



# RFP 2016-0025 - ADDENDUM 1

## LEMOYNE AVENUE PROJECT Town of Hilton Head Island, South Carolina

Date Issued: August 23, 2016

### Item 1. TRAFFIC CONTROL PLAN SUPPLEMENT

The Traffic Control plan dated 4-11-16 by Darrin Shoemaker shall be the controlling traffic control plan for this job.

### Item 2. FEE SCHEDULE

The Excel spreadsheet of the fee schedule is being provided and the following items have been added:

BID ALTERNATE A						
67	SP-6	6" WATER LINE BEND UNDER STORM CROSSING AT STA. 11+40	LS	NEC	\$ -	\$ -
BID ALTERNATE B						
68	SP-6	ABANDON AND REPLACE APPROX 530 LF OF 6" WATER LINE VALVE AT STA 10+05 THRU TEE AT APPROX STA. 15+35	LS	NEC	\$ -	\$ -

### Item 3. BID ALTERNATE – WATER LINE RELOCATION

Along with the Fee Schedule, the Special Provisions are hereby revised to include the following:

#### SP-6 6" WATERLINE RELOCATION (C900 PIPE)

There is an existing 6" water line owned and operated by the South Island PSD (believed to be transite or AC type) which runs from a valve at South Forest Beach (approximately Sta. 10+05) to a tee at the proposed retention near Seascape Villas (approximately Sta. 15+35).

Bid Alternate A entails removing a short segment of the existing 6" line if it is found to be in conflict with the proposed storm pipe at Sta. 11+40, and replacing it with a new C-900 PVC line under the storm including 4 – 45-degree bends.

Bid Alternate B entails removing and replacing the entire run of pipe from a

valve at South Forest Beach (approximately Sta. 10+05) to the tee at the (approximately Sta. 15+35) with C-900 PVC. All fittings and installation shall be in accordance with SIPSD standards. Specifications are included in Special Provision 6

The Contractor MUST submit bids for both of these alternates.

#### Item 4. PROPOSAL QUESTIONNAIRE

##### Proposal Questionnaire

Delete Question 2 as irrelevant:

~~2. Does your firm have a South Carolina Marine Contractor's License? If so, please provide the license number:~~

Revise Question number 4 as follows:

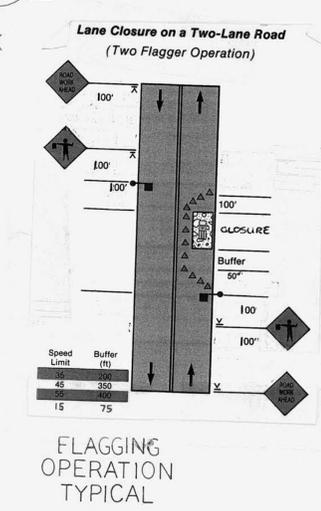
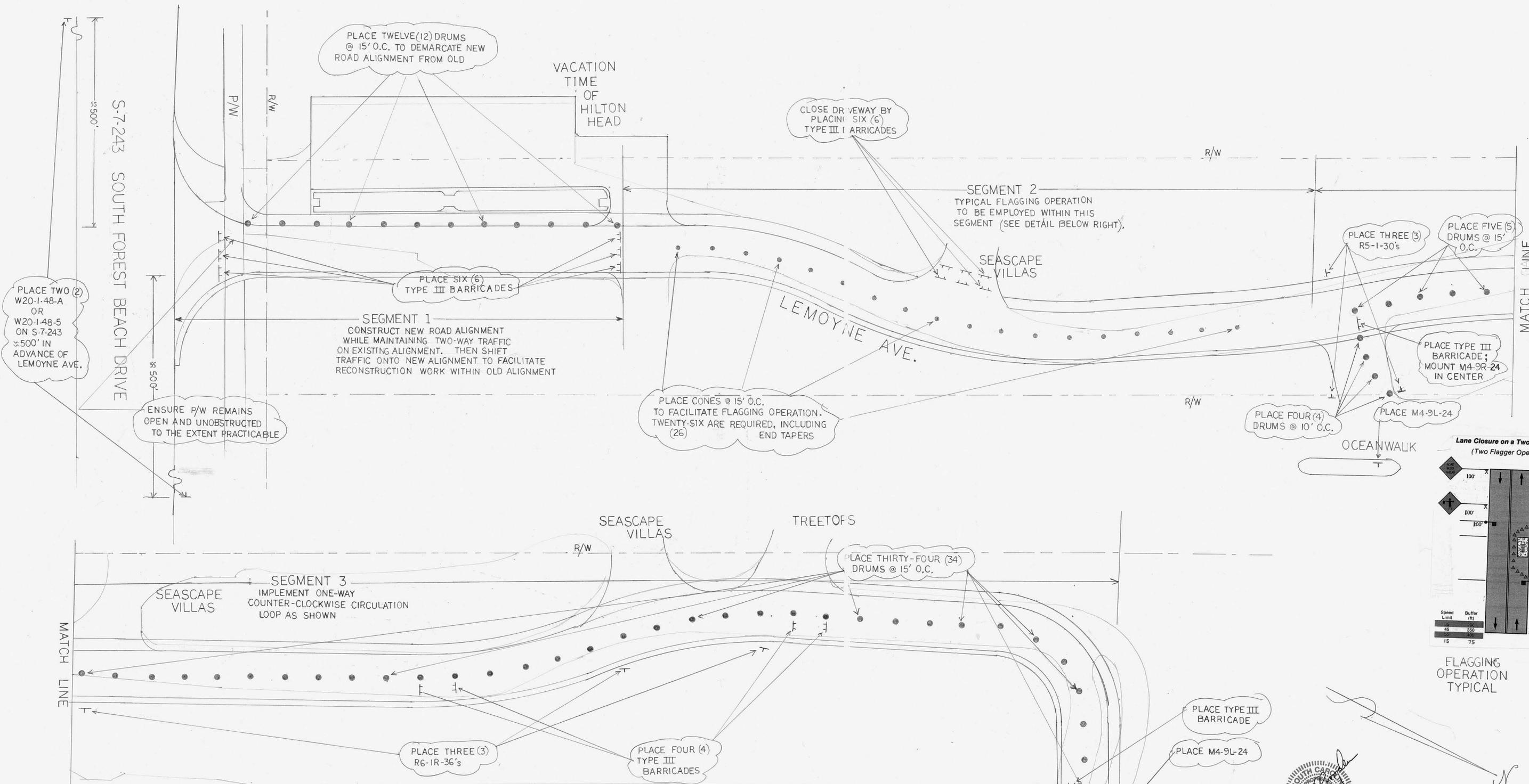
4. List all **similar projects** (~~pedestrian bridges, marine construction, storm drainage, grading, asphalt paving~~) the firm has completed, as a Prime Contractor only:

##### **Attachments:**

Supplemental Traffic Control Plan  
Revised Fee Schedule  
Revised Special Provisions  
Waterline Installation Specifications

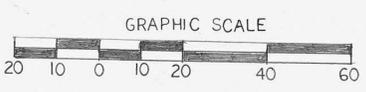
##### **Reminder:**

**Proposal Deadline is AUGUST 30, 2016 at 2:00 PM**



DEVICES REQUIRED	
QTY.	DESCRIPTION
6	TYPE III BARRICADES
38	DRUMS
26	CONES, 36"
4	W20-1-48-A "ROAD WORK AHEAD"
2	FLAGGERS W/ STOP/SLOW PADDLES & FLAGS
3	R5-1-30 "DO NOT ENTER"
3	R6-1R-36 "ONE WAY" (RIGHT)
2	M4-9L-24 "DETOUR" (LEFT)
1	M4-9R-24 "DETOUR" (RIGHT)
2	W20-7-48 (FLAGGER AHEAD)

- GENERAL NOTES:**
1. ALL DEVICES TO BE FULLY COMPLIANT W/ M.U.T.C.D & NCHRP-350.
  2. COORDINATE CLOSURES W/ TOWN PROJECT MGR.
  3. INVENTORY OF DEVICES REQD. IS BASED ON PROSECUTING WORK IN THREE PHASES PER SEGMENTS SHOWN. OVERLAPPING SEGMENTS MAY REQUIRE ADDITIONAL DEVICES.
  4. ENSURE S.FOREST BEACH DR, P/W REMAINS OPEN & UNOBSTRUCTED TO EXTENT PRACTICABLE. NOTIFY TOWN PROJECT MGR, IF P/W WILL NEED TO BE CLOSED OR OBSTRUCTED.



**LEMOYNE AVENUE IMPROVEMENTS**

HILTON HEAD ISLAND, BEAUFORT COUNTY, SOUTH CAROLINA

**TRAFFIC CONTROL PLAN**

NO.	DATE	REVISION	JOB NO: INFERI	SHEET
			DATE: 4-11-16	
			DRAWN BY: DAS	
			DESIGNED BY: DAS	
			SURVEYED BY: SILS	
			SURVEY DATE:	
			SCALE: 1" = 20'	



