound, porous, dry, and free of dust, dirt, oil, grease and other contaminants prior to application of lining.
- D. Interior surface of structure must be abrasive-blasted to remove all loose patching, old coatings and any contamination in the concrete. Do not use silica sand.
 - 1. Abrasive-blast "new" structures to remove all oils and patch mud, and to open pinholes and expose aggregate.
 - 2. Abrasive-blast "rehab" structures to remove all loose patching, old coatings, and any contamination that penetrated the concrete. The finished interior of the structure shall be gray. Coat the exposed invert/floor also. Where there is severe deterioration of the mortar, place new concrete to match the original interior dimensions after abrasive blasting and removal of all loose material and by-products of corrosion. Restore invert/floor to the original elevation.
 - 3. Vacuum to remove all abrasives and debris.

4. Condition of the wetwell may require the use of a 10% solution of hydrochloric (muriatic) acid over all surfaces or the use of a detergent. If an acid or detergent solution is used, the surface shall be thoroughly rinsed and neutralized prior to the installation of the liner system.
- E. Repair all leaks by injecting grout using Avanti Multi-grout AV-202 or equivalent. Hydraulic cement shall not be used to stop any water leaks.
- F. Spray Application: Mix and apply the pure fused calcium aluminate cement liner system in strict accordance with the manufacturer's written instructions using only manufacturers approved equipment. This includes the preparation, installation, curing and finish operation required for the completion of the process.
 1. Wet gun: Spray the material directly to the damp wetwell surface in a two-coat application. Trowel the material smooth after each coat, completely covering the interior surface of the wetwell from the frame to the invert with a minimum thickness of 1 inch. Apply a "brushed" finish to the second coat after troweling.
 2. Dry Gun: Spray the material directly to the damp wetwell surface in a one-coat application. Trowel the material smooth after the application, completely covering the interior surface of the wetwell from the frame to the invert with a minimum thickness of 1 inch. Apply a "brushed" finish after troweling.
- G. Curing: The material shall cure in strict accordance with the manufacturer's recommendations and instructions.
- H. Inspect lining system for holidays (i.e., discontinuity), cracks and pinholes. Take particular care to check lining over brick, block, heavy spalled surfaces, and other very rough surfaces and locate holes in the lining caused by voids in bricks, block, concrete and structure joints. Fill voids and holidays in accordance with the lining system manufacturer's instructions.
- I. Provide a five (5) year unlimited warranty on all workmanship and products. The work includes the surface preparation and application of the SewperCoat lining system, and shall protect the structure for at least five (5) years from all leaks, and from failure due to corrosion from exposure to corrosive gases such as hydrogen sulfide.

3.2 IET COATING

- A. Plug or bypass all pipes in service before any work is started on the structure. No debris is to be flushed down the line.
- B. Anyone entering the structure must conform to all OSHA requirements for "Confined Space Entry" equipment and permitting.

- C. Prepare surface in accordance with the requirements of IET Systems Data Sheets on Concrete Preparation. Interior surfaces of manhole shall be sound, porous, dry, and free of dust, dirt, oil, grease and other contaminants prior to application of lining.
- D. Dry abrasive-blast Interior surface of structure to remove all loose patching, old coatings and any contamination in the concrete. Do not use silica sand.
 - 1. Dry abrasive-blast “new” structures to remove all oils and patch mud, and to open pin holes and expose aggregate.
 - 2. Dry abrasive-blast “rehab” structures to remove all loose patching, old coatings, and any contamination that penetrated the concrete. The finished interior of the structure shall be gray. Coat the exposed invert/floor also. Where there is severe deterioration of the mortar, place new concrete to match the original interior dimensions after abrasive blasting and removal of all loose material and by-products of corrosion. Restore invert/floor to the original elevation.
 - 3. Vacuum to remove all abrasives and debris.
- E. Repair all leaks by injecting grout using Avanti Multi-grout AV-202 or equivalent. Hydraulic cement shall not be used to stop any water leaks.
- F. Clean and remove dust material with pressure washing for maximum adhesion. Blow dry concrete at 250 cfm with 120 psi.
- G. Apply IET Systems Coating by the use of the IET Systems Spray Unit and IET Systems Spincaster. Apply IET coating at least three different intervals – prime coat, intermediate coat and finish coat, per IET Systems manufacturer instructions and specifications. The total thickness of the IET coating shall be at least 125 mils.
- H. Inspect lining system for holidays, cracks and pinholes. Take particular care to check lining over brick, block, heavy spalled surfaces, and other very rough surfaces and locate holes in the lining caused by voids in bricks, block, concrete and structure joints. Fill voids and holidays in accordance with the lining system manufacturer’s instructions.
- I. Provide a five (5) year unlimited warranty on all workmanship and products. The work includes the surface preparation and application of the IET coating system, and shall protect the structure for at least five (5) years from all leaks, and from failure due to corrosion from exposure to corrosive gases such as hydrogen sulfide.

3.3 RAVEN 405 COATING

- A. Plug or bypass all pipes in service before any work is started on the structure. No debris is to be flushed down the line.
- B. Anyone entering the structure must conform to all OSHA requirements for “Confined Space Entry” equipment and permitting.

- C. Prepare surface in accordance with the requirements of Raven Data Sheets on Concrete Preparation. Interior surfaces of structure shall be sound, porous, dry, and free of dust, dirt, oil, grease and other contaminants prior to application of lining.
- D. Dry abrasive-blast Interior surface of structure to remove all loose patching, old coatings and any contamination in the concrete. Do not use silica sand.
 - 1. Dry abrasive-blast “new” structures to remove all oils and patch mud, and to open pin holes and expose aggregate.
 - 2. Dry abrasive-blast “rehab” structures to remove all loose patching, old coatings, and any contamination that penetrated the concrete.
 - 3. Vacuum to remove all abrasives and debris.
- E. New Portland concrete structures shall have a minimum of 28 days cure since manufacture prior to commencing coating installation.
- F. Offset structural components, lids, covers, frames, etc. shall be repaired, replaced, or reset prior to the commencement of surface preparation.
- G. Concrete and/or mortar damaged by corrosion, chemical attack or other means of degradation shall be removed so that sound substrate remains.
- H. In conditions where severe chemical/microbiological attack is present the prepared substrate shall exhibit a pH of 8-12. Additional cleaning and/or contaminated substrate removal may be required to achieve the specified pH level.
 - 1. Prior to the application of the coating product repairs shall be completed to ensure the following:
 - 2. All inflow and infiltration shall be eliminated by use of appropriate repair material(s), such as hydraulic cements and/or chemical grouts as described in Section 2.2.
 - 3. All repairs to joints, pipe seals, steps, mechanical penetrations, benches, inverts, pipes or other appurtenances to be coated shall be completed and repaired surfaces prepared according to this section.
 - 4. Benches or other horizontal surfaces shall have adequate slope (1” rise per lineal foot minimum) to minimize the retention of debris following surcharge.
 - 5. Inverts or flow channels shall be smooth without lips, rough edges or other features which may cause debris to collect; contoured to minimize turbulent flow; and be sloped to promote adequate flow from the inlet(s) to the outlet pipe.

6. All joints, pipe seals, steps or other penetrations shall be sealed against inflow, infiltration and exfiltration and be adequately filled, smoothed and contoured to promote monolithic coating application.
 - I. Areas where reinforcing steel has been exposed shall be repaired in accordance with the Project Engineer's recommendations or at the minimum all exposed steel shall be prepared in accordance with Section 3.2 prior to coating with the coating product specified or other approved primer as specified by the coating product manufacturer.
 - J. Coating shall be applied to a minimum dry film thickness of 80 mils to surface profiles of CSP-4 to CSP-5 or 125 mils minimum DFT to surface profiles of CSP-6 or greater and in rehabilitated structures.
 - K. Subsequent top coating or additional coats of the coating product(s) shall occur within the products recoat window. Additional surface preparation procedures will be required if this recoat window is exceeded.
 - L. Provide a five (5) year unlimited warranty on all workmanship and products. The work includes the surface preparation and application of the Raven 405t lining system, and shall protect the structure for at least five (5) years from all leaks, and from failure due to corrosion from exposure to corrosive gases such as hydrogen sulfide.

END OF SECTION

SECTION 221336

DIESEL BACKUP PUMP

PART 1 GENERAL

1.1 SCOPE

- A. Requirements for providing a permanently installed automatically starting pump station back-up pumpset.
- B. Elevated platforms shall be provided where necessary to provide access to the diesel backup pump for operation and maintenance. Typically, these platforms shall be limited to locations with existing grades requiring equipment to be located at a higher elevation due to the Florida Building Code (FBC), FEMA, and the ASCE Standard 7 and 24 requirements.

1.2 GENERAL

- A. The specifications herein state the minimum requirements of Collier County (the Owner). All bids must be regular in every respect. Unauthorized conditions, limitations, or provisions shall be cause for rejection. The Owner may consider as "irregular" or "non-responsive", any bid not prepared and submitted in accordance with the bid documents and specification, or any bid lacking sufficient technical literature to enable the Owner to make a reasonable determination of compliance to the specification. It shall be the bidder's responsibility to carefully examine each item of the specification. Failure to offer a completed bid or failure to respond to each section of the technical specification (exception yes or no) will cause the proposal to be rejected, without review, as "non-responsive". All variances, exceptions, and/or deviations shall be fully described in the appropriate section. Deceit in responding to the specification will be cause for rejection.
- B. INTERPRETATIONS: In order to be fair to all bidders, no oral interpretations will be given to any bidder as to the meaning of the specifications documents or any part thereof. Every request for each a consideration shall be made in writing to the Owner. Based upon such inquiry, the Owner may choose to issue an Addendum in accordance with local public contract laws.
- C. GENERAL SPECIFICATIONS: Units described shall be new, unused, and of the current year's production. The style of pump being bid must be in production for a minimum of 5 years (include users list). Unit shall be of the latest design and in current production completely serviced, ready for work and shall include all standard and optional equipment as specified herein. All bidders must have demonstrated the unit they are bidding, prior to bid date.
- D. Bidders must have a fully stocked parts and service facility within 50 miles of the project site. The Owner shall have the right to inspect the office and shall be the sole judge of its adequacy to fulfill this requirement.

- E. Bidders, on request of the Owner, must be prepared to review their specifications with the Owner and must, if requested, also be prepared to provide a unit for tangible evaluation purposes only. These services, if needed, are considered as part of the bidder's proposal and will be provided without cost or obligation to the Owner.

1.3 SYSTEM DESCRIPTION

- A. The pumpset specified in this section will be used to pump wastewater from a Collier County pumping station (PS).
- B. Pump shall be fitted with a fully automatic priming system capable of repeated priming from a completely dry pump casing.
- C. The complete pump set shall be supplied by the pump manufacturer.
- D. The pump offered shall be the manufacturer's standard production model. It shall have been in continuous use by municipal and industrial owners for a minimum of five years. A list of five user contacts including contact names and telephone numbers shall be provided with the bid submittal. Failure to supply a verifiable users list will be cause for rejection of the bid.

1.4 DESIGN REQUIREMENTS

- 1.4.1 All design requirements listed below must be clearly displayed on performance pump curves. These performance pump curves shall be based on testing standards established by the hydraulic institute.

DESIGN REQUIREMENTS	
OPERATING SPEED (MAXIMUM) (RPM)	
MAXIMUM SOLIDS HANDLING SIZE (INCHES)	
IMPELLER DIAMETER (INCHES)	
SUCTION SIZE (INCHES)	
DISCHARGE SIZE (INCHES)	
PRIMARY DUTY POINT (GPM @ TDH)	
MAXIMUM SUCTION LIFT AT PRIMARY DUTY POINT (FEET)	
MINIMUM EFFICIENCY AT MAX DUTY POINT	
SECOND DUTY POINT (GPM @ TDH)	
MAXIMUM SUCTION LIFT AT SECOND DUTY POINT (FEET)	
MINIMUM EFFICIENCY AT SECOND DUTY POINT	

1.5 REFERENCES

- 1. ANSI B16.1 - Standard for Cast Iron Pipe Flanges and Flanged Fittings.

PART 2 PRODUCTS

2.1 PRE-APPROVED ACCEPTABLE MANUFACTURERS:

1. GODWIN PUMPS OF AMERICA
2. THOMPSON PUMP & MANUFACTURING CO, INC.

A. All manufacturers shall be ISO 9001: 2008 certified. Certificates shall be made available to Collier County upon request. Bids will be accepted for consideration on any make and model that meets the requirements of the project specifications, as interpreted by the Owner. If a product proposed does not meet the requirements of this specification, the Contractor shall provide a unit which does, at no additional cost to the Owner. The Owner shall have the final decision on which products do and which products do not meet the project specifications.

2.2 EQUIPMENT

A. PUMPS: The pumps used in the diesel backup pump system shall be supplied directly by the manufacturer, not by a distributor. The pump itself and the diesel backup pump system as a whole shall come from a single manufacturer. "Packagers" of systems which incorporate pumps from a separate manufacturer to fabricate diesel backup pump systems shall not be allowed.

B. CASING, SUCTION COVER, SEPARATION TANK: Pump castings shall be cast iron or ductile iron with a minimum pressure rating of 100 psi. The pump casing shall be constructed so that the suction flow path is in axial alignment with the impeller eye. There shall be no turns, chambers, obstructions or straightening vanes between the suction line and the impeller. The pump casing shall be complete with a removable port for inspecting impeller/cut water area.

C. IMPELLERS: The pump impeller shall meet the criteria of one of the following:

1. An open, three-bladed, (or 2-bladed) non-clog type with pump-out vanes on the back shroud and fabricated from hardened cast- chromium steel construction (or other material to meet minimum Brinell Hardness 340 HB).
2. A high efficiency non-clog type, 2-vane, enclosed design with full front and rear shrouds, containing back pumpout vanes, constructed of high grade 65-45-12 ductile iron and capable of passing a 3" spherical solid.

D. WEARPLATES/WEAR RINGS: Shall be fully be replaceable, fabricated of cast iron. Wear plate/wear ring clearances shall have no relationship to the ability of the pump to achieve a prime.

E. BEARINGS AND SHAFTS: Pump shall be fitted with a bearing bracket to contain the shaft and bearings. Bearings shall be tapered roller bearings of adequate size to withstand imposed loads for sustained pumping at maximum duty points. Minimum ISO L₁₀ bearing life to be 100,000 hours. Impeller shafts shall be fabricated of high strength alloy steel, accurately machined, polished, and of sufficient size to transmit full driver output without excessive flexing or stress.

- F. SEALS: Pump shall be capable of running dry, with no damage, for periods up to twenty-four hours. The pump seals shall be the requirements of one of the following:
1. Seal shall be high pressure, mechanical self-adjusting type with silicon carbide faces capable of withstanding suction pressures to 87 psi. The mechanical seal shall be cooled and lubricated in an oil bath reservoir, requiring no maintenance or adjustment. All metal parts shall be of stainless steel. Elastomers shall be Viton.
 2. Pump seal shall be an inside-mounted, self-cleaning John Crane type 2 component style mechanical seal with tungsten carbide rotating and silicon carbide stationary faces with Viton elastomers and stainless steel spring and hardware.
- G. PUMP SUCTION AND DISCHARGE FLANGES: Shall be cast iron ANSI (B16.1) Class 150, raised faced.
- H. PUMP GASKETS: Shall be compressed fiber and/or Teflon.
- I. PUMP O RINGS: Shall be Buna-N.
- J. PRIMING SYSTEM: Pump shall be fitted with a fully automatic priming system incorporating a air compressor, venturi (with lifetime warranty), priming chamber, and discharge check valve assembly. The compressor shall be installed on the engine auxiliary drive and shall be gear driven, lubricated and cooled from the engine. Installed system design shall prevent any carryover of the pumping fluid onto the ground. Priming system may require additional drainage pipelines to be constructed to re-circulate pumping fluid back to sump area. The pump must be capable of running totally dry for periods up to 24 hours, then re-priming and returning to normal pumping volumes. Pump and priming system is capable of priming the pump from a completely dry pump casing. The pump shall be capable of static suction lifts to 28 vertical feet, at sea level. It shall also be capable of operation using extended suction lines, and pump shall be capable of priming and re-priming without any user intervention. Equipment acceptance shall be contingent upon the pump's ability to run continuously at full speed in a completely dry condition. The engineer may require a demonstration. Priming systems that incorporate the use of a positive displacement diaphragms OR oil-cooled vacuum pumps will not be accepted.
- K. CHECK VALVE: The priming system shall include a discharge check valve to prevent pulling air through the discharge line during priming and prevent in-line return of flow when the pump is shut off. Non-return check valve shall be constructed of cast iron with Nitrile rubber and shall be field replaceable. Check valve shall be vacuum-tested by the factory, and test results shall be provided.
- L. DRIVE UNIT: The drive unit shall be a diesel water-cooled engine. The engine shall drive the pump by use of direct-connected intermediate drive plate. Starter shall be twelve-volt electric. Low oil pressure safety shutdown, high temperature shutdown, tachometer, and hour-meter shall be integrated into engine control panel. Battery shall have 180-amp hour rating. A certified continuous-duty engine curve shall be supplied to the owner/engineer.

- M. GOVERNOR: Governor shall be an electronic or mechanical type. Engine speed shall be adjustable to operate the pump between maximum and minimum design operation speeds in manual mode. See section 2.3 for Automatic mode.
- N. FUEL SOURCE: Integral skid fuel tank capacity shall be sufficient to provide at least seventy-two (72) hours of continuous operation at full load. The minimum tank size shall be 150 gallons and the maximum tank size shall be 550 gallons. The engine shall be capable of operating satisfactorily on a commercial grade of distilled No. 2 fuel oil.
- O. EXHAUST: Exhaust system shall include a hospital grade muffler housed in a separate chamber within the enclosure. All exhaust piping and manifolds shall be encased in fitted acoustic blankets. They shall be constructed of high-density fiberglass material with waterproof jacketing.
- P. SOUND ATTENUATED ENCLOSURE: The entire unit including the pump and engine shall be completely enclosed in a lockable enclosure. The enclosure shall be constructed with a modular galvanized steel frame and galvaneel panels. Acoustical material shall be installed as required to reduce pump and engine noise. Maximum sound ratings for specific pump sizes are shown in the table below. These sounds rating shall be the maximum dBA rating measured at 7 meters @ both duty points specified.

Pump Outlet Size	Maximum Sound Rating Allowed
4"	68 dBA
6"	70 dBA
8"	72 dBA
10"	72 dBA
12"	72 dBA

- Q. Units not meeting this requirement shall not be considered. The enclosure shall be removable for easy access to the engine / pump for maintenance and repair. The enclosure doors shall all be equipped with latches that are keyed alike. For maintenance and service needs, the enclosure sides shall have hinged doors for quick access to the engine oil fill, fuel fill port, oil dipstick, and filters. The enclosure shall be coated in epoxy based primer and paint to a total dry film thickness of 5 mils.

R. UL LISTED SKID BASE

1. The pump base tank shall be a UL-142 approved double wall design constructed in accordance with Flammable and Combustible Liquids Code, NFPA 30; The Standard for Installation and use of Stationary Combustible Engine and Gas Turbines, NFPA 37; and The Standard for Emergency and Standby Power Systems, NFPA 110. Pumps installed within 25 feet of a building shall be equipped with UL-2085 fire resistant fuel tanks. All fuel tanks shall comply with the requirements set forth by Collier County Pollution Control.
2. The tank design shall be a Closed Top Dike Pump Base Tank. It shall be of double

wall construction having a primary tank to contain the diesel fuel, held within another tank or dike, which is intended to collect and contain any accidental leakage from the primary fuel tank. The completed base tank assembly is to incorporate pump mounting locations and must be able to support four times the rated load.

3. The primary tank shall be designed to withstand normal and emergency internal pressures and external loads. It shall be capable of withstanding internal air pressures of 3 to 5 psig without showing signs of excessive or permanent distortion and 25 psig hydrostatic pressures without evidence of rupture or leakage.
4. The primary and secondary tanks or dike shall have venting provisions to prevent the development of vacuum or pressure capable of distorting them as a result of the atmospheric temperature changes or while emptying or filling. The vent shall also permit the relief of internal pressures caused by exposure to fires. The vent size shall be determined by using the calculated wetted surface area in square feet (the top is excluded) in conjunction with venting capacity table 10.1 of UL-142. The tank's vent shall also be equipped with a coupling device and shall be located to facilitate connection to a vent piping system. The dike's vent may be an opening for venting directly to the atmosphere and protection from the entrance of natural elements or debris shall be provided.
5. The primary and outer tanks are to be constructed of 304 stainless steel, 7 gauge minimum. Internal baffles or reinforcement plates shall be located on a maximum of 24 inch centers in tanks up to 60 inch width and on a maximum of 19.5 inch centers in tanks over 60 inch width. At least one baffle shall separate the fuel suction pipe from the fuel return line.
6. The outer tank is to be constructed in a manner to be able to support four times the wet load of the pump and housing. The entire load is to be carried by the outer tank so no load or vibration stress is placed on the primary tank. If the pump base tank is wider than the pump set to be supported, structural rails are to be incorporated to span the width of the base tank so that the load is transferred to the side rails of the tank. Vertical reinforcements shall be welded to the outer sides of the secondary tank or dike at a maximum of 45 inch centers on tanks up to 30 inches high and on 24 inch centers on tanks greater than 30 inches high. At least one vertical reinforcement shall be positioned adjacent to each mounting hole location. Provide level monitoring and interstitial space leak monitoring.
7. Both primary and secondary tanks shall be fitted with the proper welded pipe fittings to accommodate the requirements for the fill port and normal and emergency venting.
8. The completed assembly is to be cleaned with a heated pressure wash followed by a chromium free post treatment to ensure proper paint adhesion. The tank assembly is to be painted with an epoxy ester primer and high quality polyurethane enamel with a minimum dry film thickness of 3.5 mils.
9. All tanks shall be tested in accordance with **NFPA 30 TO INCLUDE ON SITE**

TIGHTNESS TESTING in accordance with NFPA 30 Section 21.5. This requirement shall not apply to portable trailer mounted diesel pumps.

10. Manufacturing and testing of this system shall be performed within the scope of Underwriters Laboratories, Inc. "Standard for Safety UL 142.", or UL 2085, as applicable. A UL label shall be permanently attached to the tank system showing the following information:

- i. The registered UL mark and the name: Underwriters Laboratories, Inc.
- ii. A control number and the word "listed"
- iii. The product's name as identified by Underwriters Laboratories Inc.
- iv. The serial number assigned by Underwriters Laboratories, Inc.
- v. Other manufacturer's information may also be included.

S. PORTABLE TRAILER (FOR TRAILER MOUNTED UNITS ONLY):

1. The complete pump set shall be factory mounted on a highway trailer meeting NHTSA, DOT Part 571 standards 108, 119 and 120.
2. Trailers with loads of 5,000 pounds or less with fuel tank filled, shall have a flat bed, single axle, two 15-inch wheels with 6-ply tires. Axle ratings shall be a minimum of 5,000 pounds.
 - i. Trailers with loads from 5,000 to 10,000 pounds with fuel tank filled, shall have a flat bed, 2-axle, four 15-inch or 16-inch wheels with 10-ply tires. Axle rating shall be a minimum of 10,000 pounds.
 - ii. Trailers above shall have following accessories. Ring and pintal hitch including safety chain and fasteners, electric brakes shall be provided on all wheels, and all required ICC lights such as tail, brake, direction signals, license holder and light, etc., shall be provided; jacks and sand shoes for front and rear corners shall be provided so that unit can be completely supported.
 - iii. The diesel backup pump engine shall be balanced mounted on trailer. All necessary service and checkout of diesel backup pump set shall be performed prior to delivery.

T. FACTORY PAINTING: Pump, engine, and base shall be shop primed and finish painted at the place of manufacturer.

2.3 AUTOMATIC STARTING CONTROL SYSTEM

- A. The engine control panel shall be provided in a NEMA 3R enclosure mounted on rubber isolators to reduce vibration, equipped with a factory installed microprocessor-based controller designed to start/stop the engine at a signal supplied by high and low level floats or a 4-20 mA transducer.
- B. The control system shall be able to start/stop the engine a via a signal supplied by a primary level transducer and back-up high and low level floats for redundant automatic operation.

C. ENGINE / PUMP CONTROL SPECIFICATIONS

1. The engine shall be started, stopped, and controlled by a digital controller. The controller shall be weather proof enclosed, and contain an external weatherproof 12-position keypad accessible without the need to remove or open any protective cover or enclosure. It shall be designed to start/stop the engine based on relay contact closure provided by others. The controller shall provide the following functions without modification, factory recalibration, or change of chips or boards, by simply accessing the keypad:
 - D. The keypad shall be a capacitive touch sensing system. No mechanical switches will be acceptable. The keypad shall operate in extreme temperatures, and maintain complete weather-tight sealing of the controller.
 - E. In automatic mode, the unit shall conserve energy and go to “sleep”.
 - F. The controller shall function interchangeably from remote contact closure, as well as manual start/stop by selection at the keypad. No other equipment or hardware changes are required.
 - G. The start function can be programmed to provide two separate functions each day for seven days (i.e. a start, exercise cycle on two separate days at different times and for a varying length of time all via the keypad).
 - H. Manual-Automatic Button:
 1. In Manual Mode, manual “Start” button starts engine and runs until “Stop” or “Off” button is depressed or an emergency shutdown occurs.
 2. In Automatic Mode, start/stop sequencing is initiated by a signal from a digital input.
 - I. The controller shall integrate the engine safety shut-off for low and high oil temperature, and provide over-speed protection.
 - J. The controller shall include standard, field-adjustable parameters for engine cycle crank timer, and shutdown time delay.
 - K. The controller shall have only one circuit board with eight built-in relays. Three (3) of the relays shall be programmable to output desired parameter on display and to be used as dry-contacts for communication with Collier County’s SCADA system, all via the keypad without changing relays, chips, printed circuits, or any hardware or software. Relays will monitor the following:
 1. Low Battery Charge
 2. Low Fuel Level (Less than 25 gallons)
 3. Diesel Pump Engine Start
 - L. Standard components shall consist of one of the following set ups:

1. (24) Digital inputs, (7) analog inputs, (1) magnetic pick-up input, (8) 20-amp form "C" relays, (1) RS232 port, (1) RS485 port, (1) RS232/RS485 port, (1) J1939 port, and (1) 64X128 pixel full graphic LCD display with backlight.
 2. (8) Digital inputs, (5) analog inputs, (8) digital outputs, (1) RS232 port, (1) RS485 port, (1) J1939 port, (76) selectable features, (32) alarm event history.
- M. The industrially-hardened Controller shall withstand vibration of 3 g, 3 axis, frequency swept 10-1000 Hz, in an operating temperature range of 4° to 176°F (-20° to 80°C) and an operating humidity range of 0-95% non-condensing.