# LEMOYNE AVENUE PROJECT

## EXHIBIT C

### LIST OF ESTIMATED QUANTITIES / UNIT COST FEE SCHEDULE - RFP 2016-0025

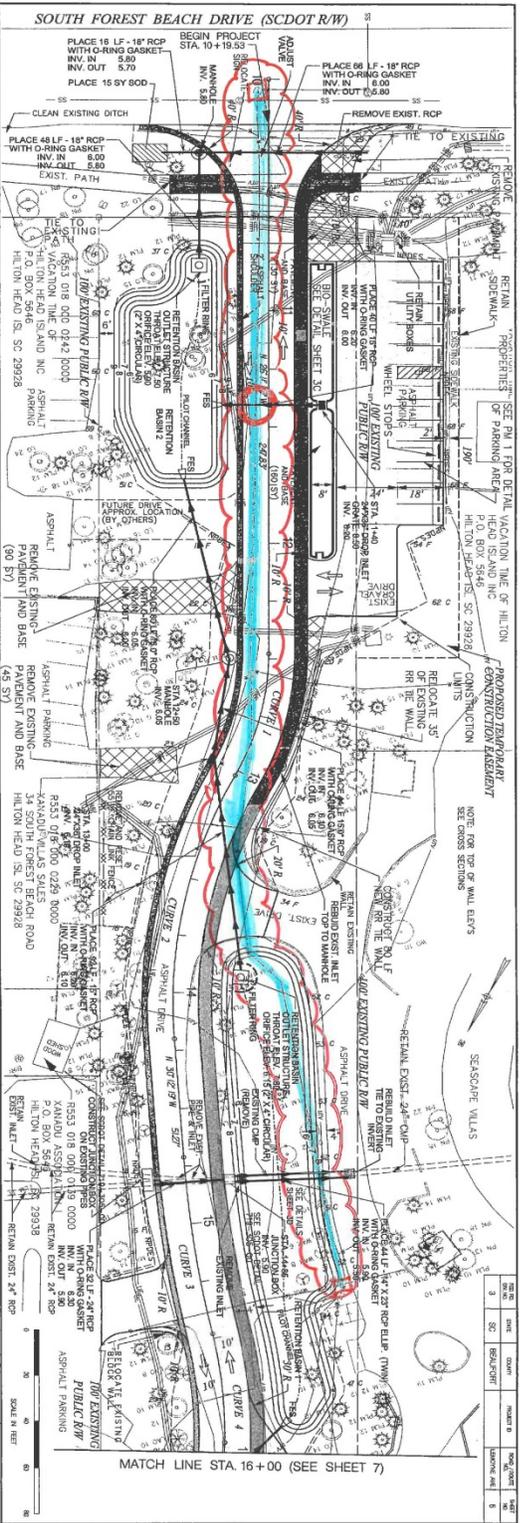
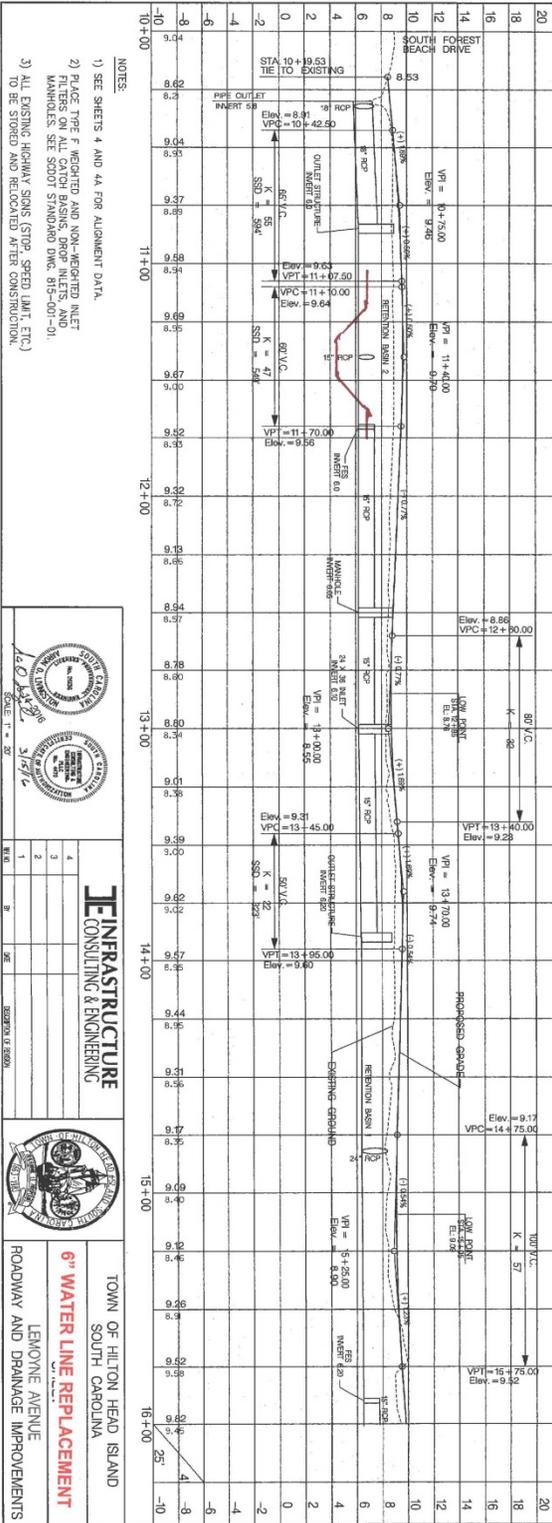
*per ADDENUM 1, ISSUED 8-23-26*

The unit prices given on this document, along with any negotiated changes in quantities, shall become the basis for, and included in, the contract agreement. Offerors are responsible for verifying all quantities and notifying the Owner of any discrepancies greater than 10% of estimate, in writing, prior to the bid opening. These quantities used as the basis for the contract shall supersede the summary of estimated quantities table in the plans.