2.4 OPTIONS

- A. FULLY AUTOMATIC TRICKLE CHARGER: The unit shall include a fully automatic trickle charger powered by 6-amperes, 115 VAC.
- B. LIGHT: The unit shall include a single switch operated 12VDC light within the enclosure.
- C. FLOATS: The unit shall be supplied with one (1) float assembly including two (2) N/O floats which shall integrate with the engine control panel via a single multi-pin plug.
- D. LEVEL TRANSDUCER: The unit shall be supplied with (1) one Teflon diaphragm sewage compatible level transducer assembly including a single 4-20 mA level transducer with leveling guard (0-15 psig), which shall integrate with the engine control panel via a single multi-pin plug.
- E. AUTO THROTTLE: The unit/s shall include one (1) automatic throttle controller integrated into (1) relays in the electronic engine control panel. The auto-throttle control panel combination shall allow the pump to ramp up to the target RPM given a start command and ramp down to idle given a stop command via the 4-20 mA level transducer.
- F. DC / AC INVERTOR: The unit/s shall include one (1) 12VDC to 110VAC volt single-phase inverter, 1750 watts, mounted inside enclosure, single 15-amp GFI outlet, and one (1) fusible link.

2.5 ACCESS PLATFORM

- A. Platforms and stairs shall meet the Occupational Safety and Health Administration (OSHA) Part 1910, applicable FBC requirements, and ASCE Standards 7 and 24. All platform and stair designs and plans shall be prepared by a Florida Registered Professional Engineer. The Engineer of Record shall identify Flood Hazard Area, Flood Design Class (ASCE 24) and other applicable loadings. All components shall be aluminum with stainless steel hardware. Standard stairs shall be utilized. Fall protection shall be provided on all exposed sides by use of an OSHA approved guardrail system. Where required for access, removable guardrail sections shall be provided. Grating shall be slip resistant and banded at ends of bearing bars and openings.

- B. All platforms and stairs shall be supported by a concrete foundation system. The foundation designs and plans shall be prepared by a Florida Registered Professional Engineer. It shall meet the requirements of the FBC, ASCE 7 (Dead, Live, Flood, and Wind), ASCE 24 (Flood Resistant) and other regulatory requirements. Where head clearance under the platform is less than 6'-8", provisions shall be made to limit access.

PART 3 EXECUTION

3.1 MANUFACTURERS SERVICES

- A. The manufacturer shall furnish the services of a competent factory representative to do the following:
 - 1. The complete pump set shall be factory tested according to ANSI/HI 1.6-1994 by a certified quality technician. The pump shall be sound tested according to ISO 3744, ANSI/HI9.4 and CPB Sound Level Measurement Standard.
 - 2. Instruct the Owner's operating personnel in the proper operation and maintenance of the system for a period of not less than one-half day.

3.2 TOOLS AND SPARE PARTS

- A. The manufacturer shall furnish the following on delivery of the pumping system;
 - 1. A recommended list of spare parts.
 - 2. Two (2) replacement mechanical seals
 - 3. An Operations and Maintenance manual for the pump and engine.
 - 4. A fuel polishing system capable of below 1 micron filtration equipped with a fuel-water separator and 12V DC fuel pump rated at 40 GPH minimum. The system shall be a standard commercial or industrial off the shelf unit intended for portable use of diesel fuel polishing. The fuel polishing system shall include 6 spare filters and an operations and maintenance manuals.

3.3 WARRANTY

- A. The manufacturer shall furnish the following to the owner:
 - 1. A copy of the engine manufacturer's parts and labor warranty.
 - 2. A 3-year Parts and Labor Warranty issued by the manufacturer on the Diesel Pump System. This warranty must cover all pump parts.
 - 3. The venturi shall have a minimum five (5) year warranty to include parts and labor.

END OF SECTION

SECTION 263213.13

STANDBY DIESEL GENERATORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Extent of diesel generator set work as indicated by Drawings and Schedules, and is hereby defined to include, but not by way of limitation:
1. Diesel engine.
 2. Electrical generator.
 3. Engine starting system.
 4. Batteries.
 5. Instrument control panel.
 6. Sound Attenuating Enclosure.
 7. Sub-Base Fuel Tanks.
 8. Exhaust silencer.
 9. Wall thimble.
 10. Additional accessories.
 11. Automatic transfer switch (ATS).
 12. Access platform and stairs.
- B. Types of generator sets required include:
1. Permanent Diesel Engine-driven Generator.

1.02 SUBMITTALS

- A. Shop Drawings: Submit in accordance with Section 013400, Shop Drawings covering the items included under this Section. Shop Drawing submittals shall include:
1. Product Data: Submit manufacturer's data on diesel engine-driven generator sets and components.
 - a. Generator dimensions.
 - b. Generator weight.
 - c. Generator rating.
 - d. Alternator rating.
 - e. Generator Starting System Data:
 - 1) Battery size and ratings.
 - 2) Charging system capacity.
 - 3) Battery heater data.
 - 4) Battery warranty.
 - f. Generator Control Panel Data:
 - 1) Layout.
 - 2) Wiring diagrams.
 - 3) Control interconnection.
 - 4) Instrumentation.
 - g. Exhaust System Data:
 - 1) Muffler size.
 - 2) Decibel reduction curve.

- 3) Fuel system data.
- h. Cooling System Data:
 - 1) Radiator capacity.
 - 2) Cooling reduction capacity
- i. Enclosure Data:
 - 1) Materials.
 - 2) Size.
 - 3) Assembly/disassembly instructions.
 - 4) Door locations.
 - 5) Noise reduction.
 - 6) Color.
- j. Sub-Base Fuel Tank:
 - 1) Capacity.
 - 2) Fuel usage calculations.
 - 3) Coating.
- k. ATS Data:
 - 1) Enclosure Material.
 - 2) Dimensions.
 - 3) Factory test report.
- l. Warranty data.
- m. Accessory and miscellaneous equipment.
- 2. Wiring Diagrams: Submit wiring diagrams for diesel engine-driven generator units showing connections to electrical power panels, feeders, and ancillary equipment. Differentiate between portions of wiring that are manufacturer installed and portions that are field installed.
- 3. Agreement to Maintain: Prior to time of final acceptance, Installer shall submit 4 copies of an agreement for continued service and maintenance of diesel engine-driven generator sets for OWNER's possible acceptance. Offer terms and conditions for furnishing parts and providing continued testing and servicing, including replacement of materials and equipment, for 1-year period with option for renewal of Agreement by OWNER.
- 4. Certifications: Provide diesel engine-driven generator sets certified test record of the following final production testing:
 - a. Single-step load pickup.
 - b. Transient and steady-state governing.
 - c. Safety shutdown device testing.
 - d. Voltage regulation.
 - e. Rated power.
 - f. Maximum power.
 - g. Provide certified test record prior to engine-driven generator set being shipped from factory to Project location.
- 5. Spare Parts Data: Submit a list of spare parts for the equipment specified.
- 6. Operating and Maintenance Instruction Manuals:
 - a. Operating instruction manuals outlining step-by-step procedures required for system startup and operation.
 - b. Manufacturer's name, model number, service manual parts list.
 - c. Brief description of equipment and basic operating features.
 - d. Maintenance instruction manuals outlining maintenance procedures.

- e. Troubleshooting guide listing possible breakdown and repairs.
- f. Point-to-point connection wiring diagram for the system.
- g. Performance Test Reports: Upon completion of installed system, submit in booklet form all shop and field tests performed to prove compliance with specified performance criteria.
- h. Provide OWNER with two (2) electronic copies of O&M manuals on CD's.

1.03 QUALITY ASSURANCE

A. Codes and Standards:

1. NFPA Compliance: Comply with applicable requirements of NFPA 37, "Installation and Use of Stationary Combustion Engines and Gas Turbines," NFPA 99, "Standard for Health Care Facilities," and NFPA 101, "Code for Safety to Life from Fire in Buildings and Structures."
2. UL Compliance: UL 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors," UL 2200, "Standard for Safety for Stationary Engine Generator Assemblies," rated 600 volts or less. UL 1008, "Automatic Transfer Switches," and UL 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors." Provide transfer switches and components which are UL listed and labeled.
3. ANSI/NEMA Compliance: Comply with applicable requirements of ANSI/NE MA MG1, "Motors and Generators," and MG2, "Safety and Use of Electric Motors and Generators." NEMA Standards Pub/Nos. ICS 2, "Industrial Control Devices, Controllers and Assemblies," ICS 6 and 250, pertaining to transfer switches.
4. IEEE Compliance: Comply with applicable portions of IEEE Standard 446, "IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications."

B. Submittal information shall be generated from a representative located within Collier County who has knowledge of Local and State code requirements.

C. Warranty: Submit in accordance with requirements of Section 01740, warranties covering the items included under this Section. Unit shall be provided with a full comprehensive warranty of 5 years or 1500 running hours from date of ENGINEER's acceptance. Response time shall be a maximum of 3 hours. Provide label on inside of generator with description of warranty period and contact information.

1.04 DELIVERY, STORAGE AND HANDLING

A. Manufactured material shall be adequately packed to prevent damage during shipping, handling, storage and erection. Material shipped to site shall have approval of OWNER prior to shipping. All shipped material shall be packed in a container properly marked for identification. Blocks and padding shall be used to prevent movement.

B. CONTRACTOR shall inspect the material prior to removing it from carrier. If damage is observed, CONTRACTOR shall immediately notify carrier so that a claim can be made. If no such notice is given, material shall be assumed to be in undamaged condition, any subsequent damage that occurs to the equipment shall be the responsibility of CONTRACTOR.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with specified requirements, manufacturers offering products which may be incorporated in Work include:
 - 1. Standby Diesel Generator Sets:
 - a. Caterpillar.
 - b. Cummins.
 - 2. Automatic Transfer Switches:
 - a. Caterpillar.
 - b. Cummins

2.02 GENERATOR SETS

- A. Except as otherwise indicated, provide manufacturer's standard diesel engine-driven generator set and auxiliary equipment as indicated by published product information, and as required for a complete installation. Generator set shall be rated to continuously power the total accumulated load and starting load shown on Schedule at 100 degrees F ambient temperature and at altitude where installed.
- B. Diesel Engine: Provide a 4-cycle, compression ignition type engine for operation on a commercial grade of petroleum fuel oil such as No. 2 fuel oil. Engine operating speed shall not exceed 1,800 rpm and shall be controlled by a governor to maintain alternator frequency within plus or minus 3 Hertz of 60 hertz from no load to full load. Frequency shall recover to steady-state tolerance within 5 seconds after application of 90 percent rated load.
- C. Starting System: Provide engine-generator unit with 12- or 24-volt, negative ground, starting system including positive engagement solenoid shift-starting motor, batteries, and 35-ampere, or greater, automatic battery charging alternator with solid-state voltage regulator. Mount batteries in a plastic- or epoxy-coated metal platform near the starter but not on the generator and coat battery terminals with an anti-oxidant. Generator sets rated 150 kW or less shall have a battery rated 650 amperes cold cranking at 0 degree F and 170 minutes reserve capacity by SAE Standard J-537. Larger generators shall have a battery rated either 220 ampere-hours or 900 amperes cold cranking, and 430 minutes reserve capacity. Batteries shall have a 12-month full warranty and 60-month prorated warranty.
- D. Battery Charger: Provide a solid-state, current limiting, float-type SENS model #NRG22-10-RC battery charger with 10-ampere minimum capacity. Charger shall operate from 120-volt AC single phase, 60 hertz power and shall automatically keep batteries at full charge. Equip charger with ammeter and voltmeter. Battery charger shall be located within the generator enclosure.
- E. Alternator: Provide a single bearing brushless, self-excited alternator with inherently regulated rotating rectifier exciter system or a revolving field design with a temperature compensated solid-state voltage regulator. Connect the alternator housing directly to the

engine flywheel housing. Couple the alternator rotor directly to engine flywheel with a semi-flexible steel disk coupling.

1. Provide windings with Class F insulation with epoxy impregnation and fungus-resistant coating. Temperature rise shall be as defined in NEMA Standard MG1-22.40.
 2. The alternator shall be capable of starting load given for site with 35 percent maximum instantaneous voltage dip. Instantaneous voltage dip shall only be 20 percent when there is a VFD. Recovery to stable equation within plus or minus 5 percent of rated voltage shall occur within 3 seconds.
- F. Engine Cooling Radiator: Provide a complete engine cooling system equipped with a radiator and blower type fan sized to maintain safe operation, 190 degrees F engine outlet water temperature at 100 degrees F maximum ambient temperature. The engine cooling system shall be filled with a solution of 50 percent ethylene glycol.
- G. Instrument Control Panel: Provide engine-generator unit with engine oil-pressure and water-temperature indicators, reset circuit breaker, static voltage regulator, voltage-adjusting rheostat, voltmeter, ammeter with phase selector switch with an OFF position, and with running time indicator and frequency meters. Select circuitry of plug-in design capable of quick replacement, and capable of accepting a plug-in device which allows maintenance to test control panel performance without operating the engine.
1. Provide a cranking limiter to open starting circuit in 45 to 90 seconds if engine has not started within that time or after a series of 3 or more cranking intervals separated by 2 or more rest periods.
 2. Provide engine safety devices to shut unit down on high engine temperature, low oil pressure, overspeed, and overcrank. Provide, for each of these conditions, an alarm light and an unpowered, normally open contact for remote use. Provide an audible alarm with silence switch which is activated by any alarm condition. Provide additional unpowered, normally open contact for remote use that indicates general generator alarm. General alarm contact will be for any alarms associated with the generator and not pre-assigned to a specific alarm. Sacrificing a specific alarm in order to receive the general alarm contact is not acceptable.
 3. Provide a relay with 2 normally open and 2 normally closed contacts rated 5A at 120 volts AC and which is energized when unit is running. Wire these contacts to terminal strips for remote use.
 4. Provide a RUN-OFF-AUTO switch. In AUTO position unit shall start when a remote contact closes and stop when contact opens. In RUN position unit shall start and run until OFF position is selected.
 5. Mount instrument control panel on unit such that it is isolated from generator set vibration.

2.03 PERMANENT ENGINE-GENERATOR SET ACCESSORIES

- A. Enclosure Design: Generator set shall be provided with a skin tight outdoor enclosure. Enclosure roof and side panels shall be constructed from a minimum of 0.090 Marine Grade Aluminum. Side panels shall be constructed from a minimum of 0.090 Marine Grade Aluminum. The Side Walls shall be complete with necessary access doors and ventilating louvers. There shall be at least 2 access doors on each side of enclosure and

one at the generator control panel for access to the controls. Doors shall be capable of full-range of motion. CONTRACTOR shall coordinate final location of generator to accommodate door swings. Any changes due to generator clearances shall be at the expense of the CONTRACTOR. Doors shall be hung on full-length piano hinge assembly. All hinge hardware shall be stainless steel. Finish paint shall be powder-coated over epoxy primer. Doors shall be equipped with handles. Louvers shall be stationary type and shall be arranged to provide adequate protection against rainfall at 15 degrees from vertical. Air of intake louvers shall be sized so not to exceed .5 inches of water column while providing the required genset cooling and combustion air flow. Enclosure shall be of bolted formed panel type construction. Exhaust shall be provided within the enclosure unless otherwise directed by the ENGINEER. Roof shall have sufficient strength to support an exhaust silencer. Enclosure shall be large enough to fully enclose all components necessary to the system. All doors shall be capable of being locked or have provisions for padlocks. Door hardware shall be stainless steel.

1. All raceway and conduits within the enclosure shall be sealed-tight flexible conduit or rigid aluminum or galvanized steel with malleable iron boxes and compression type fittings as appropriate for the raceways used under NEC. EMT and flex or "Greenfield" conduits are not acceptable.
 2. When this outdoor enclosure is specified, the temperature specifications for unit shall be 0 degrees F to 120 degrees F with ambient air at radiator intake being 100 degrees F maximum.
 3. Modular enclosures shall comply with DCA, Florida Building Code and have a minimum sustained wind rating of 150 MPH.
 4. The CONTRACTOR is responsible for verifying the impact rating requirements under Florida Building Code and shall provide a generator enclosure in compliance to these standards.
 5. Consult the ENGINEER prior to bid when generator is located within any "Zone 4 impact area under FBC".
 6. Enclosure shall match footprint of sub base fuel tank.
- B. Sound Attenuation: Enclosure shall be insulated to attenuate sound and include sound attenuating features that direct radiant cooling air in a route to minimize ambient noise when generator is running.
- C. Operational noise shall not exceed 75 dBA at 23 feet (in Free Field Conditions). Additional sound attenuation references or limitations may be required. See drawings for additional details. If generator is located within 50 feet of a commercial or residential unit, then operational noise shall not exceed 55 dBA.
- D. Source dBA and sound attenuation shall be as measured and defined under ANSI S12.34-1998 and SIO 3744 as applicable. Additional local codes and standards may apply for generator operational noise. The CONTRACTOR is responsible for compliance to all local standards without change order or additional payment.
- E. Fuel System: Provide unit with a UL142 compliant double-wall skid base type integral fuel tank that is "skid" mounted, unless otherwise directed by the ENGINEER's drawings or addenda. Tank capacity shall be a maximum of 550 gross volume gallons. The

tank capacity shall be calculated assuming the tank is 90% full and based on the generator running at full load/speed continuously for three (3) days.

- F. The ENGINEER has projected fuel use estimates using equipment listed as the basis of design. The CONTRACTOR is responsible for providing the manufacturer's fuel usage calculations with submittal documents for ENGINEER's review.
- G. The fuel tank shall be furnished with UL142 and FDEP required accessories to include a fuel site gauge, normal and emergency vents and fuel cap having padlocking provisions. All necessary fuel supply and return line shall be furnished pre-assembled to unit. The Fuel Tank shall meet all applicable State and local standards for the volume of fuel the tank will hold.
- H. Sub base fuel tank size shall be provided and sized as shown on the contract documents and within the specifications.
- I. Sub base fuel tank shall not allow pooling or ponding of water on top once generator is mounted on top.
- J. Tank shall be made by a manufacturer with minimum of (10) ten years' experience in the design and construction of UL Listed, FDEP and NFPA compliant sub base fuel tanks. Manufacturer of the fuel tank must be approved and registered with the State of Florida, and have their required "EQ" file number on the supplied fuel tank. The installing CONTRACTOR is responsible for supplying fuel for the field testing.
- K. The fuel tank shall be mounted under the generator skid rails, consisting of a dual wall design constructed to UL142 and standards applicable to this application under FS-62-762, NFPA 30, NFPA 37 and NFPA 110. All fuel tanks shall comply with the requirements set forth by Collier County Pollution Control.
- L. Sub base fuel tank shall be rectangular in shape and include reinforced steel box channel for generator support.
- M. Both the inner and outer tanks shall be constructed of 304 stainless steel.
- N. The outer wall shall be prepared before & after primer. Prime with one coat of epoxy primer to a thickness of 12-15 mils (DFT). Outer wall finish coat shall be a high gloss, black, UV blocking epoxy primer applied to a minimum thickness of 3.5 mils (DFT). All welds and fasteners connecting the generator skid base to the fuel tank shall be similarly primed and finished. Primers shall not be electrostatically or powder applied. Primers shall be hand applied & dried in a drying booth.
- O. Fuel tank shall be equipped with a magnetic liquid level fuel gauge as manufactured by Rochester Gauges, Inc. Fuel tank level shall be output as a 4-20mA signal from the generator control panel.

- P. Sub base fuel tank shall have a 4 point lifting system in place when shipped to the site. It shall be the responsibility of the Generator manufacturer to recommend a lifting system along with instructions for the CONTRACTOR on site.
- Q. Sub base tank testing shall consist of primary and secondary tank containment basin and shall be pressurized at 3-5 psi and leak checked to ensure integrity of sub base weld seams per UL-142 standards. A copy of this report shall accompany close-out documents. Fuel containment basin shall be sized as a minimum of 110% of the tank capacity to prevent escape of fuel into the environment in the event of a tank rupture. Provide a fuel containment basin leak detector switch.
- R. The sub base tank fittings shall include the following:
1. Appropriately sized NPT fuel supply.
 2. Fuel return fitting
 3. 2" NPT for normal vent
 4. NPT for emergency vent, sized as appropriate
 5. 2" NPT for manual fill.
 6. NPT for level gauge, sized as appropriate.
 7. 3/8" NPT basin drain
 8. 2" NPT for level alarm.
 9. NPT fitting for leak detection alarm
- S. Coolant Heater: Provide engine coolant heater that operates from 120-volt AC single phase, 60 hertz power with thermostatic controls to maintain engine coolant at proper temperature to fulfill start-up requirements of NFPA 99.
- T. Inlet and Exhaust Systems: Silencers and exhaust ducting to silencers shall be self-supporting when assembled. Provide all necessary supporting members for ductwork between silencer and outlet. Provide all required cutting as shown on Drawings and noted herein. The unit shall be complete with raincap. All exhaust duct shall be Schedule 10 steel pipe, minimum. Inlet silencer and filter to be self-supporting. Provide necessary supports for all intake ductwork. All intake ducts shall be Schedule 10 steel pipe, minimum.
1. Provide a silencer which meets sound standards of a critical area. Silencer shall provide attenuation (input to output) of 25 dB or greater at frequencies of 125 hertz to 8 kilohertz. A curve shall be submitted with Shop Drawings showing attenuation (input to output) in dB versus frequency. Curve shall be on manufacturer's standard data sheet or from an independent test lab. A spiral or bellows-type flexible section of pipe shall be installed in the exhaust line between the muffler and engine manifold connection. An insulated thimble section shall be provided where exhaust line passes through roof or wall. Exhaust lines shall be pitched and a condensation trap provided at non-draining low points in line.
- U. Circuit Breaker: A generator power circuit breaker shall be installed as a manual load circuit interrupter and an automatic overload and short circuit protection device.
1. The circuit breaker shall be a solid-state trip type for all sizes rated 200 amps continuous and larger. Solid-state trip shall include Long-time, Short-time, and Instantaneous. Ground fault trip required on breakers 1,000 amps and above.

2. 100% ratings under UL shall be required as noted on ENGINEER's drawings.
 3. AIC rating for generator power circuit breaker shall meet or exceed that of the upstream service entrance rating.
 4. Generator power circuit breaker shall be UL listed as short circuit, service entrance rated device under UL and NEC.
 5. Trip settings for all breakers shall be selected for the rating of the generator power circuit as indicated on Drawings.
 6. Provide breaker and alternator trip curves in the submittal. Show coordination of curves for equipment provided.
- V. Provide protective relays to protect the generator system/alternator.
- W. Alternator protection equipment as basis of design shall be equal to "Amp Sentry" protection by Cummins Power Generation with the following features: Over current and short-circuit shut down - Over current warning -Single and three phase fault regulation - Over and under voltage shut down - *Over and under frequency shut down* - *Overload warning with alarm contact* - *Reverse power and reverse Var shut down* - Excitation fault. Equipment other than basis of design is subject to ENGINEER's approval. Provide full submittal and comparison data for ENGINEER's review on equipment as provided.
- X. Any pump station requiring a generator shall also have a generator receptacle located on the pump control panel for a portable generator, coordinate exact model with OWNER.

2.04 AUTOMATIC TRANSFER SWITCHES

- A. Automatic Transfer Switch: UL listed and 600 volt-rated with amperage rating shown on Drawings and shall be the mechanically held, electrically operated type rated for continuous duty in an unventilated sheet metal enclosure.
- B. Switch shall be double throw, with an off position, having electrical operated normal-emergency positions inherently interlocked mechanically, and with main contacts mechanically attached to a common shaft. Main contacts shall be silver alloy wiping-action type. They shall be protected by arcing contacts.
- C. Heavy duty emergency pushbuttons shall be provided. Emergency pushbuttons shall reset when pulled out.
- D. Switch and Relay Contacts, Coils, Springs, and Control Elements: Removable from front of transfer switch without removal of the switch panels from enclosure and without disconnection of drive linkages or power conductors. Sensing and control relays shall be continuous duty industrial control type with 600 volt, 10 amp rated contacts.
- E. Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system

to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism.

- F. Power transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.
- G. Transfer switches that are designated on the drawings as 3-pole shall be provided with a neutral bus and lugs. The neutral bus shall be sized to carry 100% of the current designated on the switch rating.
- H. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.
- I. Upon drop in normal voltage of 83-85 percent of rated voltage, and after an override delay of 3 seconds nominal, switch shall start generator and transfer the load to emergency source, provided emergency source voltage and frequency are 90 percent of rated or higher.
- J. Upon return of normal source voltage for 5 seconds nominal, to 92-95 percent of rated, switch shall retransfer load to normal source after a minimum transfer time or if emergency source fails. Provide a 5- to 60-second adjustable time delay to maintain transfer switch in the "Off" position during transfer to either source.
- K. Sensing relays shall operate without contact chatter or false response when voltage is slowly varied to dropout and pickup levels.
- L. Four auxiliary contacts shall be provided: Two for transfer switch position indicating use, and two auxiliary contacts, one N.O. and one N.C. to operate after completion of the 3-second override delay for starting generator. All auxiliary contacts shall be 600 volt, 10 amp continuous rating.
- M. Operator Panel. Each transfer switch shall be provided with a control panel to allow the operator to view the status and control operation of the transfer switch. The operator panel shall be a sealed membrane panel rated NEMA 3R/IP53 or better (regardless of enclosure rating) that is permanently labeled for switch and control functions. The operator panel shall be provided with the following features and capabilities:
 - 1. High intensity LED lamps to indicate the source that the load is connected to (source 1 or source 2); and which source(s) are available. Source available LED indicators shall operate from the control microprocessor to indicate the true condition of the sources as sensed by the control
 - 2. High intensity LED lamps to indicate that the transfer switch is "not in auto" (due to control being disabled or due to bypass switch (when used) enabled or in operation) and "Test/Exercise Active" to indicate that the control system is testing or exercising the generator set.
 - 3. "OVERRIDE" pushbutton to cause the transfer switch to bypass any active time delays for start, transfer, and retransfer and immediately proceed with its next logical operation.

4. "TEST" pushbutton to initiate a preprogrammed test sequence for the generator set and transfer switch. The transfer switch shall be programmable for test with load or test without load.
 5. "RESET/LAMP TEST" pushbutton that will clear any faults present in the control, or simultaneously test all lamps on the panel by lighting them.
 6. The control system shall continuously log information on the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. This information shall be available via a PC-based service tool and an operator display panel.
 7. Vacuum fluorescent alphanumeric display panel with push-button navigation switches. The display shall be clearly visible in both bright (sunlight) and no light conditions. It shall be visible over an angle of at least 120 degrees. The Alphanumeric display panel shall be capable of providing the following functions and capabilities:
 - a. Display source condition information, including AC voltage for each phase of normal and emergency source, frequency of each source. Voltage for all three phases shall be displayed on a single screen for easy viewing of voltage balance. Line to neutral voltages shall be displayed for 4-wire systems.
 - b. Display source status, to indicate source is connected or not connected.
 - c. Display load data, including 3-phase AC voltage, 3-phase AC current, frequency, KW, KVA, and power factor. Voltage and current data for all phases shall be displayed on a single screen.
 - d. The display panel shall allow the operator to view and make the following adjustments in the control system, after entering an access code:
 - 1) Set nominal voltage and frequency for the transfer switch.
 - 2) Adjust voltage and frequency sensor operation set points.
 - 3) Set up time clock functions.
 - 4) Set up load sequence functions.
 - 5) Enable or disable control functions in the transfer switch, including program transition.
 - 6) Set up exercise and load test operation conditions, as well as normal system time delays for transfer time, time delay start, stop, transfer, and retransfer.
 - e. Display Real time Clock data, including date, and time in hours, minutes, and seconds. The real time clock shall incorporate provisions for automatic daylight savings time and leap year adjustments. The control shall also log total operating hours for the control system.
 - f. Display service history for the transfer switch. Display source connected hours, to indicate the total number of hours connected to each source. Display number of times transferred, and total number of times each source has failed.
 - g. Display fault history on the transfer switch, including condition, and date and time of fault. Faults to include controller checksum error, low controller DC voltage, ATS fail to close on transfer, ATS fail to close on retransfer, battery charger malfunction, network battery voltage low, and network communications error.
- N. The transfer switch control system shall be configurable in the field for any operating voltage level up to 600VAC. Provide RMS voltage sensing and metering that is accurate to within plus or minus 1% of nominal voltage level. Frequency sensing shall be accurate to within plus or minus 0.2%. Voltage sensing shall be monitored based on the normal

voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field configurable are not acceptable.

- O. Transfer switch voltage sensors shall be close differential type, providing source availability information to the control system based on the following functions:
 - 1. Monitoring all phases of the normal service (source 1) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of normal voltage level).
 - 2. Monitoring all phases of the emergency service (source 2) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of pickup voltage level).
 - 3. Monitoring all phases of the normal service (source 1) and emergency service (source 2) for loss of a single phase.
- P. The transfer switch shall be configurable to control the operation time from source to source (program transition operation). The control system shall be capable of enabling or disabling this feature, and adjusting the time period to a specific value. The transfer switch shall incorporate adjustable time delays for generator set start (adjustable in a range from 0-15 seconds); transfer (adjustable in a range from 0-120 seconds); retransfer (adjustable in a range from 0-30 minutes); and generator stop (cooldown) (adjustable in a range of 0-30 minutes).
- Q. The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device to prevent transfer to the generator service.
- R. The control system shall be designed and prototype tested for operation in ambient temperatures from -40C to +70C. It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.
- S. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.
- T. Enclosures shall be UL listed. The enclosure shall provide wire bend space in compliance to the latest version of NFPA70. The cabinet door shall include permanently mounted key type latches.
- U. Transfer switch equipment shall be provided in a NEMA 4X enclosure.
- V. The enclosure shall provide code-required wire bend space at point of entry as shown on the drawings. Manual operating handles and all control switches (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet door. Transfer switches with manual operating handles and/or non key-operated control switches located on outside of cabinet do not meet this specification and are not acceptable.
- W. Transfer switch normally connects an energized utility power source (source 1) to loads and a generator set (source 2) to the loads when normal source fails. The normal

position of the transfer switch is source 1 (connected to the utility), and no start signal is supplied to the genset.

- X. Generator Set Exercise (Test) With Load Mode. The control system shall be configurable to test the generator set under load. In this mode, the transfer switch shall control the generator set in the following sequence:
1. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.
 2. The transfer switch shall issue a compatible start command to the generator set, and cause the generator set to start and run at idle until it has reached normal operating temperature.
 3. When the generator set has reached normal operating temperature or after an adjustable time period (whichever is shorter), the control system shall accelerate the generator set to rated voltage and frequency.
 4. When the control systems senses the generator set at rated voltage and frequency, it shall operate to connect the loads to the generator set by opening the normal source contacts, and closing the alternate source contacts a predetermined time period later. The timing sequence for the contact operation shall be programmable in the controller.
 5. The generator set shall operate connected to the load for the duration of the exercise period. If the generator set fails during this period, the transfer switch shall automatically reconnect the generator set to the normal service.
 6. On completion of the exercise period, the transfer switch shall operate to connect the loads to the normal source by opening the alternate source contacts, and closing the normal source contacts a predetermined time period later. The timing sequence for the contact operation shall be programmable in the controller.
 7. The transfer switch shall operate the generator set unloaded for a cooldown period, and then remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.
- Y. Generator Set Exercise (Test) Without Load Mode. The control system shall be configurable to test the generator set without transfer switch load connected. In this mode, the transfer switch shall control the generator set in the following sequence:
1. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.
 2. The transfer switch shall issue a compatible start command to the generator set, and cause the generator set to start and run at idle until it has reached normal operating temperature.
 3. When the generator set has reached normal operating temperature or after an adjustable time period (whichever is shorter), the control system shall accelerate the generator set to rated voltage and frequency.
 4. When the control systems senses the generator set at rated voltage and frequency, it shall operate the generator set unloaded for the duration of the exercise period.
 5. At the completion of the exercise period, the transfer switch shall remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.

- Z. Factory Testing. The transfer switch manufacturer shall perform a complete operational test on the transfer switch prior to shipping from the factory. A certified test report shall be provided to OWNER & ENGINEER upon delivery of generator. Test process shall include calibration of voltage sensors.

- AA. The manufacturer of the transfer switch and generator set shall maintain service parts inventory at a central location (within 50 miles of the city) which is accessible to the service location 24 hours per day, 365 days.

- BB. The transfer switch shall be serviced by a local service organization that is trained and factory certified in both generator set and transfer switch service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

- CC. The manufacturer shall maintain model and serial number records of each transfer switch provided for at least 20 years.

- DD. Accessory devices shall be provided as follows:
 - 1. Time delay to override harmless power dips and outages. (Inverse time characteristic with voltage.)
 - 2. Test switch.
 - 3. Auxiliary contacts (as specified herein).
 - 4. Selector relay (as specified herein).
 - 5. Lockout relay (sensitive to voltage and frequency).
 - 6. Full phase protection with nominal 75-80 percent dropout and 92-95 percent pickup on phase relay.
 - 7. Adjustable time delay on retransfer to normal source. Minimum retransfer of 2 minutes and maximum of 25 minutes. Built-in circuitry to nullify the retransfer time delay if the emergency source fails and the normal source is available.
 - 8. Adjustable (10-20 minutes) time delay for running generator unloaded after transfer for cool down.
 - 9. Adjustable time delay or delays (5 to 60 seconds) for holding transfer switch in the "Off" position when switching from standby source to normal and normal source to standby.
 - 10. Engine starting contact.
 - 11. A selector switch shall permit generator to be exercised with or without load.

2.05 ACCESS PLATFORM

- A. Elevated platforms shall be provided where necessary to provide access to the generator for operation and maintenance. Typically, these platforms shall be limited to locations with existing grades requiring equipment to be located at a higher elevation due to the Florida Building Code (FBC), FEMA, and the ASCE Standard 7 and 24 requirements.

- B. Platforms and stairs shall meet the Occupational Safety and Health Administration (OSHA) Part 1910, applicable FBC requirements, and ASCE Standards 7 and 24. All platform and stair designs and plans shall be prepared by a Florida Registered

Professional Engineer. The Engineer of Record shall identify Flood Hazard Area, Flood Design Class (ASCE 24) and other applicable loadings. All components shall be aluminum with stainless steel hardware. Standard stairs shall be utilized. Fall protection shall be provided on all exposed sides by use of an OSHA approved guardrail system. Where required for access, removable guardrail sections shall be provided. Grating shall be slip resistant and banded at ends of bearing bars and openings.

- C. All platforms and stairs shall be supported by a concrete foundation system. The foundation designs and plans shall be prepared by a Florida Registered Professional Engineer. It shall meet the requirements of the FBC, ASCE 7 (Dead, Live, Flood, and Wind), ASCE 24 (Flood Resistant) and other regulatory requirements. Where head clearance under the platform is less than 6'-8", provisions shall be made to limit access.

PART 3 EXECUTION

3.01 INSTALLATION OF DIESEL ENGINE-DRIVEN GENERATOR SETS

- A. Install diesel engine-driven generator units as indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that engine-generator units fulfill requirements. Comply with NFPA and NEMA standards pertaining to installation of engine-generator sets and accessories.
- B. Coordinate with other work, including raceways, electrical boxes and fittings, fuel tanks, piping, and accessories, as necessary to interface installation of engine generator equipment work with other work.
- C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B, and the National Electrical Code.
- D. Install units on steel spring type vibration isolators fastened to an inertia base in accordance with manufacturer's instructions.
- E. Connect fuel piping to generator equipment as indicated, and comply with manufacturer's installation instructions.

3.02 GROUNDING

- A. Provide equipment grounding connections for diesel engine-driven generator unit and automatic transfer switch as indicated. Connect generator equipment ground to ground ring around generator pad. Ground ring shall have a minimum of four (4) 5/8" x 20' copper-clad ground rods. Connect ground ring to sites counterpoise. Connections to ground ring, counterpoise and ground rods shall be exothermically welded. Add additional ground rings as required to meet five (5) ohm (or less) specified resistance. Tighten connections to comply with tightening torques specified in UL Standard 486A to ensure permanent and effective grounding.

3.03 FIELD QUALITY CONTROL

A. Start-up Testing:

1. Engage local equipment manufacturer's representative to perform start-up and building load tests upon completion of installation, with ENGINEER in attendance; provide certified test record. Tests are to include the following:
 - a. Check fuel, lubricating oil, and antifreeze in liquid-cooled models for conformity to manufacturer's recommendations under environmental conditions present.
 - b. Test prior to cranking engine for proper operation, accessories that normally function while the set is in a standby mode. Accessories include: alternator strip heater, engine coolant heater, and battery charger.
 - c. Check, during start-up test mode, for exhaust leaks, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage, and phase rotation.
 - d. Test, by means of simulated power outage, automatic start-up by remote-automatic starting, transfer of load, and automatic shutdown. Prior to this test, adjust for proper system coordination, transfer switch timers. After installation inspection and fine adjustments have been completed, the Generator set shall be connected to resistive type load banks, matching the full rated output of this installed generator set.
- 1) A four (4) hour 100% resistive load bank test, matching the full rated output of this installed generator set, is to be performed after installation in the presence of the ENGINEER, OWNER, and any required Authority. Coordinate with ENGINEER, OWNER, and any required Authority for appropriate test date and time. During this load bank test, monitor the engine temperature, oil pressure, battery charge level, generator voltage, amperes, and frequency. Voltage dip will be observed with a recording oscilloscope furnished by supplier for this test only. Voltage dip is defined as the peak-to-peak voltage minimum, at starting compared to the average peak-to-peak voltage with the starting load running. The difference shall be less than 25 percent of the running P-P voltage.
- 2) Provide a test of safeties and transfer under NFPA-110 criteria.
- 3) Provide all tests in the presence of an OWNER representative. Upon completion of installation and testing, demonstrate capability and compliance of system with requirements. Where possible, correct malfunctioning units at Site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting. Initial testing and retesting to be at no cost to OWNER.

3.04 QUALITY ASSURANCE

- A. Commissioning and Qualifications shall be performed by Manufacturer's authorized and factory certified trained for installation of units personnel.
- B. Maintenance Proximity: The commissioning and selling manufacturer office location shall not be more than two hours' normal travel time from the project site.
- C. Access to Service & Parts: Manufacturer for the Generator shall maintain a full

operational facility, with service, parts and distribution center within 50 miles of the Project Site. A 'sales office' will not qualify as a service & parts facility. A "dealer" that buys product from a Factory Distributor does not qualify.

- D. Manufacturer's Qualifications: The manufacturer shall be in the business of manufacturing power generation systems under ISO-9001 certification process for over 10 years. The manufacturer shall employ service, engineering, and parts staff within a factory-owned or authorized service center, within 50 miles of Project site.
- E. When an "upfitter" is used for a fuel tank or generator enclosure, the manufacturer shall be located in the same state as the Project Site.
- F. Upfitters shall provide their UL Listing number on all documentation of compliance. UL as an "assembly" under the generator manufacturer's main UL Listing is not acceptable.
- G. cUL (or other) listing or compliance shall not be accepted in lieu of UL listing and label.
- H. Manufacturer Service Qualifications: The generator manufacturer shall have a service center within a 2-hour driving distance from the project site. This service center shall have engineering, application support, on-site rental, start-up, commissioning, and replacement parts and labor for the maintenance and repair of the same brand of power generation system equipment as supplied on the Project.
- I. Source Limitations: Obtain all equipment under this section through one source as practical and possible under the limitations of the manufacturer's ability to provide equipment.
- J. The equipment under this Section must be sold to the installer or the OWNER by an entity operating from within the project State.
- K. The equipment under this Section must be installed by a CONTRACTOR operating from offices located within the Project state.
- L. Equipment under this section shall be provided by a single manufacturer, so as to provide only one source of warranty and responsibility whenever possible.
- M. Generator engine, alternator, and generator controller shall be provided by a single manufacturer exceptions must be noted in submittal. The ENGINEER reserves the right to reject exceptions based on the equipment used as the basis of design in comparison.

3.05 PERSONNEL TRAINING

- A. Building Operating Personnel Training: Train OWNER's building personnel in procedures for starting-up, testing, and operating diesel engine-driven generator sets. In addition, train OWNER's personnel in periodic maintenance of batteries.

END OF SECTION

SECTION 312316

EXCAVATION - EARTH AND ROCK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for performing opencut excavations to the widths and depths necessary for constructing structures and pipelines, including excavation of any material necessary for any purpose pertinent to the construction of the Work.
- B. Related Work Specified In Other Sections Includes:
 - 1. Section 017416 – Site Clearing
 - 2. Section 033100 – Concrete, Masonry, Mortar and Grout
 - 3. Section 312319 – Groundwater Control for Open Cut Excavation
 - 4. Section 312323 – Backfilling
 - 5. Section 314000 – Shoring, Sheeting and Bracing

1.2 DEFINITIONS

- A. Earth: "Earth" includes all materials which, in the opinion of the ENGINEER, do not require blasting, barring, wedging or special impact tools for their removal from their original beds, and removal of which can be completed using standard excavating equipment. Specifically excluded are all ledge and bedrock and boulders or pieces of masonry larger than one cubic yard in volume.
- B. Rock: "Rock" includes all materials which, in the opinion of the ENGINEER, require blasting, barring, wedging and/or special impact tools such as jack hammers, sledges, chisels, or similar devices specifically designed for use in cutting or breaking rock for removal from their original beds and which have compressive strengths in their natural undisturbed state in excess of 300 psi. Boulders or masonry larger than one cubic yard in volume are classed as rock excavation.

1.3 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.

- B. Engage the services of a Professional Engineer who is registered in the State of Florida to design all cofferdam and sheeting and bracing systems which the CONTRACTOR feels necessary for the execution of his work. Submit to the ENGINEER a signed statement that he has been employed by the CONTRACTOR to design all sheeting and bracing systems. After the systems have been installed, furnish to the ENGINEER an additional signed statement that the cofferdams and sheeting and bracing systems have been installed in accordance with his design.
- C. If a detour is required, submit a traffic control plan for approval to County Manager or designee and/or the Florida Department of Transportation as described in Section 015526.

1.4 SITE CONDITIONS

- A. Geotechnical Investigation: A geotechnical investigation may have been prepared by the COUNTY and ENGINEER in preparing the Contract Documents.
 - 1. The geotechnical investigation report may be examined for what ever value it may be considered to be worth. However, this information is not guaranteed as to its accuracy or completeness.
 - 2. The geotechnical investigation report is not part of the Contract Documents.
- B. Actual Conditions: Make any geotechnical investigations deemed necessary to determine actual site conditions.
- C. Underground Utilities and Collier County Damage Prevention Policy:
 - 1. This policy has been put in place to avoid damage to Collier County underground utilities. A minimum distance of five feet (5') horizontally and eighteen inches (18") vertically must be maintained away from Collier County utilities. Any and all variations from this order must be the Water or Wastewater Department.
 - 2. Before commencement of any excavation at road crossings or any boring or any drilling, the contractor shall mark the proposed run alignment with white paint or flags. Subsequent to placement of the white markings, the existing underground utilities in the area affected by the work must be marked by Sunshine One Call after proper notification to them by either calling 811 in Florida or toll free at 1-800-432-4770. Visit www.sunshine811.com for more information. Before commencing excavation for the work, potholing of all potential conflicts must be performed.
 - 3. All lines in conflict must be physically located by the contractor. Any conflict shall be reported to the utility and Collier County Public Utilities. Utilities under concrete or pavement may require soft dig vacuum locates which also is the contractor's responsibility to perform. All utilities will be field marked per Sunshine State One Call's statutes and guidelines. For line verification or any

other information concerning locates, please call the Locate Department at 239-252-5922 during normal business hours. For line verification or emergency locates after hours, call emergency number 239-825-1444. **In the event the potholing and/or vacuum soft dig does not locate the marked utility, work must be stopped and the affected utility owner contacted.** Failure to comply with this policy and obtain required signature(s) may result in revocation of existing right-of-way permits.

4. The contractor must comply with all provisions of Florida Statute 556, the Underground Facility Damage Prevention and Safety Act.
- D. Quality and Quantity: Make any other investigations and determinations necessary to determine the quality and quantities of earth and rock and the methods to be used to excavate these materials.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 GENERAL

- A. Clearing: Clear opencut excavation sites of obstructions preparatory to excavation. Clearing in accordance with Section 017416, includes removal and disposal of vegetation, trees, stumps, roots and bushes, except those specified to be protected during trench excavation.
- B. Banks: Shore or slope banks to the angle of repose to prevent slides or cave-ins in accordance with Section 314000.
- C. Safety: Whenever an excavation site or trench is left unattended by the CONTRACTOR or when an area is not within 100 feet of observation by the CONTRACTOR, the excavation site or trench shall be filled and/or, at the County's Manager or designee discretion, protected by other means to prevent accidental or unauthorized entry. Include barricades and other protection devices requested by the ENGINEER or County Manager or designee, including temporary fencing, snow fencing, or temporary "structure" tape. Such safety items shall not relieve the CONTRACTOR of any site safety requirements or liabilities established by Federal, State and local laws and agencies, including OSHA, but is intended as additional safety measures to protect the general public.
- D. Hazardous Materials: If encountered, take care of hazardous materials not specifically shown or noted in accordance with Section 015000.

- E. During excavation and any site work, take storm water pollution prevention measures to ensure that water quality criteria are not violated in the receiving water body and all state and local regulatory requirements are met.

3.2 STRUCTURE EXCAVATION

- A. Excavation Size: Provide excavations of sufficient size and only of sufficient size to permit the Work to be economically and properly constructed in the manner and of the size specified.
- B. Excavation Shape: Shape and dimension the bottom of the excavation in earth or rock to the shape and dimensions of the underside of the structure or drainage blanket wherever the nature of the excavated material permits.
- C. Compaction: Before placing foundation slabs, footings or backfill, proof roll the bottom of the excavations to detect soft spots.
 - 1. For accessible areas, proof roll with a ten wheel tandem axle dump truck loaded to at least 15 tons or similarly loaded construction equipment.
 - 2. For small areas, proof roll with a smooth-faced steel roller filled with water or sand, or compact with a mechanical tamper.
 - 3. Make one complete coverage, with overlap, of the area.
 - 4. Overexcavate soft zones and replace with compacted select fill.

3.3 TRENCH EXCAVATION

- A. Preparation: Properly brace and protect trees, shrubs, poles and other structures which are to be preserved. Unless shown or specified otherwise, preserve all trees and large shrubs. Hold damage to the root structure to a minimum. Small shrubs may be preserved or replaced with equivalent specimens.
- B. Adequate Space: Keep the width of trenches to a minimum, however provide adequate space for workers to place, joint and backfill the pipe properly.
 - 1. The minimum width of the trench shall be equal to at least 3.5 feet or the outside diameter of the pipe at the joint plus 8-inches for unsheeted trench or 12 inches for sheeted trench, whichever is greater. Conform the trench walls to OSHA Regulations.
 - 2. In sheeted trenches, measure the clear width of the trench at the level of the top of the pipe to the inside of the sheeting.
- C. Depth:

1. Excavate trenches to a minimum depth of 8 inches, but not more than 12 inches, below the bottom of the pipe so that bedding material can be placed in the bottom of the trench and shaped to provide a continuous, firm bearing for pipe barrels and bells.
 2. Standard trench grade shall be defined as the bottom surface of the utility to be constructed or placed within the trench. Trench grade for utilities in rock or other non-cushioning material shall be defined as additional undercuts backfilled with crushed stone compacted in 6-inch lifts, below the standard 8-inches minimum trench undercut. Backfill excavation below trench grade not ordered in writing by the ENGINEER with acceptable Class I, II or III embedment material to trench grade and compact to density equal to native soil.
- D. Unstable or Unsuitable Materials: If unstable or unsuitable material is exposed at the level of the bottom of the trench excavation, excavate the material in accordance with the subsection headed "Authorized Additional Excavation".
1. Remove material for the full width of the trench and to the depth required to reach suitable foundation material.
 2. When in the judgment of the ENGINEER the unstable or unsuitable material extends to an excessive depth, the ENGINEER may advise, in writing, the need for stabilization of the trench bottom with additional select fill material, crushed stone, washed shell, gravel mat or the need to provide firm support for the pipe or electrical duct by other suitable methods.
 3. Crushed stone, washed shell and gravel shall be as specified in Section 312323.
 4. Payment for such trench stabilization will be made under the appropriate Contract Items or where no such items exist, as a change in the Work.
- E. Length of Excavation: Keep the open excavated trench preceding the pipe laying operation and the unfilled trench, with pipe in place, to a minimum length which causes the least disturbance. Provide ladders for a means of exit from the trench as required by applicable safety and health regulations.
- F. Excavated Material: Neatly deposit excavated material to be used for backfill at the sides of the trenches where space is available. Where stockpiling of excavated material is required, obtain the sites to be used and maintain operations to provide for natural drainage and not present an unsightly appearance.
- G. Water: Allow no water to rise in the trench excavation until sufficient backfill has been placed to prevent pipe flotation. Provide trench dewatering in accordance with Section 312319.

3.4 EXCAVATION FOR JACKING AND AUGERING

- A. Jacking and Augering Requirements: Allow adequate length in jacking pits to provide room for the jacking frame, the jacking head, the reaction blocks, the jacks, auger rig, and the jacking pipe. Provide sufficient pit width to allow ample working space on each side of the jacking frame. Allow sufficient pit depth such that the invert of the pipe, when placed on the guide frame, will be at the elevation desired for the completed line. Tightly sheet the pit and keep it dry at all times.

3.5 ROCK EXCAVATION

- A. Rock Excavation: Excavate rock within the boundary lines and grades as shown, specified or required.
 - 1. Rock removed from the excavation becomes the property of the CONTRACTOR. Transport and dispose of excavated rock at an off site disposal location. Obtain the off site disposal location.
 - 2. Remove all shattered rock and loose pieces.
- B. Structure Depths: For cast-in-place structures, excavate the rock only to the bottom of the structure, foundation slab, or drainage blanket.
- C. Trench Width: Maintain a minimum clear width of the trench at the level of the top of the pipe of the outside diameter of the pipe barrel plus 2 feet, unless otherwise approved.
- D. Trench Depth: For trench excavation, in which pipelines are to be placed, excavate the rock to a minimum depth of 8 inches below the bottom of the pipe or duct encasement. Provide a cushion of sand or suitable crushed rock. Refill the excavated space with pipe bedding material in accordance with Section 312323. Include placing, compacting and shaping pipe bedding material in the appropriate Contract Items.
- E. Manhole Depths: For manhole excavation, excavate the rock to a minimum depth of 8 inches below the bottom of the manhole base for pipelines 24 inches in diameter and larger and 6 inches below the bottom manhole base for pipelines less than 24 inches in diameter. Refill the excavated space with pipe bedding material in accordance with Section 312323. Include placing, compacting and shaping pipe bedding material for manhole bases in the appropriate Contract Items.
- F. Over-excavated Space: Refill the excavated space in rock below structures, pipelines, conduits and manholes, which exceeds the specified depths with 2,500 psi concrete, crushed stone, washed shell, or other material as directed. Include refilling of over-excavated space in rock as part of the rock excavation.

G. Other Requirements: Follow, where applicable, the requirements of the subsections on "Trench Excavation" and "Structure Excavation".

H. Payment: No additional payment will be made for rock excavation.

3.6 FINISHED EXCAVATION

A. Finish: Provide a reasonably smooth finished surface for all excavations, which is uniformly compacted and free from irregular surface changes.

B. Finish Methods: Provide a degree of finish that is ordinarily obtainable from blade-grade operations and in accordance with Section 312323.

3.7 PROTECTION

A. Traffic and Erosion: Protect newly graded areas from traffic and from erosion.

B. Repair: Repair any settlement or washing away that may occur from any cause, prior to acceptance. Re-establish grades to the required elevations and slopes.

C. It shall be the CONTRACTOR's responsibility to acquaint himself with all existing conditions and to locate all structures and utilities along the proposed utility alignment in order to avoid conflicts. Where actual conflicts are unavoidable, coordinate work with the facility owner and perform work so as to cause as little interference as possible with the service rendered by the facility disturbed in accordance with Section 020500. Repair and/or replace facilities or structures damaged in the prosecution of the work immediately, in conformance with current standard practices of the industry, or according to the direction of the owner of such facility, at the CONTRACTOR's expense.

D. Other Requirements: Conduct all Work in accordance with the environmental protection requirements specified in Division 1.

3.8 AUTHORIZED ADDITIONAL EXCAVATION

A. Additional Excavation: Carry the excavation to such additional depth and width as authorized in writing, for the following reasons:

1. In case the materials encountered at the elevations shown are not suitable.

2. In case it is found desirable or necessary to go to an additional depth, or to an additional depth and width.

B. Refill Materials: Refill such excavated space with either authorized 2500 psi concrete or compacted select fill material, in compliance with the applicable provisions of Section 312323.

- C. Compaction: Compact fill materials to avoid future settlement. As a minimum, backfill layers shall not exceed 6-inches in thickness for the full trench width and compaction shall equal 95% of maximum density, or 98% if under paved area of roadway, as determined by using ASTM D 1557. Perform compaction density tests at all such backfill areas with spacing not to exceed 100 feet apart and on each 6-inch compacted layer.
- D. Payment: Additional earth excavations so authorized and concrete or select fill materials authorized for filling such additional excavation and compaction of select fill materials will be paid for under the appropriate Contract Items or where no such items exist, as a change in the Work.

3.9 UNAUTHORIZED EXCAVATION

- A. Stability: Refill any excavation carried beyond or below the lines and grades shown, except as specified in the subsection headed "Authorized Additional Excavation", with such material and in such manner as may be approved in order to provide for the stability of the various structures.
- B. Refill Materials: Refill spaces beneath all manholes, structures, pipelines, or conduits excavated without authority with 2500 psi concrete or compacted select fill material, as approved.
- C. Payment: Refill for unauthorized excavation will not be measured and no payment will be made therefor.

3.10 SEGREGATION STORAGE AND DISPOSAL OF MATERIAL

- A. Stockpiling Suitable Materials: Stockpile topsoil suitable for final grading and landscaping and excavated material suitable for backfilling or embankments separately on the site in approved locations.
- B. Stockpile Locations: Store excavated and other material a sufficient distance away from the edge of any excavation to prevent its falling or sliding back into the excavation and to prevent collapse of the wall of the excavation. Provide not less than 2 feet clear space between the top of any stockpile and other material and the edge of any excavation.
- C. Excess Materials: Be responsible for transport and disposal of surplus excavated material and excavated material unsuitable for backfilling or embankments at an off site disposal location secured by the CONTRACTOR.

3.11 REMOVAL OF WATER

- A. Water Removal: At all times during the excavation period and until completion and acceptance of the WORK at final inspection, provide ample means and equipment with which to remove promptly and dispose of properly all water entering any excavation or other parts of the WORK.

- B. Dry Excavations: Keep the excavation dry, in accordance with Section 312319.
- C. Water Contact: Allow no water to rise over or come in contact with masonry and concrete until the concrete and mortar have attained a set and, in any event, not sooner than 12 hours after placing the masonry or concrete.
- D. Discharge of Water: Dispose of water pumped or drained from the Work in a safe and suitable manner without damage to adjacent property or streets or to other work under construction.
- E. Protection: Provide adequate protection for water discharged onto streets. Protect the street surface at the point of discharge.
- F. Sanitary Sewers: Discharge no water into sanitary sewers.
- G. Storm Sewers: Discharge no water containing settleable solids into storm sewers.
- H. Repair: Promptly repair any and all damage caused by dewatering the Work.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 312319

GROUNDWATER CONTROL FOR OPEN CUT EXCAVATION

PART 1 GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. This section provides for furnishing all permits, labor, materials, equipment, power and incidentals for performing all operations necessary to dewater, depressurize, drain and maintain excavations as described herein and as necessary for installation of pipeline and appurtenances. Included are installing, maintaining, operating and removing dewatering systems and other approved devices for the control of surface and groundwater during the construction of pipelines and appurtenances, open cut excavations, directional drilling. Included also are protecting work against rising waters and repair of any resulting damage.

1.2 CONTRACTOR'S RESPONSIBILITY

- A. It is the sole responsibility of the CONTRACTOR to identify groundwater conditions and to provide any and all labor, material, equipment, techniques and methods to lower, control and handle the groundwater as necessary for his construction methods and to monitor the effectiveness of this installed system and its effect on adjacent facilities.
- B. Operate, maintain and modify the system(s) as required to conform to these Specifications. Upon completion of the Construction, remove the system(s). The development, drilling and abandonment of all wells used in the dewatering system shall comply with regulations of the Florida Department of Environmental Protection and the governing Water Management District.
- C. Assume sole responsibility for dewatering systems and for all loss or damage resulting from partial or complete failure of protective measures and any settlement or resultant damage caused by the dewatering operation.

1.3 PLANS AND OTHER DATA TO BE SUBMITTED

- A. Prior to commencement of work, submit complete drawings, details and layouts showing the proposed dewatering plans in sufficient detail (i.e., general arrangements, procedures to be used, etc.) so as to allow the ENGINEER to evaluate the proposed dewatering systems. Include the following, as required by the CONTRACTOR's proposed operation:
 - 1. Names of equipment suppliers.
 - 2. Names of installation subcontractors.

3. Plan for dewatering at access shafts and control of surface drainage.
4. Plan for dewatering for cut-and-cover excavations, or otherwise controlling groundwater.
5. Eductor system layout and details.
6. Deep well locations and details.
7. Well point system layout and details.
8. Installation reports for eductors, deep wells and well points.
9. Water level readings from piezometers or observation wells, and method of maintenance.
10. As part of his request for approval of a dewatering system, demonstrate the adequacy of the proposed system and well point filler sand by means of a test installation.

PART 2 PRODUCTS

- A. Select equipment including but not limited to pumps, eductors, well points and piping and other material desired.

PART 3 EXECUTION

3.1 DEWATERING EXCAVATIONS

- A. Obtain all permits necessary for dewatering operations and file a copy of all such permits with the County Manager or designee and ENGINEER.
- B. Furnish, install, operate and maintain all necessary equipment for dewatering the various parts of the Work and for maintaining free of water the excavations and such other parts of the Work as required for Construction operations. Dewatering system should provide for continuous operation including nights, weekends, holidays, etc. Provide appropriate backup if electrical power is primary energy source for dewatering system.
- C. Continue dewatering in all required areas, until the involved work is completed, including the placing and compaction of backfill materials.
- D. Provide a uniform diameter for each pipe drain run constructed for dewatering. Remove the pipe drain when it has served its purpose. If removal of the pipe is impractical, provide grout connections at 50-foot intervals, and fill the pipe with clay grout or cement and sand grout when the pipe has served its purpose.

3.2 DEWATERING TRENCH

- A. Dewatering Excavation Plan: Develop an excavation dewatering plan that considers site ground and groundwater conditions, the type and arrangement of the equipment to be used and the proper method of groundwater disposal. Prepare the dewatering plan before beginning excavations below groundwater. Maintain one copy of the dewatering plan at the project site to be available for inspection while all dewatering operations are underway.
- B. Do not lay any pipeline in a trench in the presence of water. Remove all water from the trench sufficiently ahead of the pipeline placing operation. The ENGINEER shall have full and final authority to require dewatering of the trench to ensure a dry, firm bed on which to place the pipeline. As a minimum, maintain water levels at least 6 inches below the bottom of the trench. Continue to dewater trench until trench backfilling operations have been completed.
 - 1. If a dry trench bottom has not been obtained with usual methods of trench dewatering, then the order to excavate below grade and place sufficient select fill material, crushed stone, or 2500 psi concrete over the trench bottom may be given.
 - 2. If all efforts fail to obtain a stable dry trench bottom, and it is determined that the trench bottom is unsuitable for pipe foundation, present an alternate system for stabilization to the Engineer of Record for approval by the County Manager or designee on a case-by-case basis.
- C. Removal of water may be accomplished by pumping in connection with well point installation as the particular situation may warrant.
- D. If the soils encountered at the trench grade are suitable for the passage of water, without destroying the sides or utility foundation of the trench, sumps may be provided at intervals at the side of the main trench excavation. Use pumps to lower the water level by taking their suction from said sumps.

3.3 REQUIREMENTS FOR EDUCTOR, WELL POINTS OR DEEP WELLS

- A. Eductor, well points or deep wells, where used, must be furnished, installed and operated by a reputable CONTRACTOR regularly engaged in this business, and approved.

3.4 DURATION OF DRAINAGE

- A. In areas where concrete is to be placed, carry out the foundation drainage so that the required lowering of the water table will be effected prior to placing reinforcing steel. Keep foundation beds free from water to the same levels for 3 days after placing concrete.

3.5 PROTECTION OF STRUCTURES

- A. Provide adequate protection for all structures to avoid damage to concrete.
- B. Operate construction equipment over completed concrete slabs or structures only with approval. Rubber tire equipment heavier than 5 tons and crawlers heavier than 7 tons will require adequate load spreading by sand fill or other means.

3.6 DISCHARGE OF WATER

- A. Do not discharge pumped drainage water into the sanitary sewer system or inhibit pedestrian or vehicular traffic with the groundwater control system.
- B. Discharge pumped drainage water into the storm sewer system or drainage ditch by direct means (i.e., discharge hose to inlet, burying header, etc.). Monitor the discharged water to determine that soil particles are not being removed.
- C. Conform all discharge to current South Florida Water Management District and Collier County Department of Stormwater Management rules, regulations, procedures and regulatory permits and if discharged into receiving waters, shall not exceed 29 N.T.U.'s above background.

3.7 REPAIR OF DAMAGE

- A. Assume full responsibility for all loss and damage due to flooding, rising water or seepage resulting from dewatering operations in any part of the work. Repair any damage to partially completed work from these or other causes, including the removal of slides, repair of foundation beds and performance of any other work necessitated by lack of adequate dewatering or drainage facilities.

END OF SECTION

SECTION 312323

BACKFILLING

PART 1 GENERAL

1.1 SUMMARY

- A. General Requirements: Backfill all excavation to the original surface of the ground or to such other grades as may be shown or required. For areas to be covered by topsoil, leave or stop backfill (12) inches below the finished grade. Obtain approval for the time elapsing before backfilling against masonry structures. Remove from all backfill, any compressible, putrescible, or destructible rubbish and refuse and all lumber and braces from the excavated space before backfilling is started. Leave sheeting and bracing in place or remove as the work progresses.
- B. Equipment Limitations: Do not permit construction equipment used to backfill to travel against and over cast-in-place concrete structures until the specified concrete strength has been obtained, as verified by concrete test cylinders. In special cases where conditions warrant, the above restriction may be modified providing the concrete has gained sufficient strength, as determined from test cylinders, to satisfy design requirements for the removal of forms and the application of load.
- C. Related Work Specified In Other Sections Includes:
 - 1. Section 017416 – Site Clearing
 - 2. Section 312316 – Excavation – Earth and Rock

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. ASTM D 1557 - Standard Test Methods for Moisture-Density Relations of Soil and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 in Drop

PART 2 PRODUCTS

2.1 BACKFILL MATERIAL - GENERAL

- A. General: Refer to Utilities Standards and Procedures Ordinance Section 9.1.2 for laying and backfilling requirements. Backfill with sound materials, free from waste, organic matter, rubbish, boggy or other unsuitable materials. Acceptable backfill shall not contain rocks or stones larger than 2 inches in size.

- B. General Materials Requirements: Conform materials used for backfilling to the requirements specified. Follow common fill requirements whenever drainage or select fill is not specified. Determine and obtain the approval of the appropriate test method where more than one compaction test method is specified.
- C. Classification of Approved Embedment Materials: Embedment materials listed here include a number of processed materials plus the soil types defined according to the Unified Soil Classification System (USCS) in ASTM D2487. These materials are grouped into 5 broad categories according to their suitability for this application.
1. Class I: Angular, 0.25 inch to 1.5 inch (6 to 40 mm) graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed shells and crushed stone. (Note: The size range and resulting high void ratio of Class I material makes it suitable for use to dewater trenches during pipe installation. This permeable characteristic dictates that its use be limited to locations where pipe support will not be lost by migration of fine grained natural material from the trench walls and bottom or migration of other embedment materials into the Class I material. When such migration is possible, the material's minimum size range should be reduced to finer than 0.25 inch (6 mm) and the gradation properly designed to limit the size of the voids. An alternative to modifying the gradation is to use a geotextile fabric as a barrier to migration to fines.)
 2. Class II: Coarse sands and gravels with maximum particle size of 1.5 inches (40 mm), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW and SP are included in this class. (Note: Sands and gravels, which are clean or borderline between clean and with fines, should be included. Coarse-grained soils with less than 12 percent, but more than 5 percent fines are neglected in ASTM D2487 and the USCS, but should be included. The gradation of Class II material influences its density and pipe support strength when loosely placed. The gradation of Class II material may be critical to the pipe support and stability of the foundation and embedment, if the material is imported and is not native to the trench excavation. A gradation other than well graded, such as uniformly graded or gap graded, may permit loss of support by migration into void spaces of a finer grained natural material from the trench wall and bottom. An alternative to modifying the gradation is to use a geotextile fabric as a barrier to migration of fines.)
 3. Class III: Fine sand and clayey (clay filled) gravels, including fine sands, sand-clay mixtures and gravel-clay mixtures. Soil Types GM, GC, SM and SC are included in this class.

4. Class IV: Silt, silty clays and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. Soil Types MH, ML, CH and CL are included in this class. (Note: Use caution in the design and selection of the degree and method of compaction for Class IV soils because of the difficulty in properly controlling the moisture content under field conditions. Some Class IV soils with medium to high plasticity and with liquid limits greater than 50 percent (CH, MH, CH-MH) exhibit reduced strength when wet and should only be used for bedding, haunching and initial backfill in arid locations where the pipe embedment will not be saturated by groundwater, rainfall or exfiltration from the pipe. Class IV soils with low to medium plasticity and with liquid limits lower than 50 percent (CL, ML, CL-ML) also require careful consideration in design and installation to control moisture content, but need not be restricted in use to arid locations.)
5. Class V: This class includes the organic soils OL, OH and PT as well as soils containing frozen earth, debris, rocks larger than 1.5 inches (40 mm) in diameter and other foreign materials. Do not use these materials for bedding, haunching or backfill.

2.2 SELECT FILL

- A. Materials for Select Fill: Use clean gravel, crushed stone, washed shell, or other granular or similar material as approved which can be readily and thoroughly compacted to 95 percent of the maximum dry density obtainable by ASTM D 1557.

1. Allowed Materials: Grade select fill between the following limits:

U.S. Standard Sieve	Percent Passing By Weight
2 inch	100
1-1/2 inch	90-100
1 inch	75-95
1/2 inch	45-70
#4	25-50
#10	15-40
#200	5-15

2. Unallowed Materials: Very fine sand, uniformly graded sands and gravels, sand and silt, soft earth, or other materials that have a tendency to flow under pressure when wet are unacceptable as select fill.

2.3 COMMON FILL

- A. **Materials for Common Fill:** Material from on-site excavation may be used as common fill provided that it can be readily compacted to 90 percent of the maximum dry density obtainable by ASTM D 1557, and does not contain unsuitable material. Select fill may be used as common fill at no change in the Contract Price.
- B. **Granular Materials On-Site:** Granular on-site material, which is fairly well graded between the following limits may be used as granular common fill:

U.S. Standard Sieve	Percent Passing by Weight
2 inch	100
#10	50-100
#60	20-90
#200	0-20

- C. **Cohesive Materials On-Site:** Cohesive site material may be used as common fill.
 - 1. The gradation requirements do not apply to cohesive common fill.
 - 2. Use material having a liquid limit less than or equal to 40 and a plasticity index less than or equal to 20.
- D. **Material Approval:** All material used as common fill is subject to approval. If there is insufficient on-site material, import whatever additional off-site material is required which conforms to the specifications and at no additional cost.

2.4 UTILITY PIPE BEDDING

- A. **Gradation for Small Piping:** For pipe 18 inches or less in diameter, use pipe bedding of material 90 percent of which will be retained on a No. 8 sieve and 100 percent of which will pass a 1/2-inch sieve and be well graded between those limits.
- B. **Gradation for Large Piping:** For pipe larger than 18 inches in diameter, use the same pipe bedding material as specified for smaller pipe or use a similar well graded material 90 percent of which will be retained on a No. 8 sieve and 100 percent of which will pass a 1-inch sieve.
- C. Provide a minimum of six (6) inches bedding material under all gravity sewer piping. In areas where poor soil conditions or rock exist, provide a minimum of six (6) inches of pipe bedding material under water or force main pressure pipe.

PART 3 EXECUTION

3.1 PRECAST MANHOLE BEDDING

- A. Bedding Compaction: Bed all precast manholes in well graded, compacted 12-inch layer of crushed stone. Compact bedding thickness no less than 6 inches for precast concrete manhole bases.
- B. Concrete Work Mats: Cast cast-in-place manhole bases and other foundations for structures against a 2500 psi concrete work mat in clean and dry excavations.
- C. Bedding Placement: Place select fill used for bedding beneath precast manhole bases, in uniform layers not greater than 9 inches in loose thickness. Thoroughly compact in place with suitable mechanical or pneumatic tools to not less than 95 percent of the maximum dry density as determined by ASTM D 1557.
- D. Use of Select Fill: Bed existing underground structures, tunnels, conduits and pipes crossing the excavation with compacted select fill material. Place bedding material under and around each existing underground structure, tunnel, conduit or pipe and extend underneath and on each side to a distance equal to the depth of the trench below the structure, tunnel, conduit or pipe.

3.2 PIPE BEDDING AND INITIAL BACKFILL

- A. Placement: Place backfill for initial pipe backfill from top of bedding to 1 foot over top of pipes in uniform layers not greater than 8 inches in loose thickness. Tamp under pipe haunches and thoroughly compact in place the backfill with suitable mechanical or pneumatic tools to not less than 98 percent of the maximum dry density as determined by ASTM D 1557.
- B. Foundation Bedding: Place bedding, to a depth specified by the County Manager or designee, as a foundation in wet, yielding or mucky locations. Construct foundation bedding by removal of the wet, yielding or mucky material and replacement with sufficient Class I material to correct soil instability.
- C. Stone Placement: Do not place large stone fragments in the pipe bedding or backfill within 2 feet over or around pipelines, or nearer than 2 feet at any point from any casing pipe, conduit or concrete wall.
- D. Machine Compaction: Machine Compaction of initial backfill is prohibited unless adequate cover as deemed by the County Manager or designee is provided. In no case shall adequate cover be less than 12 inches.
- E. Unallowed Materials: Pipe bedding containing very fine sand, uniformly graded sands and gravels, sand and silt, soft earth, or other materials that have a tendency to flow under pressure when wet is unacceptable.

3.3 TRENCH BACKFILL

- A. General: Backfill trenches from 1 foot over the top of the pipe, from the top of electrical duct bedding or as shown to the bottom of pavement base course, subgrade for lawns or lawn replacement, to the top of the existing ground surface or to such other grades as may be shown or required.
- B. Materials: All backfill material shall be acceptable dry materials, and shall be free from cinders, ashes, refuse, vegetable or organic material, boulders, rocks, or stones, or other deleterious material which in the opinion of the County Manager or designee is unsuitable.
- C. Depth of Placement - Place trench backfill in uniform layers not greater than 12 inches in loose thickness and that can be thoroughly compacted in place using suitable mechanical or pneumatic equipment to not less than 98 percent of the maximum dry density as determined by ASTM D 1557.
- D. Depth of Placement - Undeveloped Areas: In nondeveloped areas and where select fill material or hand-placed backfill are not specified or required, place suitable job-excavated material or other approved backfill in lifts not exceeding 12 inches in loose thickness. Lifts of greater thickness may be permitted by the County Manager or designee if the CONTRACTOR demonstrates compliance with required densities. When the trench is full, consolidate the backfill by jetting, spading, or tamping to ensure complete filling of the excavation. Mound the top of the trench approximately 12 inches to allow for consolidation of backfill.
- E. Compaction: Compact backfill as a percentage of the maximum density at optimum moisture content as determined by the standard proctor test, ASTM D698 as demonstrated in the following table:

Area	(Mod.) ASTM D1557
Around and 1' (Min) above top of pipe	98
Remaining Trench	98
Pavement Sub-Grade and Shoulders (Last 3' of Fill)	98
Base Material and Pavement	98
Adjacent to Structures (Areas not Paved)	98
Under Structures	98
Sub-Base	98

- F. Density Tests: Density tests will be made at the request of the County Manager or designee. Deficiencies will be corrected at the expense of the CONTRACTOR.
- G. Dropping of Material on Work: Do trench backfilling work in such a way as to prevent dropping material directly on top of any conduit or pipe through any great vertical distance.

- H. Distribution of Large Materials: Break lumps up and distribute any stones, pieces of crushed rock or lumps which cannot be readily broken up, throughout the mass so that all interstices are solidly filled with fine material.

3.4 STRUCTURE BACKFILL

- A. Use crushed stone underneath all structures, and adjacent to structures where pipes, connections and structural foundations are to be located within this fill. Use crushed stone beneath all pavements, walkways, and railroad tracks, and extend to the bottom of pavement base course or ballast.
 - 1. Place backfill in uniform layers not greater than 8 inches in loose thickness and thoroughly compact in place with suitable approved mechanical or pneumatic equipment.
 - 2. Compact backfill to not less than 95 percent of the maximum dry density as determined by ASTM D 1557.
- B. Use of Common Fill: Use common granular fill adjacent to structures in all areas not specified above. Select fill may be used in place of common granular fill at no additional cost.
 - 1. Extend such backfill from the bottom of the excavation or top of bedding to the bottom of subgrade for lawns or lawn replacement, the top of previously existing ground surface or to such other grades as may be shown or required.
 - 2. Place backfill in uniform layers not greater than 8 inches in loose thickness and thoroughly compact in place with suitable equipment, as specified above.
 - 3. Compact backfill to not less than 90 percent of the maximum dry density as determined by ASTM D 1557.

3.5 COMPACTION EQUIPMENT

- A. Equipment and Methods: Carry out all compaction with suitable approved equipment and methods.
 - 1. Compact clay and other cohesive material with sheep's-foot rollers or similar equipment where practicable. Use hand held pneumatic tampers elsewhere for compaction of cohesive fill material.
 - 2. Compact low cohesive soils with pneumatic-tire rollers or large vibratory equipment where practicable. Use small vibratory equipment elsewhere for compaction of cohesionless fill material.

3. Do not use heavy compaction equipment over pipelines or other structures, unless the depth of fill is sufficient to adequately distribute the load.

3.6 FINISH GRADING

- A. Final Contours: Perform finish grading in accordance with the completed contour elevations and grades shown and blend into conformation with remaining natural ground surfaces.
 1. Leave all finished grading surfaces smooth and firm to drain.
 2. Bring finish grades to elevations within plus or minus 0.10 foot of elevations or contours shown.
- B. Surface Drainage: Perform grading outside of building or structure lines in a manner to prevent accumulation of water within the area. Where necessary or where shown, extend finish grading to ensure that water will be carried to drainage ditches, and the site area left smooth and free from depressions holding water.

3.7 RESPONSIBILITY FOR AFTERSETTLEMENT

- A. Aftersettlement Responsibility: Take responsibility for correcting any depression which may develop in backfilled areas from settlement within one year after the work is fully completed. Provide, as needed, backfill material, pavement base replacement, permanent pavement, sidewalk, curb and driveway repair or replacement, and lawn replacement, and perform the necessary reconditioning and restoration work to bring such depressed areas to proper grade as approved.

3.8 INSPECTION AND TESTING OF BACKFILLING

- A. Sampling and Testing: Provide sampling, testing, and laboratory methods in accordance with the appropriate ASTM Standard Specification. Subject all backfill to these tests.
- B. Correction of Work: Correct any areas of unsatisfactory compaction by removal and replacement, or by scarifying, aerating or sprinkling as needed and recompaction in place prior to placement of a new lift.
- C. Testing Schedule:
 1. Compaction Schedule
 2. Optimum Moisture Content (Proctor Test)

END OF SECTION

SECTION 314000

SHORING, SHEETING AND BRACING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Work required for protection of an excavation or structure through shoring, sheeting, and bracing.
- B. Related Work Specified In Other Sections Includes:
 - 1. Section 312316 – Excavation – Earth and Rock
 - 2. Section 312323 – Backfilling

1.2 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. CONTRACTOR's Submittals: All sheeting and bracing shall be the responsibility of the CONTRACTOR to retain qualified design services for these systems, and to be completed with strict adherence to OSHA Regulations. Submit complete design calculations and working drawings of proposed shoring, sheeting and bracing which have been prepared, signed and sealed by a Licensed Professional Engineer experienced in Structural Engineering and registered in the State of Florida, before starting excavation for jacking pits and structures. Use the soil pressure diagram shown for shoring, sheeting and bracing design. ENGINEER's review of calculations and working drawings will be limited to confirming that the design was prepared by a licensed professional engineer and that the soil pressure diagram shown was used.

1.3 REFERENCES

- A. Design: Comply with all Federal and State laws and regulations applying to the design and construction of shoring, sheeting and bracing.
- B. N.B.S. Building Science Series 127 "Recommended Technical Provisions for Construction Practice in Shoring and Sloping Trenches and Excavations."

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Do work in accordance with the U.S. Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54), and the Florida

Trench Safety Act. Observe 29 CFR 1910.46 OSHA regulations for Confined Space Entry.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND MATERIALS

- A. Material Recommendations: Use manufacturers and materials for shoring, sheeting and bracing as recommended by the Licensed Professional Engineer who designed the shoring, sheeting, and bracing.
 - 1. Wood Materials: Oak, or treated fir or pine for wood lagging.

PART 3 EXECUTION

3.1 SHORING, SHEETING AND BRACING INSTALLATION

- A. General: Provide safe working conditions, to prevent shifting of material, to prevent damage to structures or other work, to avoid delay to the work, all in accordance with applicable safety and health regulations. Properly shore, sheet, and brace all excavations which are not cut back to the proper slope and where shown. Meet the general trenching requirements of the applicable safety and health regulations for the minimum shoring, sheeting and bracing for trench excavations.
 - 1. CONTRACTOR's Responsibility: Sole responsibility for the design, methods of installation, and adequacy of the shoring, sheeting and bracing.
- B. Arrange shoring, sheeting and bracing so as not to place any strain on portions of completed work until the general construction has proceeded far enough to provide ample strength.
- C. If ENGINEER is of the opinion that at any point the shoring, sheeting or bracing are inadequate or unsuited for the purpose, resubmission of design calculations and working drawings for that point may be ordered, taking into consideration the observed field conditions. If the new calculations show the need for additional shoring, sheeting and bracing, it should be installed immediately.
- D. Monitoring: Periodically monitor horizontal and vertical deflections of sheeting. Submit these measurements for review.
- E. Accurately locate all underground utilities and take the required measures necessary to protect them from damage. Keep all underground utilities in service at all times as specified in Division 1.

- F. Driven Sheet piling: Drive tight sheet piling in that portion of any excavation in paved or surface streets City collector and arterial streets and in State and County highways below the intersection of a one-on-one slope line from the nearest face of the excavation to the edge of the existing pavement or surface.
- G. Sheet piling Depth: In general drive or place sheet piling for pipelines to a depth at elevation equal to the top of the pipe as approved.
1. If it is necessary to drive sheet piling below that elevation in order to obtain a dry trench or satisfactory working conditions, cut the sheet piling off at the top of the pipe and leave in place sheet piling below the top of the pipe.
 2. Do not cut the sheet piling until backfill has been placed and compacted to the top of the pipe.
- H. Sheet piling Removal: In general, remove sheet piling and bracing above the top of the pipe as the excavation is refilled in a manner to avoid the caving in of the bank or disturbance to adjacent areas or structures. Remove sheet piling as backfilling progresses so that the sides are always supported or when removal would not endanger the construction of adjacent structures. When required to eliminate excessive trench width or other damages, shoring or bracing shall be left in place and the top cut off at an elevation 2.5 feet below finished grade, unless otherwise directed.
1. Carefully fill voids left by the withdrawal of the sheet piling by jetting, ramming or otherwise.
 2. No separate payment will be made for filling of such voids.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 320117

PAVEMENT REPAIR AND RESTORATION

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required and remove and replace pavements over trenches excavated for installation of pipelines as shown on the drawings and/or specified herein.

1.2 GENERAL

- A. Repair all damage, as a result of work under this project, done to existing pavement, driveways, paved areas, curbs and gutters, sidewalks, shrubbery, grass, trees, utility poles, utility pipe lines, conduits, drains, catch basins, or stabilized areas or driveways and including all obstructions not specifically named herein, in a manner satisfactory to the ENGINEER. Include in the bid price, the furnishing of all labor, materials, equipment, and incidentals necessary for the cutting, repair, and restoration of the damaged areas unless pay items for specific types of repair are included in the Bid Form.
- B. Keep the surface of the backfilled area of excavation in a safe condition and level with the remaining pavement until the pavement is restored in the manner specified herein. All surface irregularities that are dangerous or obstructive to traffic are to be removed. Conform the repair to applicable COUNTY or State requirements for pavement repair and as described herein.
- C. The COUNTY reserves the right to require soil bearing or loading tests or materials tests, should the adequacy of the foundation or the quality of materials used be questionable. Costs of these tests shall be the responsibility of the COUNTY, if found acceptable; the costs of all failed tests shall be the responsibility of the CONTRACTOR.
- D. Make all street and road repair in accordance with the details indicated on the drawings and in accordance with the applicable requirements of these Specifications and meeting the permit requirements and approval of the governing Department of Transportation agencies.
- E. Replace pavement or roadway surfaces cut or damaged in equal or better condition than the original, including stabilization, base course, surface course, curb and gutter or other appurtenances. Obtain the necessary permits prior to any roadway work. Provide advance notice to the appropriate authority, as required, prior to construction operations.

1. Roadway Restoration (within Collier County Department of Transportation & Engineering jurisdiction): Perform restoration in accordance with the requirements set forth in the "Right-of-Way Utility Construction Activities Policy" and these Standards. Obtain prior approval from Collier County DOT for the materials of construction and method of installation, along with the proposed restoration design for items not referred or specified herein.
 - a. Where existing pavement is to be removed, mechanical saw cut the surface prior to trench excavation, leaving a uniform and straight edge parallel or perpendicular to the roadway centerline with minimum disturbance to the remaining adjacent surfacing. Provide minimal width of cut for this phase of existing pavement removal.
 - b. Immediately following the specified backfilling and compaction, apply a temporary sand seal coat surface to the cut areas. For this temporary surfacing, provide a smooth traffic surface with the existing roadway and maintain until final restoration. Ensure that surfacing remains for a minimum of ten (10) days in order to assure the stability of the backfill under normal traffic conditions. Thirty (30) days following this period and prior to sixty (60) days after application: remove the temporary surfacing and perform final roadway surface restoration.
 - c. In advance of final restoration, remove the temporary surfacing and mechanically saw the existing pavement straight and clean to the stipulated dimensions, if needed. Following the above operation, proceed immediately with final pavement restoration in accordance with the requirements set forth by Collier County Department of Transportation.
 - d. No layer shall be greater than two inches (2") when compacted. Where a surface course is constructed to a thickness greater than two inches (2"), construct it in approximately equal layers, each not exceeding two inches (2").
 - e. Where necessitated by traffic conditions, lay mixture in strips in such manner as to provide for the passage of traffic. Where the road is closed to traffic, mixture may be laid to the full width, by machines traveling in parallel.
2. Roadway Restoration (outside Collier County Department of Transportation jurisdiction) – Conform work within the rights-of-way of public thoroughfares which are not under jurisdiction of Collier County to the requirements of the Governmental agency having jurisdiction or the Florida Department of Transportation, if no governmental agencies have jurisdiction. Work within State Highway right-of-way shall be in full compliance with all requirements of the permit drawings, and to the satisfaction of the Florida Department of Transportation.

1.3 QUALITY ASSURANCE

- A. Applicable provisions of the latest version of the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction", and Supplemental Specifications hereunder govern the work under this Section. The Florida Department of Transportation will hereafter be referred to as FDOT.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Use materials for flexible base pavement and base course as specified in the latest version of the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction".

PART 3 EXECUTION

3.1 CUTTING PAVEMENT

- A. Cut and remove pavement to straight edges, 6 inches outside each edge of proposed trench to avoid pavement damage during installation of the new pipelines and appurtenances and for making connections to existing pipelines.
- B. Before removing pavement, mark the pavement for cuts nearly paralleling pipelines and existing street lines. Cut asphalt pavement along the markings with a jackhammer, rotary saw, or other suitable tool.
- C. No pavement shall be machine pulled until completely broken and separated along the marked cuts.
- D. The pavement adjacent to pipeline trenches shall neither be disturbed nor damaged. If the adjacent pavement is disturbed or damaged, irrespective of cause, remove the damaged pavement replace it at CONTRACTOR's expense.

3.2 GENERAL RESTORATION

- A. Restore, replace or rebuild existing street paving, driveways, etc., using the same type of construction as was in the original. Be responsible for restoring all such work, including sub-grade and base courses where present. Obtain and pay for such local or other governmental permits as may be necessary for the opening of streets. Meet any requirements other than those herein set forth which may affect the type, quality and manner of carrying on the restoration of surfaces by reason of jurisdiction of such governmental bodies.
- B. In all cases, maintain, without additional compensation, all permanent replacement of street paving, done by him under this Contract until accepted by the County Manager or designee, including the removal and replacement of such

work wherever surface depressions or underlying cavities result from settlement of trench backfill.

- C. Complete all the final resurfacing or re-paving of streets or roads, over the excavations and relay paving surfaces of roadbed that have failed or been damaged prior to acceptance by the County Manager or designee. Conform backfilling of trenches and the preparation of sub-grades to the requirements of Section 312323.
- D. Do all re-paving or resurfacing in accordance with Florida Department of Transportation Specifications, to which the following requirement of trench backfill will be added: Where pipeline construction crosses paved areas such as streets, backfill the top 24 inches of trench below the road bases or concrete slabs with compacted A-4 or better material that will provide a bearing value of not less than 75 when tested by the Florida Department of Transportation Soil Bearing Test Methods.

3.3 PRIME AND TACK COATS

- A. Apply bituminous prime and tack coats on the previously prepared base course in accordance with Section 300 of the FDOT Specifications.

3.4 WEARING COURSE

- A. Use plant-mixed hot bituminous pavement to the thickness indicated in the drawings conforming to Type III asphaltic concrete in accordance with Section 333 of the FDOT Specifications. The requirements for plant and equipment are specified in Section 320 and the general construction requirements for asphaltic concrete pavement are contained in Section 330 of the FDOT specifications.

3.5 TESTING

- A. Perform all field-testing at an independent laboratory employed by the COUNTY. Test and certify all materials by the producer. Repeat tests of sub-grade or base not meeting specified compaction at the CONTRACTOR's expense.

3.6 MISCELLANEOUS RESTORATION

- A. Restore sidewalks, cut or damaged by construction, in full sections or blocks to a minimum thickness of four inches. Restore concrete curb or curb gutter to the existing height and cross section in full sections or lengths between joints. Concrete shall be as specified on the drawings. Restore grassed yards, shoulders and parkways to match the existing sections with grass seed or sod of a type matching the existing grass.

3.7 CLEANUP

- A. After all repair and restoration or paving has been completed, remove all excess asphalt, dirt, and other debris from the roadways. Check and clean all existing storm sewers and inlets of any construction debris.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 321300

SIDEWALKS, DRIVEWAYS AND CURBS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Sidewalks, sidewalk ramps, driveways, curbs and drive approaches complete with concrete materials, concrete curing compounds, joint materials, field quality control and appurtenances.

1.2 REFERENCES

- A. Reference Standards: Conform the work for this Section to the applicable portions of the following standard Specifications.
 - 1. ASTM - American Society of Testing and Materials
 - 2. AASHTO - American Association of State Highway and Transportation Officials
 - 3. FDOT - Florida Department of Transportation - Standard Specifications for Road and Bridge Construction.
 - 4. FAC - Florida Accessibility Code.
 - 5. ADAAG - American with Disabilities Act Accessibility Guidelines
 - 6. UFAS - Uniform Federal Accessibility Standards

1.3 SUBMITTALS

- A. Reports: Written permission for the use of all local disposal sites Furnish copies to the ENGINEER.
- B. Test Reports:
 - 1. Thickness and Compressive Strength: Provide the ENGINEER with two (2) certified copies of the test results. Perform the tests by a laboratory approved by the ENGINEER.

1.4 JOB CONDITIONS

- A. Environmental Requirements:

1. Temperature: Comply with the requirements for concrete installation due to outside ambient air temperatures as specified under Article 3.3.I of this Section.

B. Protection:

1. Protection Against Rain: Comply with the requirements for protecting new work against damage from Rain, as specified under Article 3.3.I of this Section.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Concrete: Use 2,500-psi concrete except as modified herein.
- B. Ready-Mixed Concrete: Use ready-mixed concrete that conforms to ASTM C94, Alternate 2.
- C. Water: Use water for mixing and curing concrete reasonably clean and free from oil, salt, acid, alkali, chlorides, sugar, vegetable, or other substances injurious to the finished product. Waters from sources approved by the local Health Department as potable may be used without test. Test water requiring testing in accordance with the current Method of Test for Quality of Water to be Used in Concrete, AASHTO T-26.
- D. Concrete Curing Compounds: Use white membrane curing compound for curing concrete that conforms to AASHTO M148, Type 1 clear, or Type 2 white per FDOT Section 925.
- E. Premolded Joint Filler: Use fiber joint filler that conforms to ASTM D1751. Use filler of the thickness, as specified herein, or as directed by the ENGINEER.
- F. Steel Hook Bolts: Use hook bolts that conform to ASTM A706, or for Grade 60 of ASTM A615, A616, or A617. Use 5/8-inch diameter hook bolts self-tapping.
- G. Joint Sealant: Use hot-poured type joint sealant that conforms to ASTM D1190.

PART 3 EXECUTION

3.1 CONTRACTOR'S VERIFICATION

- A. Excavation and Forming: Prior to the installation of any concrete, examine the excavation and forms for the proper grades, lines, and levels required to receive the new work. Ascertain that all excavation and compacted subgrades are adequate to receive the concrete to be installed.

1. Correct all defects and deficiencies before proceeding with the work.
- B. Existing Improvements: Investigate and verify location of existing improvements to which the new work is to be connected.
1. Making necessary adjustment in line and grade to align the new work with the existing improvements must be approved by the ENGINEER prior to any change.

3.2 PREPARATION

- A. Forms: Use wood or metal forms, straight and free from warp, clean, and sufficient strength to resist springing during the process of depositing concrete against them.
1. Use full depth of the concrete forms.

3.3 INSTALLATION

- A. Sidewalks, Sidewalk Ramps, Driveways and Driveway Approaches: Construct all sidewalks and sidewalk ramps four (4) inches thick except at driveways and alleys. Construct thickness of the sidewalks six (6) inches at driveways and alleys. Construct sidewalks five (5) feet wide unless otherwise noted on the Plans, and slope 1/4-inch per foot towards the center of the road. Normally, sidewalks will be located within the right-of-way, parallel the property lines, at a distance of 1-foot from the property line.
1. Construct alleys, driveways and approaches six (6) inches thick. Construct the width of the driveways and driveway approaches as shown on the Plans or as directed by the ENGINEER.
- B. Removal of Existing Curb for Sidewalk Ramps and Driveway Approaches: Conform construction of sidewalk ramps within street intersections where curbed pavement existing to the current FDOT Roadway and Traffic Design Standards.
1. Saw cut, to full depth of pavement, and remove a minimum of an 18-inch wide curb and gutter section where there is no proper curb drop for the sidewalk ramp or driveway approach. When mountable curbs are present, remove a 24-inch wide curb and gutter section for the construction of sidewalk ramps, as specified above.
 2. Remove curb and gutter as determined by the ENGINEER in the field but remove curb and gutter at least as wide as the proposed sidewalk ramp plus 1-foot on each side.

3. Replace the removed curb and gutter section with materials, equal to what was removed and seal joint with hot poured rubber asphalt.
- C. Install 5/8-inch diameter self-tapping hook bolts, in the existing concrete pavement as indicated on the Plans prior to placing concrete for the removed curb and gutter section.
- D. Placement of Forms: Use wood forms, straight and free from warp, of nominal depth for sidewalk sections less than 25 feet in length.
1. Stake forms to line and grade in a manner that will prevent deflection and settlement.
 2. When unit slab areas are to be poured, place slab division forms such that the slab division joints will be straight and continuous.
 3. Set forms for sidewalk ramps to provide a grade toward the centerline of the right-of-way in accordance with current standards. Use a uniform grade, except as may be necessary to eliminate short grade changes.
 4. Oil forms before placing concrete. Leave forms in place at least 12 hours after the concrete is placed. Place forms ahead of the pouring operations to maintain uninterrupted placement of concrete.
 5. The use of slip form pavers can be allowed when approved by the ENGINEER in lieu of the construction system described above.
- E. Joints: Construct transverse and longitudinal expansion and plane-of-weakness joints at the locations specified herein, or as indicated on the Plans or as directed by the ENGINEER.
1. Place the transverse expansion joints for the full width and depth of the new work. Use transverse expansion joints placed against an existing pavement a minimum of six (6) inches deep but no less than the thickness of the concrete being placed.
 2. Conform longitudinal expansion joints to the requirements as transverse expansion joints.
 3. Construct joints true to line with their faces perpendicular to the surface of the sidewalk. Install the top slightly below the finished surface of the sidewalk. Construct transverse joints at right angles to the centerline of the sidewalk and construct longitudinal joints parallel to the centerline or as directed by the ENGINEER.
 4. Place transverse expansion joints, 1/2-inch thick, through the sidewalk at uniform intervals of not more than 50 feet and elsewhere as shown on the Plans, or as directed by the ENGINEER.

5. Place expansion joints, 1/2-inch thick, between the sidewalk and back of abutting parallel curb, buildings or other rigid structures, concrete driveways and driveway approaches. When directed by the ENGINEER, place the expansion joint between sidewalks and buildings 1-foot from the property line and parallel to it.
 6. Form plane-of-weakness joints every five (5) feet. Form joints by use of slab divisions forms extending to the full depth of the concrete or by cutting joints in the concrete, after floating, to a depth equal to 1/4 the thickness on the sidewalk. Construct cut joints not less than 1/8-inch or more than 1/4-inch in width and finish smooth and at right angles to the centerline on the sidewalk.
- F. Placing and Finishing Concrete: Place all concrete on a prepared unfrozen, smooth, leveled, rolled and properly compacted base. Place concrete on a moist surface with no visible water present.
1. Deposit the concrete, in a single layer to the depth specified. Spade or vibrate and compact the concrete to fill in all voids along the forms and joints. Strike off the concrete with a strike board until all voids are removed and the surface has the required grade and cross section as indicated on the Plans, or as directed by the ENGINEER.
 2. Float the surface of the concrete just enough to produce a smooth surface free from irregularities. Round all edges and joints with an edger having a 1/4-inch radius.
 3. Broom the surface of sidewalks, driveways and approaches to slightly roughen the surface.
 4. Texture the surface of the sidewalk ramps with a coarse broom transversely to the ramp slope, and coarser roughen than the remainder of the sidewalk. Contrast the ramp slope in color (using a brick-red dye or approved equal) from the remainder of the sidewalk. Comply with minimum color contrast and slope requirements from FAC, UFAS, ADAAG, Local Government Standards, or as directed by the ENGINEER.
- G. Curing: After finishing operations have been completed and immediately after the free water has left the surface, completely coat and seal the surface of the concrete (and sides if slip-forming is used) with a uniform layer of white membrane curing compound. Do not thin the curing compound. Apply the curing compound at the rate of one gallon per 200 square feet of surface.
- H. Barricades: Place suitable barricades and lights around all newly poured sidewalks, sidewalk ramps, driveways, driveway approaches and curb and gutter sections in order to protect the new work from damage from pedestrians, vehicles and others until the concrete has hardened.

1. Leave barricades in place for a minimum of two (2) days, except for driveway approaches and curb and gutter sections. Leave barricades in place for a minimum of three (3) days.
 2. Remove and replace any concrete that suffers surface or structural damage at no additional cost.
- I. Protection:
1. Against Rain: Protect new concrete from the effects of rain before the concrete has sufficiently hardened. Have available on the job site at all times enough burlap or 6-mil thick polyurethane film to cover and protect one day's work. Stop work and cover completed work when rain appears eminent. As soon as the rain ceases, uncover the concrete and burlap drag the surface where necessary. Apply curing compound to any areas where the compound has been disturbed or washed away.
 2. Against Cold Weather: If concrete is placed between December 15 and February 15, have available on the site sufficient amount of clean, dry straw or hay to cover one (1) day's production. If the temperature reaches 40 degrees F and is falling, place the hay or straw 12 inches thick, immediately after the curing compound is applied.
 3. Concrete Temperature Limitations: Do not place concrete when the temperature of the concrete at the point of placement is above 90 degrees F.
- J. Cleanup: After the concrete has gained sufficient strength, but no sooner than within 12 hours, remove the fixed forms and backfill the spaces on both sides with sound earth of topsoil quality. Compact, level and leave backfill in a neat condition.
- K. Gutters and Curbs: Construct gutters and curbs in accordance with Section 520 FDOT Standard Specifications for Road and Bridge Construction, latest edition, including supplements.

3.4 FIELD QUALITY CONTROL

- A. Concrete Delivery Ticket: Use a ticket system for recording the transportation of concrete from the batching plant to point of delivery. Issue this ticket to the truck operator at the point of loading and give to the ENGINEER upon delivery.
- B. Concrete Delivery Rejection: Remove concrete not permitted for inclusion in the work by the ENGINEER from the site. Rejection of concrete will be determined through Field Quality Control and elapsed time from mixer charging to delivery.
- C. Concrete Testing at Placement: Perform tests of each batch of concrete delivered, each 50 cubic yards, or whenever consistency appears to vary. The

sampling and testing of slump, air content and strength will be performed at no cost to the CITY.

1. Sampling: Secure composite samples in accordance with the Method of Sampling Fresh Concrete, ASTM C172.
2. Slump Test: Test in accordance with ASTM C143. Use the least slump possible consistent with workability for proper placing of the various classifications of concrete.
 - a. Place structural concrete for walls and slabs, by means of vibratory equipment, with a slump of four (4) inches.
 - b. A tolerance of up to 1-inch above the indicated maximum will be allowed for individual batches provided the average for all batches or the most recent ten (10) batches tested, whichever is fewer, does not exceed the maximum limit.
3. Air Content: Determine air content of normal weight concrete in accordance with Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method, ASTM C23 1, or by the volumetric method, ASTM C 173, for each strength test.
4. Compressive Strength: Make two (2) strength tests of three (3) samples each for each 50 cubic yards, or fraction thereof, of each mix design of concrete placed in any one (1) day.
 - a. Handling Samples: Mold and cure three (3) specimens from each sample in accordance with Method of Making and Curing Concrete Test Specimens in the Field, ASTM C31. Record any deviations from the requirements of this Standard in the test report.
 - b. Testing: Test specimens in accordance with Method of Test for Compressive Strength of Cylindrical Concrete Specimens, ASTM C39. Test one (1) specimen at seven (7) days for information and test two (2) at 28 days for acceptance. Use the average of the strengths of the two (2) specimens tested at 28 days. Discard results if one (1) specimen in a test manifests evidence of improper sampling, molding or testing, and use the strength of the remaining cylinder. Should both specimens in test show any of the above defects, discard the entire test.
 - c. Acceptance of Concrete: The strength level of the concrete will be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified 28-day strength and no individual strength test results falls below the specified 28-day strength by more than 500 psi. If the strength test is not acceptable, perform further testing to qualify the concrete.

- d. Concrete Temperature: Determine the temperature of concrete sample for each strength test.
- D. Reductions due to deficiencies in thickness or compressive strength are additive, that is, if an area is deficient by 3/8 inch and under strength by 200 psi, the total reduction is 20% plus .02% or .40% reduction.

END OF SECTION

SECTION 323113

CHAIN LINK FENCING AND GATES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for providing vinyl coated galvanized steel chain link fencing and gates.
- B. Related Work Specified in Other Sections Includes:
 - 1. Section 033100 – Concrete, Masonry, Mortar and Grout

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. ASTM 1043 - Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework
 - 2. ASME B36.10M - Welded and seamless wrought steel pipe
 - 3. FS RR-F-191 - Fencing, Wire and Post, Metal

1.3 DESIGN

- A. General: Provide fencing of the chain-link type and six (6) feet high with six (6) feet of diamond mesh woven wire fabric. Locate the fence as shown.
- B. Fabric, Supports and Fittings: Provide steel fabric, supports and fittings except as specified.
- C. Fabric, Supports and Fittings: Provide green or black color coated steel fabric, supports and fittings. Coat the framework, posts and hardware except hinges and latches to match the fabric with thermoplastic or thermoset resins and provide oven-baked materials to a minimum dry coating of seven mils. Color coat all accessories except hinges and latches to match the fence. Provide aluminum hinges and latches.
- D. Pipe Sizes and Weights: Provide pipe sizes and weights meeting the requirements of ASME B 36.10, Table 2 and ASTM A 53, Table 1. All pipe sizes listed are nominal, unless otherwise indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable manufacturers are listed in the County Approved Product List, Appendix F. Other manufacturers of equivalent products may be submitted.

2.2 FABRIC

- A. Provide fabric that is a one piece woven 2-inch mesh chain link of 6-gauge steel wire with a minimum breakload of 1800 lbs/ft. and which is interwoven to form a continuous fabric with no splices and is coated after weaving. Provide the top selvage knuckled for fabric 60 inches high and under, and the bottom selvage twisted and barbed for fabric over 60 inches high. Clean the fabric of all grease and foreign matter before coating and shipping. Stretch the fabric tightly approximately three inches above grade level and attach the fabric to the terminal or gateposts using beveled tension bands and tension bars.
 - 1. Provide galvanized fabric that is fusion coated with a minimum seven-mil coating of polyvinyl chloride (PVC) applied over a thermoset plastic bonding agent. Conform the PVC to Federal Specification RR-F-191.
 - 2. Vinyl coat all cut ends.
 - 3. Conform aluminum fabric to Fed. Spec. RR-F-191.

2.3 TENSION WIRE

- A. For the tension wire for the fence bottom use minimum 6-gauge galvanized coil spring steel fusion color coated as specified for the fabric.

2.4 TOP AND BRACE RAILS

- A. General: Furnish the top rail in approximately 20-foot lengths with couplings approximately 6 inches long for each joint. Provide one coupling in each 5 with an expansion spring. Provide the rail continuous from end-to-end for each run of fence. Provide brace rails at all terminal posts, locate the rails midway between the top and bottom of the fabric and extend from the terminal post to the first adjacent line post. Securely fasten rails at both ends. Provide top and brace rails that are galvanized steel fusion color coated as specified for framework in Subsection 1.03 C.
- B. Pipe Type: 1-1/4-inch, Schedule 40 pipe or a 1.625- by 1.25-inch roll-formed section with minimum bending strength of 192 pounds on 10-foot span.

2.5 POSTS

- A. General: Provide all posts that are coated as specified for vinyl-coated framework, posts and hardware in Subsection 1.03 C.

- B. Pipe Posts: Provide pipe posts as follows:
1. For end, corner and pull posts use 2-1/2-inch, Schedule 40 pipe
 2. For line posts use 2-inch, Schedule 40 pipe
 3. For gate posts use the following pipes for different leaves:
 - a. For leaves up to 6 feet wide, use 2-1/2-inch Schedule 40 pipe
 - b. For leaves over 6 feet to 12 feet wide, use 3-1/2-inch Schedule 40 pipe
 - c. For leaves over 12 feet to 18 feet wide, use 6-inch Schedule 40 pipe
- C. Bending Strength: Provide materials with the minimum bending strength based on a 6-foot cantilever for rolled formed or tube posts as follows:

		<u>Galvanized Steel</u>
1.	End, Corner and Pull Posts:	
	2.875" O.D. roll formed or	444
	2-1/2-inch square tube	547
	2-1/2-inch square, heavy wall extrusion	
2.	Line Posts:	
	For fences 8 feet maximum height 1.875- by 1.625-inch C-Section	245
	For fences over 8 feet high 2.25- by 1.703-inch C-Section	347
3.	Gate Posts:	
	For leaves up to 6 feet wide (2.875-inch O.D. roll formed or	444
	2-1/2-inch square tube	645

2.6 GATES

- A. General: For the perimeter construction of gates with leaves up to 6 feet wide, use 1-1/2-inch Schedule 40 pipe or 1-1/2-inch square steel tube, and for gates with leaves greater than 6 feet wide, use 2-inch Schedule 40 pipe or 2-inch square steel tube.
- B. Braces: Provide the gates with sufficient horizontal and vertical members and bracing to ensure structural stability to prevent sagging and to provide for the attachment of fabric, hardware and accessories. Provide gates with diagonal cross bracing consisting of 3/8-inch diameter adjustable length truss rods where necessary to provide frame rigidity without sag or twist.
- C. Cantilever Sliding Gates: Furnish cantilever overhang as follows:

Gate Leaf Size	Overhang
6'-0" to 10'-0"	6'-6"
11'-0" to 14'-0"	7'-6"
15'-0" to 22'-0"	10'-0"
12'-0" to 30'-0"	12'-0"

- 1. For gates leaf sizes 23'-0" to 30'-0", add one additional 2-inch square lateral support rail welded adjacent to the top horizontal rail. Make the bottom rail of 2" x 4" tubing weighing 1.71 pounds per foot.
- 2. Provide all cantilever overhang frames having 3/8-inch (galvanized steel) (aluminum) brace rods.
- 3. Provide the enclosed track made of a combined track and rail aluminum extrusion having a total weight of 3.72 pounds per foot and designed to withstand a reaction load of 2,000 pounds.
- 4. Provide each gate leaf with two swivel type zinc die cast trucks having four sealed lubricant ball-bearing wheels, 2-inch in diameter by 9/16-inch in width, with two side rolling wheels to insure alignment of the truck in the track. Hold trucks to post brackets by 7/8-inch diameter ball bolts with 1/2-inch shank. Design truck assemblies to take the same reaction load as the track.
- 5. Install gates on 8.625-inch OD Schedule 40 (galvanized) posts. Use three posts for single slide gate and four posts for double slide gate.
- 6. Provide guide wheel assemblies for each supporting post. Provide each assembly consisting of two rubber wheels 4 inches in diameter attached to a post so that the bottom horizontal member will roll between the wheels which can be adjusted to maintain gate frames plumb and in proper alignment.

- D. Gate Accessories: Equip gates with hinges, latches, center stops, hasps, holdbacks, and padlocks. Provide hinges, latches, center stops, hasps, and holdbacks that are aluminum. Provide double gates with a center drop bar and gate holdbacks.
- E. Latches: Provide gate latches that are positive locking, pivoting type with the padlocking arrangement accessible from either side of the gate.
- F. Hinges: Hang all gates on offset hinges to permit swinging the gate through a 180-degree arc to lie, when not obstructed, along and parallel to the line of the fence.

2.7 ATTACHMENTS

- A. General: Provide all attachments fabricated of coated to match the fabric as specified for framework, posts and hardware in Subsection 1.03, except provide aluminum hinges and latches.
- B. Tension Bars: Provide 3/16-inch by 3/4-inch galvanized carbon steel tension bars attached to the terminal posts by means of beveled edge bands.
- C. Truss Rods: Provide 3/8-inch diameter galvanized carbon steel truss rods. Securely mount truss rods between the line post end of the brace rail and the base of the terminal post.
- D. Post Tops: Provide post tops of galvanized pressed steel or malleable iron to form weathertight caps for post or tube posts. Make provisions for installation or passage of the top rail.
- E. Brace and Tension Bands: Provide galvanized steel brace bands and tension bands, of the "unclimbable" beveled edge type with 3/8-inch diameter square shouldered aluminum carriage bolts, nonremovable from outside of the fence.
- F. Rail Couplings: Provide rail couplings of the outside sleeve type, not less than six inches long, self-centering, which allows for expansion and contraction. Provide aluminum galvanized steel rail couplings.
- G. Fabric Ties: Provide 9-gauge galvanized steel fabric ties.
- H. Hog Rings: Provide 9-gauge wire, aluminum alloy, Type 6061-T6 hog rings.
- I. Extension Arms: Provide galvanized pressed steel extension arms for supporting the barbed wire where used. Design the arms with an adequate cross section to withstand without failure or permanent deflection a perpendicular force of 250 pounds applied at the end of the arm when the arm is securely attached to the post. Construct extension arms to be slanted out.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General: Install all fencing and accessories according to the manufacturer's recommendations. Do not begin installation and erection before final grading is completed, unless otherwise approved.
- B. Excavation: Drill or hand excavate (using post hole digger) holes for posts to the diameter and spacing indicated, in firm, undisturbed or compacted soil.
 - 1. If not indicated, excavate holes for each post to the minimum diameter recommended by the fence manufacturer, but not less than four times the largest cross-section of the post.
 - 2. Unless otherwise indicated excavate the hole depths approximately 3 inches lower than the post bottom, with the bottom of posts set not less than 36 inches below the finished grade surface.
- C. Tension Wire: Attach the tension wire to the bottom of the fabric by hog rings spaced at 24-inch intervals and to terminal posts by brace bands.
- D. Posts: Set posts plumb in concrete encasement at not more than 10-foot centers in the line of the fence with the tops properly aligned. Extend concrete encasement for line posts a minimum of three feet below finish grade with a minimum diameter of ten inches. Extend concrete encasement for terminal, corner and gate posts 40 inches below finished grade, except gate posts for leaves greater than 6 feet, for which extend the encasement 54 inches below grade. Provide the minimum diameter of encasement for terminal, corner and gateposts to be sufficient to provide not less than four inches between any part of the post and the face of the concrete and in no case provide the diameter to be less than 12 inches. Set line posts 32 inches into the concrete and set all other posts 36 inches, except gate posts for leaves greater than 6 feet wide, which are to be set 48 inches into the concrete. Slope the top exposed surface of the concrete to shed water and provide a neat appearance.
 - 1. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment and hold posts in position during placement and finishing operations.
 - a. Unless otherwise indicated, extend the concrete footing 2 inches above grade and trowel to a crown to shed water.
 - 2. Where aluminum is in contact with concrete, coat the aluminum.
- E. Fabric Ties: Space fabric ties approximately 12 inches apart on the line posts and 12 inches apart on the rails. (For clips used with C-section posts, use galvanized 11-gauge steel wire.)

- F. Fabric: Leave approximately 3 inches between finished grade and the bottom selvage, unless otherwise indicated. Pull the fabric taut and tie to posts, rails, and tension wires. Install the fabric on the security side of the fence, and anchor the fabric to the framework so that the fabric remains in tension after the pulling force is released.
- G. Fasteners: Install nuts for tensions bands and hardware bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent nut removal.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 329200

RESTORATION BY SODDING OR SEEDING

PART 1 GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. The work in this section consists of furnishing all labor, material and equipment to restore all areas disturbed during construction to match preconstruction conditions. Establish a stand of grass within the areas disturbed by furnishing and placing grass sod where required, or by seeding and mulching areas not requiring sod.

1.2 REFERENCE DOCUMENTS

- A. Use materials conforming to the requirements of Florida Department of Transportation Standard Specifications for Road and Bridge Construction as follows:
 - 1. Section 570 – Grassing (by Seeding)
 - 2. Section 575 – Sodding
 - 3. Section 981 – Grassing and Sodding Materials
 - 4. Section 982 – Commercial Fertilizer
 - 5. Section 983 – Water for Grassing

1.3 SUBMITTALS

- A. Submit certifications and identification labels for all sodding supplied in accordance with General Conditions.

PART 2 PRODUCTS

2.1 SODDING

- A. Types: Sod may be of either St. Augustine or Argentine Bahia grass or as that disturbed, as established prior to construction. Use well matted sod with roots. When replacing sod in areas that are already sodded, use sod of the same type as the existing sod.

- B. Provide sod as required in accordance with Florida Department of Transportation Specifications 575 and 981. Furnish sod equal to and similar in type as that disturbed. Place and water in accordance with FDOT Specifications Section 575.
- C. Use sod in commercial-size rectangles, preferably 12-inch by 24-inch or larger, except where 6-inch strip sodding is called for.
- D. Use sod that is sufficiently thick to secure a dense stand of live grass. Use sod that is live, fresh and uninjured at the time of planting, having a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. It shall be reasonably free of weeds and other grasses. Plant sod as soon as possible after being dug, and shade and keep moist from the time it is dug until it is planted.
- E. Handle sod in a manner to prevent breaking or other damage. Do not handle by dumping from trucks or other vehicles. Use care at all times to retain the native soil on the roots of each sod roll during stripping and handling. Sod that has been damaged by handling during delivery, storage or installation will be rejected.
- F. Swales: Place sod to the proper grade and cross section in all flow areas to ensure the design flow of water in the ditch. In excavating for the placement of sod, provide a minimum of 3 inches of undercut.

2.2 FERTILIZER

- A. Supply chemical fertilizer in suitable bags with the net weight certification of the shipment. Fertilizer shall be 12-8-8 and comply with Section 982 of the FDOT Standard Specification for Road and Bridge Construction.
- B. The numerical designations for fertilizer indicate the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid and (3) water soluble potash, contained in the fertilizer.
- C. The chemical designation of the fertilizer shall be 12-8-8, with at least 50 percent of the nitrogen from a nonwater-soluble organic source. The nitrogen source may be a unreaformaldehyde source provided it is not derived from a waste product of the plastic industry.

2.3 EQUIPMENT

- A. Spread fertilizer uniformly at the specified rate.

2.4 NETTING

- A. See County Approved Product List, Appendix F.

2.5 SEEDING

- A. Seed all unpaved areas disturbed during construction that do not require sod. Complete all seeding in conformance with FDOT Specifications Sections 570 and 981. Mulch and fertilize the grassed areas shall be mulched and fertilized in accordance with FDOT Specifications.
- B. Provide mulch material free of weeds. Mulch shall be oat straw or rye, Pangola, peanut, Coastal Bermuda, or Bahia grass hay.
- C. All seeds must have been tested within 6 months of planting. Submit a seed bag tag with final payment requests from each type or mixture of seed used.

2.6 TOPSOIL

- A. Topsoil stockpiled during excavation may be used. If additional topsoil is required to replace topsoil removed during construction, it shall be obtained off site at no additional cost to the COUNTY. Topsoil shall be fertile, natural surface soil, capable of producing all trees, plants, and grassing specified herein.

2.7 MULCH

- A. Furnish small grain straw mulch. Apply mulch at a rate of 1.5 tons per acre, corresponding to a depth not less than 1-inch or more than 3-inches according to texture and moisture content of mulch material. Apply asphalt emulsion at a rate of 150 gallons per ton of straw to anchor the straw applied.

2.8 WATER

- A. It is the CONTRACTOR'S responsibility to supply all water to the site, as required during seeding and sodding operations and through the maintenance period and until the work is accepted. Make whatever arrangements may be necessary to ensure an adequate supply of water to meet the needs for the work. Furnish all necessary hose, equipment, attachments, and accessories for the adequate irrigation of lawns and planted areas as may be required. Water shall be suitable for irrigation and free from ingredients harmful to plant life.

2.9 SOIL IMPROVEMENTS

- A. Apply lime at the rate of 1 to 1.5 tons per acre. Apply 10-10-10 commercial fertilizer at the rate of 800 pounds per acre and work well into the top inch of topsoil.

PART 3 EXECUTION

3.1 SOD BED PREPARATION

- A. Clear areas to be sodded and/or seeded of all rough grass, weeds, and debris, and bring soil to an even grade.
- B. Thoroughly till soil to a minimum 4-inch depth.
- C. Bring area to proper grade, free of sticks, stones, or other foreign matter over 1-inch in diameter or dimension. The surface shall conform to finish grade, less the thickness of sod, free of water-retaining depressions, the soil friable and of uniformly firm texture.

3.2 INSPECTION

- A. Verify that soil preparation and related preceding work has been completed.
- B. Do not start work until conditions are satisfactory.

3.3 SOD HANDLING AND INSTALLATION

- A. During delivery, prior to planting, and during the planting of sod areas, protect the sod panels at all times from excessive drying and unnecessary exposure of the roots to the sun. Stack sod during construction and planting so as not to be damaged by sweating or excessive heat and moisture.
- B. After completion of soil conditioning as specified above, lay sod panels tightly together so as to make a solid sodded lawn area. On mounds and other slopes, the long dimension of the sod shall be laid perpendicular to the slope. Immediately following sod laying, roll the lawn areas with a lawn roller customarily used for such purposes, and then thoroughly water.
- C. Place sod at all areas where sod existed prior to construction, on slopes of 3 horizontal to 1 vertical (3:1) or greater, in areas where erosion of soils will occur, and as directed by the ENGINEER. On areas where the sod may slide, due to height and slope, the ENGINEER may direct that the sod be pegged, with pegs driven through the sod blocks into firm earth, at suitable intervals.

3.4 USE OF SOD ON ROADWAY PROJECTS

- A. In accordance with the FDOT District One Standard Practice, establish permanent green grass at the completion of roadway construction and maintenance work. The following shall apply to all restoration involving State or County roadways:
 - 1. Use sod in lieu of seed and mulch on all roadways with urban (raised curb) typical sections.

2. One inch water per week shall be required for a minimum of four (4) consecutive weeks for the purpose of establishing sod. This can be waived during construction, if and only if there is a minimum of one inch of rain per week on all sod on the project.
3. Placed sod on slopes 1:3 or greater. Stake sod on slopes 1:2 or greater.
4. On all curves with superelevation, place sod from the edge of pavement to the toe of slope on the downhill side(s) for the entire length of the superelevated roadway. On multi-lane divided rural facilities, place sod in the median and on the inside of the curve in the superelevated areas. This does not apply to reverse crowns.
5. Use sod for all projects with less than 10,000 square yards grass area.
6. On tangent sections and on outside of curves, use sod between the edge of pavement and a point 4 feet beyond the shoulder break point.
7. The entire width of sod should not exceed 15 feet from the edge of pavement.
8. Sod is to be used to eliminate narrow seed and mulch areas. Sod areas less than 6 feet in width.
9. Place sod around drainage structures as per the standard Indexes and extend to the edge of pavement.

3.5 SOD MAINTENANCE

- A. The sod shall produce a dense, well-established growth. Repair and re-sod all eroded or bare spots until project acceptance. Repair to sodding shall be accomplished as in the original work.
- B. Perform sufficient watering to maintain adequate moisture for optimum development of the seeded and sodded areas, and no less than 1.5 inches of water per week for at least 2 weeks. Thereafter, apply water for a minimum of 60 days as needed until the sod takes root and starts to grow or until final acceptance, whichever is latest.

3.6 GUARANTEE

- A. Guarantee a live and vigorous stand of permanent grass at the time of acceptance of the work consisting of 80 percent minimum coverage for seeded grass areas with no bare spots greater than 5 square feet.

3.7 CLEANING

- A. Remove debris and excess materials from the project site.

END OF SECTION

SECTION 330130.16

TELEVISIONING AND INSPECTION OF GRAVITY SEWER SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Work specified herein:

1. Furnish all labor, tools, test equipment and materials, including any and all permits required to televise, inspect, video tape, still photograph and document the gravity wastewater collection systems.

1.2 QUALITY ASSURANCE

- A. Utilize services of competent personnel in the field of TV/video inspection of wastewater collection systems.
- B. Schedule all work with ENGINEER.
- C. Equipment used shall be in good working order and provide continuous operation during TV/video tape inspection.
- D. VHS videotapes or DVD recording media shall be of good visual quality capable of slow motion and pausing without significant reduction of visual quality.

1.3 SUBMITTALS

- A. Submit to the County Manager or designee a list of equipment and materials to be used on the project, including all permits obtained prior to commencing with the Work.
- B. Submit to the County Manager or designee a copy of all television inspection log sheets and VHS videotapes or DVD recording media completed.

PART 2 MATERIALS

2.1 GENERAL

- A. Equipment used shall be designed for use in gravity wastewater collection systems. CONTRACTOR has the option of a County approved equal device or other material than that which is specified. Submittals are required prior to commencement of work.

2.2 TELEVISION CAMERA

- A. Camera used shall be 360 degree COLOR RVC camera. Camera shall be operative in 100% relative humidity and be specifically designed for the environment. Camera shall have an integral lighting system capable of producing clearly focused, well-defined images of the entire periphery of the pipe. Camera shall have an integral depth measurement device capable of clearly showing the depth of vertical dips. The quality of video picture and definition provided shall be to the satisfaction of the ENGINEER and, if unsatisfactory, equipment shall be removed and replaced with satisfactory equipment.

2.3 MONITOR

- A. A high resolution TV monitor screen shall be used. Quality of monitor shall be to the satisfaction of the County Manager or designee.

2.4 VIDEO TAPE EQUIPMENT

- A. Furnish videotape equipment to provide a visual and audio recording of all areas in the pipe. Videotape system at the site shall be capable of rewind, play back, slow motion and stop motion. The videotape shall be 1/2-inch color VHS, with an audio channel for clearly recording the camera locations and operator observations (cracks, leaks, service connections, etc.). The system shall continuously indicate distance, in feet, from manhole to manhole and the manhole-to-manhole run numbers on the video recording.

2.5 WINCHES

- A. Furnish variable speed powered remote controlled winches for upstream and downstream manhole locations to control two-way movement of the camera. If a self-propelled camera is used, winches are not necessary.

2.6 POWER SUPPLY

- A. Power supply shall be continuous. If night operations occur, supply all labor, power and lighting equipment for operations, traffic safety, permits, etc.

PART 3 EXECUTION

3.1 GENERAL

- A. All sanitary sewer gravity lines shall be televised at the CONTRACTOR's expense; and a videotape of the subject mains provided prior to preliminary acceptance and at the 1-year warranty inspection by Collier County Utilities. Televiewing may only occur after the stabilized subgrade has been installed and satisfactory density tests have been submitted to Collier County Utilities. The sewer video inspection shall include rotating the camera lens to inspect the interior of each sewer lateral.

- B. Demonstrate the ability of the TV/video equipment (camera/light/video tape/audio/ photograph system) to the satisfaction of the County Manager or designee. Distance meter shall be furnished on the video tape recording. Meter shall be checked using distances between manholes. Meter distances and actual distances shall be consistent. Depth measurement device shall be visible in the video recording during movement of the camera in the pipe.

3.2 TELEVISIONING/INSPECTION

- A. Inspection shall be done one manhole section at a time. Stop flow into the section being inspected prior to video inspection, unless otherwise approved in writing by the County Manager or designee.
- B. Locate video vehicle on upstream side of manhole. Video tape in the downstream direction such that camera movement is with the flow.
- C. Insert the camera in the upstream manhole after flow restrictions required have been accomplished. Flow into the system being inspected shall be stopped, with the exception of service laterals into the system being inspected. Move camera through the pipe lines at a moderate speed not exceeding 30 feet per minute. Stop camera at locations where one or more of the following conditions is observed:
 - 1. Infiltration/inflow sources.
 - 2. Service Laterals.
 - 3. Structural defects including broken pipe; collapsed or collapsing pipe, cracks, deterioration, punctures, etc.
 - 4. Abnormal joint conditions such as misalignments, open joints and joints not sealed.
 - 5. Unusual conditions such as root intrusion, protruding pipes, in-line pipe size changes, mineral deposits, grease and obstructions.
- D. Stop camera long enough for a thorough visual inspection of the conditions. All such conditions as specified above shall be audio recorded on videotape and the inspection log sheet. Move the camera and rotate to obtain optimum view of the conditions. If requested by the County Manager or designee, view problem areas in the opposite direction by pulling the TV camera from the opposite direction at no additional cost to the COUNTY.
- E. While the camera is stopped at each service connection, rotate the camera so as to be able to view the service connection for a length of time that enables a good visual inspection of the service connection for damage and infiltration. Be responsible for measurements such as service lateral locations, if used for subsequent rehabilitation work.

- F. When, during the inspection operation, the television camera will not pass through the entire manhole-to-manhole section, set up equipment so that the inspection can be performed from the opposite manhole at no additional cost to the COUNTY.
- G. Prior to the end of the one-year warranty period, all manholes will be televised and inspected. The complete interior of each manhole shall be inspected and video recorded after interior coating has been completed. Manhole identification number shall be displayed on the video recording, and the recording shall accompany the submittal of the gravity lines inspection. Any deficiencies shall be corrected prior to acceptance by the County.

3.3 DOCUMENTATION

- A. Furnish a detailed report and videotapes of the system inspected. The minimum information supplied shall be the following:
 - 1. Name and address of CONTRACTOR and the ENGINEER.
 - 2. Name of OWNER, system(s) inspected, and OWNER's representative involved.
 - 3. Log reports:
 - a. Log sheet for each section of pipe
 - b. Separate line for each deficiency and location
 - c. Corresponding videotapes and location of each section of pipe and deficiencies on tape.
 - 4. Video tapes shall be labeled with the following information:
 - a. System that is video taped (street name and manhole to manhole numbers) and log report number corresponding to video tape
 - b. Date video was taped
 - c. CONTRACTOR's name and representative
 - d. OWNER's name
- B. All tapes shall be rendered unable to be taped over after they are completed.

3.4 MAINTENANCE OF TRAFFIC

- A. Be responsible for all maintenance of traffic around work site. CONTRACTOR shall maintain traffic in accordance to all federal, state and local regulations. At no additional cost to the COUNTY, submit a Maintenance of Traffic Plan, for review and approval by Collier County DOT as necessary, prior to commencing work. Obtain all necessary permits prior to commencing work, at no additional cost to the COUNTY.
- B. MOT shall also include construction and maintenance of any necessary detour facilities, furnishings, installing and maintaining of traffic control and safety devices during construction, control of dust, and any other special requirements for safe and expeditious movement of traffic around or through the work site.
- C. Be responsible for coordination with all affected agencies when roadways will be closed or traffic will be detoured. No detours or roadway closings shall be permitted unless specifically approved in writing by the County Manager or designee or ENGINEER.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 330201

ROADWAY CROSSINGS BY OPEN CUT

PART 1 GENERAL

1.1 SCOPE OF WORK

Provide all labor, materials, equipment, supervision and incidentals required to install the pipeline as shown on the Drawings in Collier County Streets by method of open cut.

Note: Open cutting of existing pavement will generally not be allowed, but may be considered under one or more of the following conditions:

1. Subsurface obstructions including rock;
2. Extreme high water table;
3. Limited space for jack and bore pits;
4. Condition of roadway surface - including imminent resurfacing and rebuilding, provided inspection and approval beforehand is made by the affected Transportation Department; or
5. Extreme economic hardship is proven with adequate supportive data.

1.2 SUBMITTAL

- A. Submit shop drawings to the ENGINEER for review.
- B. Before starting work, submit to the Collier County Department of Transportation, with copy to the ENGINEER, a detailed schedule of his operations a minimum of fourteen (14) days prior to beginning work for approval. This shall include, but not be limited to, type and extent of temporary paving, and drawings and lists describing materials and traffic control methods to be used. Approval shall not relieve the CONTRACTOR of his obligation to provide a safe and proper crossing.
- C. If a detour is required, submit a traffic control plan for approval to Collier County and/or the Florida Department of Transportation.
- D. Submit a plan for maintenance of traffic in accordance with Index 600 through 650 of the Florida Department of Transportation Specifications.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Use materials specified in other applicable portions of this Specification.

PART 3 EXECUTION

3.1 GENERAL

- A. Trench dimensions for open cutting of road crossings are shown on the Standard Details.
- B. Where possible, limit the completion of the open-cut road crossing to a 24-hour period. Perform all work in accordance with the approved traffic control plan.
- C. Notify Collier County DOT forty-eight (48) hours in advance of starting construction.

3.2 INSTALLATION

A. Temporary Roadways

1. For temporary roadways required for traffic relocation use materials meeting the requirements of the FDOT. Use temporary roadways when crossing a state highway right-of-way or at the direction of the ENGINEER.
2. Maintain temporary roadways in good condition throughout their use.
3. Maintain drainage through all existing ditches by the use of culvert pipe as necessary.
4. Submit drawings indicating the type and location of temporary roadways for approval prior to beginning work.
5. Provide all necessary barricades and signs where detours are permitted as required to divert the flow of traffic. Notify Collier County DOT and ENGINEER in advance of planned detours. While traffic is detoured, expedite construction operations to minimize the period of detour.
6. Perform and complete all work at the roadway crossing in a manner fully satisfactory to Collier County DOT.

B. Maintenance of Traffic

1. The requirements specified herein are in addition to the plan for Maintenance of Traffic as specified in Section 015526.

2. Furnish during construction and any subsequent maintenance within State secondary road right-of-ways and Collier County streets, proper signs, signal lights, flagmen, and other warning devices for the protection of traffic all in conformance with the latest Manual on Uniform Traffic Control and Safe Streets and Highways, and the Florida Manual of Traffic Control and Safe Practices for Street and Highway Construction, Maintenance and Utility Operations. Information as to the above may be obtained from FDOT Division engineers. The ENGINEER, County Engineer, or FDOT Manager of the right-of-way of their representatives reserves the right to stop any work for non-compliance.
3. Take precautions to prevent injury to the public due to open trenches. Night watchmen may be required where special hazards exist, or police protection provided for traffic while work is in progress. Be fully responsible for damage or injuries whether or not police protection has been provided.
4. Unless permission to close a County street is received in writing from the proper authority, place all excavated material so that vehicular and pedestrian traffic may be maintained at all times. Repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to the ENGINEER if the CONTRACTOR's operations cause traffic hazards.
5. Be fully responsible for the installation of adequate safety precautions, for maintenance of the channelization devices, and for the protection of the traveling public.
6. Maintain at all open cut crossings, a minimum of one-way traffic during the daylight hours, and two-way traffic at night.

C. Installation of Pipeline

1. Meet the requirements of the applicable portions of this specification for pavement removal, sheeting, shoring and bracing, excavation and backfill, and dewatering.
2. Install the pipe in accordance with Division 2 of these Specifications.
3. Backfill the trench in accordance with the requirements of Section 312323.
4. Replace pavement in accordance with the requirements of Section 320117.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 330502

HIGH DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required to install High Density Polyethylene (HDPE) pressure pipe, fittings, and appurtenances as shown on the Drawings and specified in the Contract Documents.
- B. High Density Polyethylene (HDPE) – Collier County Utilities has the option of approving the use of HDPE for pipeline crossings of roadways, ditches, canals, and environmentally sensitive lands. HDPE mains shall have the same equivalent internal diameter and equivalent pressure class rating as the corresponding PVC pipe, unless otherwise approved by the County Manager or designee. For all roadway crossings requiring casing pipe, a steel or DR 11 HDPE casing pipe must be provided. The Department of Transportation having jurisdiction of said road and right-of-way must grant specific approval.

1.2 REFERENCED STANDARDS

- A. All standard specifications, i.e., Federal, ANSI, ASTM, etc., made a portion of these Specifications by reference, shall be the latest edition and revision thereof.

1.3 QUALIFICATIONS

- A. Furnish all HDPE pipe, fittings, and appurtenances by a single manufacturer who is fully experienced, reputable and qualified in the manufacture of the items to be furnished.

1.4 SUBMITTALS

- A. Submit to the ENGINEER, a list of materials to be furnished, the names of the suppliers, and the appropriate shop drawings for all HDPE pipe and fittings.
- B. Submit the pipe manufacturer's certification of compliance with the applicable sections of the Specifications.
- C. Submit shop drawings showing installation method and the proposed method and specialized equipment to be used.

1.5 INSPECTIONS AND TESTS

- A. All work shall be inspected by the County Manager or designee who shall have the authority to halt construction if, in his opinion, these specifications or standard construction practices are not being followed. Whenever any portion of these specifications is violated, the County Manager or designee, may order further construction to cease until all deficiencies are corrected.

1.6 WARRANTY AND ACCEPTANCE

- A. Warrant all work to be free from defects in workmanship and materials for a period of one year from the date of completion of all construction. If work meets these specifications, a letter of acceptance, subject to the one year warranty period, shall be given at the time of completion. A final acceptance letter shall be given upon final inspection at the end of the one year warranty period, provided the work still complies with these specifications. In the event deficiencies are discovered during the warranty period, the CONTRACTOR shall correct them without additional charge to the COUNTY before final acceptance. During the warranty period, the ENGINEER will determine if warranty repairs or replacement work shall be performed by the CONTRACTOR. The decision of the ENGINEER shall be binding upon the CONTRACTOR.
- B. Installer Certification for The CONTRACTOR installing thermal butt fused HDPE pipe.

PART 2 PRODUCTS

2.1 POLYETHYLENE PIPE AND FITTINGS

- A. Provide polyethylene pressure pipe manufactured from PE4710 polyethylene meeting AWWA C906 standards. When specified by the ENGINEER on the construction drawings, as an alternate to PVC, HDPE (ductile iron pipe sized) piping can be used for buried applications. Iron pipe sized (IPS) HDPE piping can be used for below-ground applications as determined by the ENGINEER.
- B. The diameter of DR 11 HDPE casing pipe provided for roadway crossings or other purposes shall conform to the following.

For HDPE pressure carrier pipes, casing spacers are not required when HDPE DR11 (or DR17 for 42" to 54" or DR21 for 63") casing is used. The casing inside diameter shall be a minimum of two inches larger than the carrier pipe's outside diameter.

- C. HDPE to HDPE pipe connections shall be by thermal butt fusion. Thermal fusion shall be accomplished in accordance with the pipe manufacturer and fusion equipment supplier specifications. The CONTRACTOR installing thermal butt

fused HDPE pipe shall be certified in this type of work and have a minimum of five years experience performing this type of work. The CONTRACTOR shall provide certification to the Engineer of Record, who will provide the Engineering Review Services Department with the certification.

- D. Qualification of Manufacturer: The Manufacturer shall have manufacturing and quality control facilities capable of producing and assuring the quality of the pipe and fittings required by these specifications. The Manufacturer's production facilities shall be open for inspection by the County Manager or designee. Qualified manufacturers shall be approved by the County Manager or designee.
- E. See the County Approved Product List, Appendix F, for manufacturers that are qualified. Products from other manufacturers proposed for the work must receive approval from the County Manager or designee prior to ordering.
- F. Materials: Materials used for the manufacture of polyethylene pipe and fittings shall be PE4710 high density polyethylene meeting cell classification 445574C or 445574E per ASTM D3350; and meeting Type III, Class B or Class C, Category 5, Grade P34 per ASTM D1248; and shall be listed in the name of the pipe and fitting manufacturer in PPI (Plastics Pipe Institute) TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade rating of 1600 psi at 73°F. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.
- G. Polyethylene Pipe: Polyethylene pipe shall be manufactured in accordance with ASTM F714, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter or ASTM D3035, Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, % carbon, (from pipe) dimensions and either quick burst or ring tensile strength (equipment permitting).
- H. Color Identification: HDPE must have at least three equally spaced horizontal colored marking stripes. Permanent identification of piping service shall be provided by adhering to the following colors.

Blue – potable water (Underground HDPE pipe shall be one of the following:

- a. Solid-wall blue pipe;
- b. Co-extruded blue external skin; or
- c. White or black pipe with blue stripes incorporated into, or applied to, the pipe wall.

White – raw water

Green – wastewater, sewage

Pantone Purple – non-potable irrigation, reclaimed or reuse water

- I. Polyethylene Fittings and Custom Fabrications: Polyethylene fittings and custom fabrications shall be molded or fabricated by the pipe manufacturer. Butt fusion outlets shall be made to the same outside diameter, wall thickness, and tolerances as the mating pipe. All fittings and custom fabrications shall be fully rated for the same internal pressure as the mating pipe. Pressure de-rated fabricated fittings are prohibited.
- J. Molded Fittings: Molded fittings shall be manufactured in accordance with ASTM D3261, Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing, and shall be so marked. Each production lot of molded fittings shall be subjected to the tests required under ASTM D3261.
- K. X-Ray Inspection: The Manufacturer shall submit samples from each molded fittings production lot to x-ray inspection for voids, and shall certify that voids were not found.
- L. Fabricated Fittings: Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Fabricated fittings shall be rated for internal pressure service equivalent to the full service pressure rating of the mating pipe. Directional fittings 16" IPS and larger such as elbows, tees, crosses, etc., shall have a plain end inlet for butt fusion and flanged directional outlets. Part drawings shall be submitted for the approval of the ENGINEER.
- M. Polyethylene Flange Adapters: Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves to provide gasketless sealing, or to restrain the gasket against blow-out.
- N. Back-up Rings and Flange Bolts: Flange adapters shall be fitted with lap joint flanges pressure rated equal to or greater than the mating pipe. The lap joint flange bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.

2.2 MANUFACTURER'S QUALITY CONTROL

- A. The pipe and fitting manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rate, and contamination. The cell classification properties of the material shall be certified by the supplier, and verified by Manufacturer's Quality Control. Incoming materials shall be approved by Quality Control before processing into finished goods. Outgoing materials shall be checked for:

1. Outside diameter, wall thickness, and eccentricity as per ASTM D2122 at a frequency of at least once/hour or once/coil, whichever is less frequent.
 2. Out of Roundness at frequency of at least once/hour or once/coil, whichever is less frequent.
 3. Straightness, inside and outside surface finish, markings and end cuts shall be visually inspected as per ASTM F714 on every length of pipe.
- B. Quality Control shall verify production checks and test for:
1. Density as per ASTM D1505 at a frequency of at least once per extrusion lot.
 2. Melt Index as per ASTM D1238 at a frequency of at least once per extrusion lot.
 3. Carbon content as per ASTM D1603 at a frequency of at least once per day per extrusion line.
 4. Quick burst pressure (sizes thru 4-inch) as per ASTM D1599 at a frequency of at least once per day per line.
 5. Ring Tensile Strength (sizes above 4-inch equipment permitting) as per ASTM D2290 at a frequency of at least once per day per line.
 6. ESCR (size permitting) as per ASTM F1248 at a frequency of at least once per extrusion lot.
- C. X-ray inspection shall be used to inspect molded fittings for voids, and knit line strength shall be tested. All fabricated fittings shall be inspected for joint quality and alignment.

2.3 COMPLIANCE TESTS

- A. In case of conflict with Manufacturer's certifications, the CONTRACTOR, ENGINEER, or County Manager or designee may request re-testing by the manufacturer or have re-tests performed by an outside testing service. All re-testing shall be at the requestor's expense, and shall be performed in accordance with the Specifications.
- B. Installation shall be in accordance with Manufacturer's recommendations and this specification. All necessary precautions shall be taken to ensure a safe working environment in accordance with the applicable codes and standards.

PART 3 EXECUTION

3.1 INSTALLATION OF HIGH DENSITY POLYETHYLENE PRESSURE PIPE AND FITTINGS

- A. Install all high density polyethylene (HDPE) pressure pipe by direct bury, directional bore, or a method approved by the COUNTY or ENGINEER prior to construction. If directional bore is used, or if directed by the County Manager or designee or ENGINEER, surround the entire area of construction by silt barriers.

Install all high density polyethylene pressure pipe and fittings in accordance with Manufacturer's recommendations, and this specification. Take all necessary precautions to ensure a safe working environment in accordance with the applicable codes and standards.

3.2 HEAT FUSION JOINING

- A. Make joints between plain end pipes and fittings by butt fusion, and joints between the main and saddle branch fittings by using saddle fusion using only procedures that are recommended by the pipe and fitting Manufacturer. Ensure that persons making heat fusion joints have received training and certification for heat fusion in the Manufacturer's recommended procedure. Maintain records of trained personnel, and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed.

3.3 MECHANICAL JOINING

- A. HDPE pipe and fittings shall be fused together by heat welding when possible. HDPE pipe and fittings may be joined together or to other materials by means of flanged connections with back-up rings, by mechanical joint adapter with glands, or mechanical couplings designed for joining HDPE pipe or for joining HDPE pipe to another material. A stainless steel sleeve insert shall be used with a mechanical coupling. Mechanical couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with manufacturer's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins.

3.4 BRANCH CONNECTIONS

- A. Make branch connections to the main with saddle fittings or tees. Saddle fuse polyethylene saddle fittings to the main pipe.

3.5 EXCAVATION

- A. Excavate trenches in conformance to this specification, the plans and drawings, or as authorized in writing by the County Manager or designee, and in accordance

with all applicable codes. Remove excess groundwater. Where necessary, shore or reinforce trench walls.

3.6 LARGE DIAMETER FABRICATED FITTINGS

- A. Butt fuse fabricated directional fittings 16" IPS and larger to the end of a pipe. Make up the flanged directional outlet connections in the trench.

3.7 MECHANICAL JOINT AND FLANGE INSTALLATION

- A. Install mechanical joints and flange connections in accordance with the Manufacturer's recommended procedure. Center and align flange faces to each other before assembling and tightening bolts. Do not use the flange bolts to draw the flanges into alignment. Lubricate bolt threads, and fit flat washers under the flange nuts. Tighten bolts evenly according to the tightening pattern and torque step recommendations of the Manufacturer. At least one hour after initial assembly, re-tighten flange connections following the tightening pattern and torque step recommendations of the Manufacturer. The final tightening torque shall be 100 ft-lbs or less as recommended by the Manufacturer.

3.8 FOUNDATION AND BEDDING

- A. Lay pipe on grade and on a stable foundation. Remove unstable or mucky trench bottom soils, and install a 6-inch foundation or bedding of compacted Class I material to pipe bottom grade. Remove excess groundwater from the trench before laying the foundation or bedding and the pipe. A trench cut in rock or stony soil shall be excavated to 6 inches below pipe bottom grade, and brought back to grade with compacted Class I bedding. Remove all ledge rock, boulders, and large stones.

3.9 PIPE HANDLING

- A. When lifting with slings, use only wide fabric choker slings to lift, move, or lower pipe and fittings. Do not use wire rope or chain. Slings shall be of sufficient capacity for the load, and shall be inspected before use. Do not use worn or defective equipment.

3.10 TESTING

- A. Hydrostatic Pressure Testing: Pressure test and flush HDPE pipes after swabbing in accordance with Section 022501 and 025400.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 330503

POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for providing buried PVC pipe, fittings and appurtenances.
1. Provide PVC pipe and fittings complete with all necessary jointing facilities and materials, specials, adapters and other appurtenances required for installation in and completion of the pipelines to be constructed.
 2. Provide plain end or rubber gaskets (push-on or mechanical joint) of the types, sizes and classes shown or specified.
- B. Related Work Specified In Other Sections Includes:
1. Section 022501 – Leakage Tests
 2. Section 025400 – Disinfection
 3. Section 330504 – Ductile Iron Pipe and Fittings
 4. Section 330518 – Laying and Jointing Buried Pipelines

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
1. ASTM D3034 - Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
 2. ASTM F679 - Polyvinyl Chloride (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings
 3. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. through 60 In., for Water Distribution
 4. AWWA C907 - Polyvinyl Chloride (PVC) Pressure Fittings for Water - 4 In. through 8 In.

5. ASTM D2321 - Underground Installation of Flexible Thermoplastic Sewer Pipe
6. ASTM F477 - Elastomeric Seals (Gaskets) For Joining Plastic Pipe
7. ANSI A21.10 - Ductile-Iron and Gray-Iron Fittings 3 inches through 48 inches, for Water and Other Liquids
8. ANSI A21.11 - Rubber-Gasket Joints for Ductile-Iron and Gray Iron Pressure Pipe and Fittings
9. Uni-Bell B-11

1.3 SYSTEM DESCRIPTION

- A. Gravity Sewer Pipe - PVC pipe shall be of the integral wall bell and spigot joint type, which meets or exceeds all requirements set forth in ASTM D3034, latest revision. Minimum wall thickness shall conform to ASTM SDR 26. PVC pipes used for gravity sewers shall be green in color. Fittings shall be made of PVC plastic as defined by ASTM SDR 26 1784, latest revision. Flexible gasketed joints shall be compression type conforming to ASTM D3201, latest revision. Elastomeric joint gaskets shall conform to ASTM F477, latest revision. At all conflict crossings using 4"-12" substitute C900 PVC, Class 305, DR 14 and for PVC pipe 14" and larger use C900 PVC, Class 235, DR 18.
- B. Force Main Pipe – PVC pipe meeting the latest revision of AWWA C900 shall be provided. For installation of 4" – 12" pipe, the pressure class shall be 235 with a DR of 18. For installation of 14" – 24" pipe, use pressure class 165, DR 25, meeting or exceeding the requirements of Uni-Bell B-11. PVC pipes used for force mains shall be green in color. Outside diameters shall be equivalent to ductile iron pipe of the same nominal size. Joints between successive lengths of straight PVC pipe shall be compression type using a single elastomeric gasket, per ASTM C-3139 and F477. Fittings for C900 pipe shall be C900 rated PVC. Joint restraint devices shall be provided for horizontal or vertical alignment changes using uni-flange type collars, epoxy coated, with high strength, and low alloy hardware (see County Approved Product List, Appendix F). PVC pipe direct buried beneath roadways, parking lots or parking lot entrances shall meet AWWA Specification C900, latest revision. All 4" to 12" pipe in such locations shall be a minimum of Class 305, DR 14, and all 14" to 24" pipe shall be a minimum of Class 235, DR 18. Pressure Class 250 ductile iron pipe may be used instead of PVC in these locations if approved by the County Manager or designee.
- C. Potable, Raw and Non-Potable Irrigation Water Main Pipe - PVC shall conform to AWWA Specification C900, latest revision. All 4" to 12" pipe shall be a minimum of Class 235, DR 18 and all 14" to 24" pipe shall be a minimum of Class 165, DR 25 and shall meet or exceed Uni-Bell B-11. All potable water pipe shall bear the seal of the National Sanitation Foundation (NSF) for potable water pipe. All pipe shall be marked with the manufacturer's name, nominal size, type of plastic and pressure rating. All PVC pipe used for potable water lines shall be predominately

blue in color. Underground PVC pipes used for potable water lines shall be solid-wall blue pipe, will have a co-extruded blue external skin, or will be white or black pipe with blue stripes incorporated into, or applied to, the pipe wall. PVC pipes used for raw water shall be white in color. PVC pipes used for non-potable irrigation, reclaimed or reuse water shall be purple in color. Pipe O.D. shall be equivalent to cast iron pipe of the same nominal size. PVC pipe direct buried beneath roadways, parking lots or parking lot entrances shall meet AWWA Specification C900, latest revision. All 4" to 12" pipe in such locations shall be a minimum of Class 305, DR 14, and all 14" to 24" pipe shall be a minimum of Class 235, DR 18. Pressure Class 250 ductile iron pipe may be used instead of PVC in these locations if approved by the County Manager or designee.

- D. Provide pipe of the various sizes and classes as specified in the schedule or shown. Restrain all pressure pipe joints.
- E. Construct concrete encasements only with written permission from the Water Director.

1.4 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Submit the following shop drawings:
 - 1. Pipe joints, fittings, sleeves and cleanouts. Where special designs or fittings are required, show the work in large detail and completely describe and dimension all items.
 - 2. Fully dimensioned drawings of piping layouts, including fittings, couplings, sleeves, cleanouts, valves, supports and anchors. Label pipe size, materials, type, and class on drawings and include the limits of each reach of restrained joints. Provide cross sections showing elevations of cleanouts, pipes, fittings, sleeves, and valves.
 - 3. Catalog data for pipe, joints, fittings, sleeves, harnessing and cleanouts.
- C. Quality Control: Submit certificate of compliance for pipe, fittings, gaskets, coatings, specials, sleeves and cleanouts in accordance with this Section.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle all pipe, fittings and appurtenances as specified in Division 1 and Section 330518.

PART 2 PRODUCTS

2.1 MATERIALS

- A. PVC Pipes and Fabricated Fittings: PVC pipe and fabricated fittings shall be made from virgin PVC resin that has been compounded to provide physical and chemical properties that equal or exceed cell class 12454-B as defined in ASTM D1784, and shall qualify for a hydrostatic design basis of 4,000 psi (27.58 MPa) at 73.4°F (23°C) per the requirements of PPI TR-3.
- B. Fittings for Pressure Pipe: Provide all fittings meeting the requirements of Sections 330504.
- C. Joints and Fittings for Gravity Sewer Pipe: Provide all fittings meeting the requirements of ASTM D 3034 and ASTM F 679. Provide joints that are a molded integral part of the pipe section. Do not use joints or couplings furnished loose. Provide joints with elastomeric gasket joints.
- D. Joints for Pressure Pipe: Provide pipe with bell ends in accordance with AWWA C900. Provide joints with elastomeric gasket joints.
- E. Elastomeric Gasket Joints: Provide elastomeric gasket joints in accordance with ASTM F 477.
- F. Rubber Gasket Joints: Provide mechanical joints meeting the requirements of ANSI A21.11.
- G. Color: Provide pipe made of 100 percent of the color specified. Provide green sewer or force main pipe. Provide blue potable water pipe. Provide white raw water pipe. Provide purple non-potable irrigation, reclaimed or reuse water pipe.
- H. Pipe Marking: Provide mark on each pipe at internals of 5 feet or less to designate compliance with applicable ASTM or AWWA specification.
- I. Temporary Bulkheads: Provide temporary bulkheads at the ends of sections where adjoining pipelines have not been completed and are not ready to connect.
 - 1. Remove all temporary bulkheads when they are no longer needed.
- J. Date of Manufacturer: Provide pipe and fitting manufactured no earlier than 12 month period proceeding the date of the Agreement.
- K. Wall Thickness for Pressure Pipe:
 - 1. 4 through 12 inches diameter – provide AWWA-C900 DR 14, Class 305 for pressure pipe installed under pavement.

2. 14 through 24 inches diameter – provide AWWA-C905 DR 18, Class 235 for pressure pipe installed under pavement.
- L. Restraining Devices: Joint restraining devices (see County Approved Product List, Appendix F) shall be placed at all bends, tees, plugs, reducers, and other fittings to provide lateral support, and shall conform to the Collier County Standard Details. Concrete thrust blocks shall only be utilized if approved by Collier County Utilities.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install all buried PVC pipe and fittings in accordance with the manufacturer's recommendations, approved shop drawings, as specified in Division 1, and Section 330518. For horizontal directional drilling of Fusible PVC, see Section 330502 for casing and execution requirements.

3.2 LEAKAGE TESTING

- A. Cleaning: Flush clean and test all pipes after installation.
- B. Testing: Test pipes for leaks and repair or tighten as required.
- C. Procedures: Conduct tests in accordance with Section 022501.

3.3 DISINFECTION

- A. General: Disinfect all pipelines that are to carry potable water before they are placed in service as specified in Section 025400.

3.4 SCHEDULES

- A. Refer to the Schedules contained in Section 330518 Laying and Jointing Buried Pipelines for information on the piping that is to be constructed using the pipe materials and methods specified herein.

END OF SECTION

NO TEXT FOR THIS PAGE

SECTION 330504

DUCTILE IRON PIPE (DIP) AND FITTINGS

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required, and install ductile iron pipe, fittings and appurtenances as shown on the Drawings and as specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 330518 - Laying and Jointing Buried Pipe

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Commercial Standards: (Latest Revision)

1. ANSI/AWWA C104/A21.4 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
2. ANSI/AWWA C105/A21.5 Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.
3. ANSI/AWWA C110/A21.10 Ductile-Iron Fittings, 3 in. Through 48 Inches, for Water and Other Liquids. (C110 2-48 inches).
4. ANSI/AWWA C111/A21.11 Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. ANSI/AWWA C115/A21.15 Flanged Ductile-Iron Pipe with Threaded Flanges.
6. ANSI/AWWA C150/A21.50 Thickness Design of Ductile-Iron Pipe.
7. ANSI/AWWA C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast for Water or Other Liquids.
8. ANSI/AWWA C153/A21.53 Ductile-Iron Compact Fittings
9. AWWA C600 Installation of Ductile Iron Water Mains and Their Appurtenances.
10. Collier County Utilities Standards and Procedures Ordinance

1.4 CONTRACTOR SUBMITTALS

- A. Shop Drawings: Submit shop drawings of pipe and fittings in accordance with the requirements in the General Conditions, the requirements of the referenced standards and the following supplemental requirements as applicable:
 - 1. Certified dimensional drawings of all valves, fittings, and appurtenances.
 - 2. In all cases, a line layout to indicate the limits of each reach of restrained joints or of concrete encasement shall be supplied. (NOTE: Obtain COUNTY Water Director's approval of all proposed concrete encasement of ductile iron pipe.)
- B. Certifications: Furnish a certified affidavit of compliance for all pipe and other products or materials furnished under this Section of the Specifications, which indicates that all tests have been made and that all results comply with the requirements of AWWA C151, including but not necessarily limited to the following:
 - 1. Acceptance Tests.
 - 2. Hydrostatic Tests.
 - 3. Impact Tests.
- C. Additional Documentation: Upon request, furnish foundry records in the form of written transcripts.
- D. All expenses incurred for certification, testing, and data submittal shall be borne by the CONTRACTOR or the Supplier.

1.5 QUALITY ASSURANCE

- A. Inspection: All pipe shall be available for inspection at the place of manufacture prior to shipping in accordance with the provisions of the referenced standards. Notify the ENGINEER in writing not less than 10 calendar days prior to the shipping of the pipe.
- B. The ENGINEER shall be given access to all areas where manufacturing and testing is performed and shall be permitted to make all inspections necessary to confirm manufacturer compliance with these Specifications.
- C. Tests: Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with the requirements of the referenced standards as applicable.
- D. Provide data on material tests at no additional cost to the COUNTY.

- E. In addition to those tests specifically required, the ENGINEER may request additional samples of any material including lining and coating samples for testing by the COUNTY. Furnish the additional samples at no additional cost to the COUNTY.

1.6 CORROSION PROTECTION

- A. If specifically approved by Collier County Utilities for use, provide exterior protection for underground ductile iron pipe and fittings within areas of severe corrosive conditions. This shall be accomplished by the installation of polyethylene encasement through the area of concern. The soil test evaluation to determine the necessity for extra protection in suspect areas shall be those set forth in ANSI Standard A21.5. Additionally, where other existing utilities are known to be cathodically protected, ductile iron pipe crossing said utility shall be protected for a distance of 20 feet to each side. If ductile iron pipe is to be installed parallel to and within 10 feet of cathodically protected pipe, then protection shall be provided for the entire length. Do not install steel pipe in severe corrosion areas.

PART 2 PRODUCTS

2.1 GENERAL

- A. Protective Lining for Water Mains: Cement mortar lined ductile iron pipe shall conform to ANSI/AWWA C151 and C104, subject to the following supplemental requirements. The pipe shall be of the diameter and class shown, shall be furnished complete with rubber gaskets as indicated in the Contract Documents, and all specials and fittings shall be provided as required under the Contract Documents.
- B. Protective Lining for Force Mains and Sewers: Where lining is shown, specified or required, for the protection of pipelines carrying sewage from corrosive gases, line the pipe using protective ceramic epoxy coating (see County Approved Product List, Appendix F) in accordance with the manufacturer's written instructions. For ceramic epoxy lining, abrasive blast clean pipe and fittings to a near white surface to SSPC SP-10 and provide 40 mils minimum of dry film thickness of ceramic epoxy lining.
- C. Handling and Storage: Handle the pipe by using wide slings, padded cradles, or other devices designed and constructed to prevent damage to the pipe and its lining. The use of equipment or handling, which might injure the pipe and its lining, will not be permitted. Stockpiled pipe shall be suitably supported and shall be secured to prevent accidental rolling. Assure that all other pipe handling equipment and methods is acceptable to the ENGINEER.
- D. Laying lengths: Maximum pipe laying lengths shall be 20 feet.

- E. Finish: The pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing and roughness, in accordance with ANSI/AWWA C104.
- F. Closures and Correction Pieces: Provide closures and correction pieces as required so that closures may be made due to different headings in the pipe laying operation and so that correction may be made to adjust the pipe laying to conform to pipe stationing shown on the Drawings or line layouts where applicable.

2.2 PIPE DESIGN CRITERIA

- A. General: Ductile Iron pipe shall be designed in accordance with the requirements of ANSI/AWWA C150 as applicable and as modified in this Section.
- B. Pipe Wall Thickness for Internal Pressure: The pipe shall be designed with a net thickness to withstand the design internal pressure in accordance with the hoop stress formula. In addition to the requirements of the Section, the minimum wall thickness shall be in accordance with the minimum thickness wall depicted in table 50.5 of ANSI/AWWA C150.
- C. Potable, Raw and Non-Potable Irrigation Water Mains:
 - 1. Ductile Iron Pipe shall be a minimum pressure Class 250 and will be accepted in any diameter for use within the water distribution system.
 - 2. All aboveground potable water main pipe shall be painted Federal Safety Blue. All aboveground raw water main pipe shall be painted white. All aboveground non-potable irrigation, reclaimed or reuse water main pipe shall be painted Pantone Purple 522C. The pipe wall thickness shall not be less than that required by a working pressure of 250 psi in laying condition Type 4 "B" with 5-foot cover in conformance with ANSI Standard A21.50.
- D. Force Mains and Gravity Sewers:
 - 1. Ductile Iron Pipe shall be a minimum pressure Class 150 and will be accepted in any diameter for use within the wastewater collection system.
 - 2. Ductile iron pipe for Gravity Sewer applications is not permitted unless the ENGINEER can demonstrate that C900 PVC pipe, Class 150 or 200, cannot be utilized from a structural standpoint.
 - 3. All aboveground force main pipe shall be painted Safety Green. The pipe wall thickness shall not be less than that required by a working pressure of 150 psi.

2.3 MATERIALS

- A. Ductile Iron Pipe: Pipe materials shall conform to the requirements of ANSI/AWWA C151.
- B. Adapters to connect ductile iron pipe or fittings to pipe or fittings of dissimilar materials shall be supplied by the CONTRACTOR in accordance with ASTM specifications and the pipe manufacturer recommendations, and as approved by the ENGINEER.
- C. Water Mains:
 - 1. All water mains shall contain cement for mortar lining conforming to the requirements of ANSI/AWWA C104. Cement for mortar lining shall be Type II or V. A fly ash or pozzolan shall not be used.
 - 2. All Ductile Iron buried water main pipelines shall have blue stripes applied to the pipe wall. Stripe width shall comply with AWWA standards. The stripes shall be applied during installation and shall incorporate blue tape or blue paint. The tape or paint shall be applied in a continuous line that runs parallel to the axis of the pipe and be located along the top of the pipe.
 - 3. All pipe with an internal diameter of 24" or greater, tape or paint shall be applied in continuous lines along each side of the pipe as well as along the top of the pipe.
- D. Force Mains and Gravity Sewer:
 - 1. All Ductile iron pipe used within the wastewater system shall be lined with a ceramic epoxy, (see County Approved Product List, Appendix F). Pipe and fittings shall be lined as specified herein. Each piece of pipe shall bear a marking denoting the class to which it belongs.

2.4 SPECIALS AND FITTINGS

- A. Fittings for Potable, Raw, Non-Potable Irrigation, Reclaimed and Reuse Water Systems:
 - 1. Fittings for ductile iron pipe shall conform to the requirements of ANSI/AWWA C153/A21.53 or ANSI/AWWA C110/A21.10 for diameters 3 inches through 48 inches and shall have a minimum pressure rating of 350 psi for pipe sizes 6 inches through 24 inches and 250 psi for sizes larger than 24 inches. Ductile iron fittings shall be double cement lined, seal coated and outside coated with an asphaltic material in accordance with AWWA C104 as specified.
- B. Fittings for Wastewater System:

1. All pipe and fittings in direct contact with wastewater shall be interior coated with a 40 mil thickness of ceramic epoxy coating (see County Approved Product List, Appendix F). Pipe and fittings shall have an outside asphaltic coating as specified in AWWA Standard C151. Each piece of pipe shall bear a marking denoting the class to which it belongs.

2.5 DESIGN OF PIPE

- A. General: The pipe furnished shall be ductile iron pipe, lined as specified, with rubber gasketed joints.
- B. The pipe shall be designed, manufactured, tested, inspected, and marked according to applicable requirements previously stated and except as hereinafter modified, shall conform to ANSI/AWWA C150 and ANSI/AWWA C151.
- C. Pipe Dimensions: The pipe shall be of the diameter and class shown. The minimum wall thickness for each pipe size shall be as specified herein or shown on the Drawings.
- D. Fitting Dimensions: The fittings shall be of the diameter shown and class specified.
- E. Joint Design: Ductile Iron pipe and fittings shall be furnished with mechanical joints, push-on joints and flanged joints as follows:
 1. For buried pipe applications, unless otherwise indicated, mechanical and push-on joints shall conform to ANSI/AWWA C111/A21.11, with the minimum pressure rating of 350 psi.
 2. For above-ground or buried vault applications, unless otherwise indicated, flanged joints shall conform to ANSI/AWWA C115/A21.15, with the minimum pressure rating of 250 psi. All above-ground fittings shall be painted blue.
 3. Use manufactured, labeled gasket lubricant for push on joints with trade name and pipe manufacturer name, other lubricants are prohibited.
 4. Nuts and bolts for flanged joints shall be 304 stainless, as specified by the COUNTY, and conform to ANSI/AWWA C111.
- F. Restraining Devices: Joint restraining devices (see County Approved Product List, Appendix F) shall be placed at all bends, tees, plugs, reducers, and other fittings to provide lateral support, and shall conform to the Collier County Standard Details. Concrete thrust blocks shall only be utilized if approved by Collier County Utilities.
- G. For bell-and-spigot ends with rubber gaskets, the clearance between the bells and spigots shall be such that when combined with the gasket groove configuration and the gasket itself will provide watertight joints under all operating conditions

when properly installed. Require the pipe manufacturer to submit details complete with significant dimensions and tolerances and also to submit performance data indicating that the proposed joint has performed satisfactorily under similar conditions. In the absence of a history of field performance, the results of a test program shall be submitted.

- H. Gaskets shall be a Buna N, Neoprene, or a Nitril-based rubber product. Gaskets shall have clean tips unless otherwise specified. Elastomeric gaskets conforming to ASTM F-477 shall also be acceptable.
- I. Shop-applied interior linings and exterior coatings shall be applied evenly to the nominal thickness specified. Exterior coatings: asphalt coating for buried pipe or primed pipe cannot be furnished holiday free.

2.6 CEMENT-MORTAR LINING

- A. Cement-Mortar Lining For Shop Application: Except as otherwise provided herein, interior surfaces of all ductile iron pipe shall be cleaned and lined in the shop with cement-mortar lining applied centrifugally in conformity with ANSI/AWWA C104. Ductile-Iron pipefittings need not have the cement-mortar lining applied centrifugally. The lining machines shall be of a type that has been used successfully for similar work. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found faulty at delivery site, the damaged or unsatisfactory portions shall be repaired in the field in accordance with ANSI/AWWA C104.
- B. The nominal wet lining thickness shall be as follows:

Nominal Factory Nominal Replacement		
Nominal Pipe Diameter (in.)	Applied Lining Thickness (in.)	Lining Thickness (in.)
3-12	1/8	1/8
14-24	3/16	3/16
30-64	1/4	1/4

- C. Protection of Pipe Lining/Interior: All shop-applied cement mortar lining shall be given a seal coat of asphaltic material in conformance with ANSI/AWWA C104.

2.7 EXTERIOR COATING OF PIPE

- A. Exterior Coating of Buried Piping: The exterior coating shall be an asphaltic coating approximately 1 mil thick, conforming to ANSI/AWWA C151.

2.8 CORROSION PROTECTION

- A. If specifically approved by Collier County Utilities for use, exterior protection shall be provided for underground ductile iron pipe and fittings within areas of severe

corrosive conditions. This shall be accomplished by the installation of polyethylene encasement through the area of concern. The soil test evaluation to determine the necessity for extra protection in suspect areas shall be those set forth in ANSI Standard A21.5. Additionally, where other existing utilities are known to be cathodically protected, ductile iron pipe crossing said utility shall be protected for a distance of 20 feet to each side. If ductile iron pipe is to be installed parallel to and within 10 feet of cathodically protected pipe, then protection shall be provided for the entire length. Steel pipe shall not be installed in severe corrosion areas.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPE

- A. Handling and Storage: Carefully handle and protect all pipe, fittings, etc., against damage, impact shocks, and free fall and in accordance with ANSI/AWWA C600. Do not place pipe directly on rough rocky ground, but in such instances support the pipe in a manner that will protect the pipe against injury whenever stored at such trench site or elsewhere. Do not install any pipe where the lining or coating show defects that may be harmful as determined by the ENGINEER. Repair such damaged lining or coating, or furnish and install a new undamaged pipe.
- B. Repair or replace all pipe damaged prior to Substantial Completion or during warrantee period.
- C. Inspect each pipe and fitting prior to installation to insure that no damaged portions of pipe are installed.
- D. Before placement of pipe in the trench, thoroughly clean each pipe or fitting of any foreign substance that may have collected therein, and keep the pipe clean at all times thereafter. For this purpose, close the openings of all pipes and fittings in the trench during any interruption to the work.
- E. Pipe Laying: Install the pipe in accordance with ANSI/AWWA C600.
- F. Lay pipe directly on the bedding material. Refer to the Utilities Standards and Procedures Ordinance Section 9.1.2 for laying and backfilling requirements. No blocking will be permitted, and the bedding shall be such that it forms a continuous, solid bearing for the full length of the pipe. Make excavations as needed to facilitate removal of handling devices after the pipe is laid. Form bell holes at the ends of the pipe to prevent point loading at the bells or couplings. Make excavations as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coating on field joints.
- G. Where necessary to raise or lower the pipe due to unforeseen obstructions or other causes, the ENGINEER may change the alignment and/or the grades. Such

change may be made by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. However, in no case shall the deflection in the joint exceed 70 percent of the maximum deflection recommended by the pipe manufacturer. No joint shall be misaligned any amount which will be detrimental to the strength and water tightness of the finished joint.

- H. Pipe and Specials Protection: Protect the openings of all pipe and specials with suitable bulkheads to prevent unauthorized access by persons, animals, water, or any undesirable substance. At all times, provide means to prevent the pipe from floating.
- I. Pipe Cleanup: As pipe laying progresses, keep the pipe interior free of all debris. Completely clean the interior of the pipe of all sand, dirt, mortar splatter and any other debris following completion of pipe laying, pointing of joints, and any necessary interior repairs per ANSI/AWWA C600 and C602 prior to testing and disinfecting the completed pipeline. For pipe larger than 12" diameter, utilize a polyurethane foam plug "Poly Pig" to remove all debris from main.

3.2 RUBBER GASKETED JOINTS

- A. Rubber Gasketed Joints: Immediately before jointing pipe, thoroughly clean the bell end of the pipe, and place a clean rubber gasket in the bell groove. Carefully clean the bell and spigot end of push-on joint pipe, and lubricate with a vegetable-based lubricant or per manufacturer's recommendation. Insert the spigot end of the pipe section into the bell of the previously laid joint and telescope into the proper position. Do not tilt the pipe to insert the spigot into the bell.

3.3 INSTALLATION OF PIPE APPURTENANCES

- A. Installation of Valves: Handle all valves in a manner to prevent any injury or damage to any part of the valve. Thoroughly clean and prepare all joints prior to installation. Adjust all stem packing and operate each valve prior to installation to insure proper operation.
- B. Install all valves so that the valve stems are plumb and in the location shown on the Drawings.
- C. Mechanical joints consisting of bell, socket, gland, gasket, bolts, and nuts shall conform to ANSI Standard A21.11. Bolts and nuts shall be high strength, low alloy, Cor-Ten, T-Head Type having hexagonal nuts. Bolts and nuts shall be machined through and nuts shall be tapped at right angles to a smooth bearing surface. Single sealed gasket push-on type joints (see County Approved Product List, Appendix F) shall conform to the requirements of ANSI A21.11.
- D. Mechanical joint retainer glands may be used to restrain mechanical joint pipe and fittings to the plain end of ductile iron pipe and fittings when used in conjunction with thrust blocks of reduced size. The Utilities ENGINEER must approve thrust block size. Maintain joint flexibility.

3.4 TESTING AND DISINFECTION

- A. Test completed water or force main pipeline in accordance with Section 022501. Disinfect completed water pipeline in accordance with Section 025400.

END OF SECTION

SECTION 330518

LAYING AND JOINTING BURIED PIPELINES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Installation of all underground pipelines. Provide pipeline materials, coatings and linings as specified and pipe of the types, sizes and classes shown or specified.
1. Use proper and suitable tools and appliances for the safe and convenient cutting, handling, and laying of the pipe and fittings.
 2. Use suitable fittings where shown and at connections or where grade or alignment changes require offsets greater than those recommended and approved.
 3. Lay all underground pipelines not supported on piles or concrete cradle in select fill bedding material.
 4. Close off all lines with bulkheads when pipe laying is not in progress.
- B. Related Work Specified in Other Sections Includes:
1. Section 022501 – Leakage Tests
 2. Section 025400 – Disinfection
 3. Section 312316 – Excavation - Earth and Rock
 4. Section 312319 – Groundwater Control for Open Excavation
 5. Section 312323 – Backfilling
 6. Section 330502 – High Density Polyethylene (HDPE) Pipe and Fittings
 7. Section 330503 - Polyvinyl Chloride (PVC) Pipe and Fittings
 8. Section 330504 - Ductile Iron Pipe (DIP) and Fittings

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:

1. ASTM D 2774 - Practice for Underground Installation of Thermoplastic Pressure Piping
2. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances
3. ASTM A 307 - Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile
4. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, C25, 125, 250, 800
5. ASME B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges
6. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
7. AWWA C115/A21.15 - Flanged Ductile-Iron Pipe With Threaded Flanges
8. Uni-Bell - Handbook of PVC Pipe
9. Collier County - Utilities Standards and Procedures Ordinance

1.3 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:
- B. Transportation and Delivery: Take every precaution to prevent injury to the pipe during transportation and delivery to the site.
- C. Loading and Unloading: Take extreme care in loading and unloading the pipe and fittings.
 1. Work slowly with skids or suitable power equipment, and keep pipe under perfect control at all times.
 2. Under no condition is the pipe to be dropped, bumped, dragged, pushed, or moved in any way that will cause damage to the pipe or coating.
- D. Sling: When handling the pipe with a crane, use a suitable sling around the pipe.
 1. Under no condition pass the sling through the pipe. Interior of pipe is to be kept free of dirt and foreign matter at all times.
 2. Use a nylon canvas type sling or other material designed to prevent damage to the pipe and coating.

3. When handling reinforced concrete pipe or uncoated steel or ductile iron pipe, steel cables, chain or like slings are acceptable.
- E. Damaged Piping: If in the process of transportation, handling, or laying, any pipe or fitting is damaged, replace or repair such pipe or pipes.
- F. Blocking and Stakes: Provide suitable blocking and stakes installed to prevent pipe from rolling.
1. Obtain approval for the type of blocking and stakes, and the method of installation.
- G. Storage for Gaskets: Store gaskets for pipe joints in a cool place and protect gaskets from light, sunlight, heat, oil, or grease until installed. Store gaskets in a sealed container (such as a vented drum). When long-term storage with exposure to direct sunlight is unavoidable, PVC pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excessive heat accumulation (Uni-Bell PVC Handbook).
1. Do not use any gaskets showing signs of cracking, weathering or other deterioration.
 2. Do not use gasket material stored in excess of six months without approval.

1.4 FIELD CONDITIONS

- A. Repair of Sanitary Sewers and Services: Rebed, in compacted select fill material, sanitary sewers which cross over the new pipe or which cross under the new pipe with less than 12 inches clear vertical separation. Compact the bedding to densities required for new pipeline construction and extend bedding below the sewer to undisturbed earth. Reconstruct sewers damaged by pipeline construction.
1. Furnish and install all materials and do all work necessary for the reconstruction or repairs of sanitary sewers and services.
 2. Provide pipe for reconstruction of sanitary sewers and services meeting the appropriate specification requirements.
 3. Provide pipe of the same size as the existing sewer or when the same size is not available, use the next larger size of pipe. Obtain approval of joints made between new pipe and existing pipe.

PART 2 PRODUCTS

- A. The materials allowed for buried sewer pipes are PVC, HDPE or Ductile Iron Pipe.

PART 3 EXECUTION

3.1 PREPARATION

- A. Dry Trench Bottoms: Lay pipe only in dry trenches having a stable bottom.
 - 1. Where groundwater is encountered, make every effort to obtain a dry trench bottom in accordance with Section 312319.
 - 2. Perform trench excavation and backfill in accordance with Sections 312316 and 312323.

3.2 INSTALLATION

- A. General: Install all piping in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1. Where pipe joint deflections are used, do not exceed 80 percent of the maximum deflection limits shown in AWWA C600. Gravity systems shall contain no joint deflection.
 - 1. Arrange miscellaneous pipelines, which are shown in diagram form on the Plans, clear of other pipelines and equipment.
 - 2. Gravity systems shall not contain vertical dips greater than one inch (1.0").
- B. Code Requirements: Provide pipeline installations complying with AWWA C600 for iron pipe, AWWA Manual M11 for steel pipe, ASTM D 2774 for thermoplastic pressure piping, and as modified or supplemented by the Specifications.
- C. Pipe Laying - General:
 - 1. Thoroughly inspect all pipe for damage and cleanliness. If found to be defective, tag, remove and replace pipe with satisfactory pipe or fittings at no additional charge to COUNTY.
 - 2. Generally, lay all pipe with bells pointing ahead.
 - 3. Carefully place all pipe, pipe fittings, valves and hydrants into trench by means of a derrick, ropes or other suitable tools or equipment in such a manner as to prevent damage and check for alignment and grade.
 - 4. Make adjustments to bring pipe to line and grade by scraping away or filling in select fill material under the body of the pipe.
 - 5. Wedging or blocking up the pipe barrel is not permitted.

6. Bring the faces of the spigot ends and the bells of pipes into fair contact and firmly and completely shove the pipe home.
7. As the work progresses, clean the interior of pipelines of all dirt and superfluous materials of every description.
8. Keep all lines absolutely clean during construction.
9. Lay pipelines accurately to line and grade.
10. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other material from entering the pipe.

D. Pipe Laying - Trenches:

1. Carefully lay all pipelines in trench excavations piece by piece using suitable tools or equipment on select fill bedding (refer to Utilities Standards and Procedures Ordinance, Section 9.1.2), concrete cradle or other foundations as shown, specified or ordered in writing. Prevent damage to materials, protective coatings and linings.
2. Do not dump or drop pipe or pipe materials into trench.
3. Properly secure the pipe against movement and make the pipe joints in the excavation as required.
4. Carefully grade and compact pipe bedding.
5. Bell Holes:
 - a. Cut out bell holes for each joint as required to permit the joint to be properly made and allow the barrel of the pipe to have full bearing throughout its length.
 - b. Thoroughly tamp bell holes full of select fill material following the making of each joint to provide adequate support to the pipe throughout its entire length.

E. Other Foundations: Install pipelines laid on other types of foundations as specified for such other foundations or as ordered in writing.

F. Field Cuts of Pipelines: For shorter than standard pipe lengths, make field cuts in a manner producing a cut square and perpendicular to the pipe axis. Remove any sharp, rough edges which otherwise might injure the gasket.

G. Procedure for sealing cut ends and repairing field damaged areas of polyethylene lined pipe and fittings is as follows:

1. Remove burrs caused by field cutting of ends or handling damage and smooth out edge of polyethylene lining if made rough by field cutting or handling damage.
2. Remove oil or lubricant used during field cutting operations.
3. Areas of loose lining associated with field cutting operation must be removed and exposed metal cleaned by sanding or scraping. For larger areas, remove loose lining and dirt, then roughen bare pipe surface by scratching or gouging with a small chisel to provide an anchor pattern for the epoxy. It is recommended that the polyethylene lining be stripped back by chiseling, cutting, or scraping about 1 inch to 2 inches into well adhered lined area before patching. This ensures that all areas of undercutting have been removed. Be sure to roughen an overlap of 1 inch to 2 inches of polyethylene lining in area to be epoxy coated. This roughening should be done with a rough grade emery paper (40 grit), rasp, or small chisel. Avoid honing, buffing, or wire brushing since these tend to make surface to be repaired too smooth for good adhesion.
4. With area to be sealed or repaired clean and suitably roughened, apply a thick coat of a two-part coal tar epoxy (see County Approved Product List, Appendix F). The heavy coat of epoxy must be worked into the scratched surface by brushing. Mixing and application procedure for the epoxy must follow the epoxy manufacturer's instructions.
5. It is important that the entire freshly cut, exposed metal surface of the cut pipe be coated. To ensure proper sealing, overlap at least 1 inch of the roughened polyethylene lining with this two-part epoxy system.

H. Ductile Iron Pipe Mechanical Joints:

1. Assembly: In making up mechanical joints, center the spigot in the bell.
 - a. With a wire brush just prior to assembly of the joint thoroughly brush 8 inches outside of spigot and inside of bell with which the rubber gasket comes in contact. Remove all oil, grit, tar (other than standard coating) and other foreign matter from joint.
 - b. Brush lubricant over the gasket just prior to installation. (Note: There is only one rubber gasket size for each diameter of pipe.)
 - c. Press the gasket into place within the bell and move the gland into position, bolts inserted, and the nuts tightened finger tight.
 - d. Tighten the nuts with a torque wrench so that the gland is brought up toward the pipe evenly. Torque wrenches shall be set as specified in AWWA C111. Spanner type wrenches not longer than specified in

AWWA C111 may be used with the permission of County Manager or designee.

- e. Tighten all nuts 180 degrees apart alternately in order to produce equal pressure on all parts of the gland.

- 2. Torques: Apply the following range of bolt torques:

<u>Size Inches</u>	<u>Range of Torque - ft. lbs</u>
5/8	40 - 60
3/4	60 - 90
1	70 - 100
1-1/4	90 - 120

- 3. Remaking of Joints: If effective sealing is not obtained at the maximum torque listed above, disassemble and reassemble the joint after thorough cleaning.

I. Ductile Iron Pipe Rubber Gasket Joints:

- 1. Assembly: In making up the rubber gasket joint, brush the gasket seat in the socket thoroughly with a wire brush and wipe the gasket with a cloth.
 - a. Place the gasket in the socket with the large round end entering first so that the groove fits over the bead in the seat.
 - b. Apply a thin film of lubricant (AWWA C600) to the inside surface of the gasket that will come in contact with the entering pipe.
 - c. Brush the plain end of the pipe to be entered thoroughly with a wire brush and place it in alignment with the bell of the pipe to which it is to be joined.
 - d. Exert sufficient force on the entering pipe so that its plain end is moved past the gasket until it makes contact with the base of the socket to make the joint.
- 2. Positioning: Before proceeding with backfilling, feel completely around the joint using a feeler gauge to confirm that the gasket is in its proper position.
 - a. If the gasket can be felt out of position, withdraw the pipe and examine the gasket for cuts or breaks.
 - b. If the gasket has been damaged, replace it with a new one before re-installing the pipe.