ITEM NO.	SCDOT SPEC or SPEC PROV	ITEM DESCRIPTION	UNIT	EST. QUANT.	UNIT PRICE	VALUE
1	1031000	MOBILIZATION	LS	NEC.	\$ -	\$ -
2	1050800	CONSTRUCTION STAKES, LINES & GRADES	EA	1	\$ -	\$ -
3	1071000	TRAFFIC CONTROL	LS	NEC	\$ -	\$ -
4	2012000	CLEARING & GRUBBING WITHIN ROADWAY	LS	NEC	\$ -	\$ -
5	2024100	REMOVAL & DISPOSAL OF EXISTING CURB	LF	150	\$ -	\$ -
6	2025000	REMOVAL & DISPOSAL OF EXISTING ASPHALT PAVEMENT	SY	520	\$ -	\$ -
7	2031000	UNCLASSIFIED EXCAVATION (INCLUDES PONDS)	CY	7160	\$ -	\$ -
8	2103000	FLOWABLE FILL	CY	15	\$ -	\$ -
9	3100320	HOT MIX ASPHALT BASE COURSE - TYPE B	TON	200	\$ -	\$ -
10	4011004	LIQUID ASPHALT BINDER PG64-22	TON	80	\$ -	\$ -
11	4013990	MILLING EXISTING ASPHALT PAVEMENT (VARIABLE)	SY	700	\$ -	\$ -
12	4030340	HOT MIX ASPHALT SURFACE COURSE TYPE C or CM	TON	1165	\$ -	\$ -
13	6020005	PERMANENT CONSTRUCTION SIGNS (GROUND MOUNTED)	SF	304	\$ -	\$ -
14	6271020	12" WHITE SOLID LINES - THERMO. - 125 MIL	LF	60	\$ -	\$ -
15	6271010	4" WHITE SOLID LINES (PVT. EDGE LINES) THERMO.- 90 MIL.	LF	2460	\$ -	\$ -
16	6271025	24" WHITE SOLID LINES (STOP/DIAG LINES)-THERMO.-125 MIL	LF	125	\$ -	\$ -
17	6271030	WHITE SINGLE ARROWS (LT, STRGHT, RT) THERMO.-125 MIL	EA	2	\$ -	\$ -
18	6271050	HANDICAP SYMBOL - THERMOPLASTIC - 125 MIL.	EA	1	\$ -	\$ -
19	6271074	4" YELLOW SOLID LINES(PVT.EDGE LINES) THERMO-90 MIL.	LF	2360	\$ -	\$ -
20	6510105	FLAT SHEET, TYPE III, FIXED SZ. & MSG. SIGN	SF	44.00	\$ -	\$ -
21	6531210	U-SECTION POST FOR SIGN SUPPORTS - 3P	LF	100	\$ -	\$ -
22	7141141	14"X 23" HORIZONTAL ELLIPTICAL(HE) RC PIPE CUL.-CLASS HE-III	LF	90	\$ -	\$ -
23	7141112	15" RC PIPE CUL.-CLASS III	LF	670	\$ -	\$ -
24	7141113	18" RC PIPE CUL.-CLASS III	LF	152	\$ -	\$ -
25	7141114	24" RC PIPE CUL.-CLASS III	LF	32	\$ -	\$ -
26	7191250	CATCH BASIN -TYPE 9 MH (POND OUTLET STRUCTURES)	EA	2	\$ -	\$ -
27	7192020	DROP INLET(24" X 36")	EA	5	\$ -	\$ -
28	7192105	MANHOLE	EA	2	\$ -	\$ -
29	7192260	48" X 48" JUNCTION BOX	EA	1	\$ -	\$ -
30	719228Z	JUNCTION BOX (SPECIAL)	EA	1	\$ -	\$ -
31	7197120	ADJUST EXISTING MANHOLE TOPS	LS	NEC	\$ -	\$ -
32	7197141	ADJUST UTILITY VALVE BOX COVERS	LS	NEC	\$ -	\$ -
33	7198420	MANHOLE - CONVERT EXISTING DROP INLET 24" X 36"	EA	1	\$ -	\$ -
34	7198530	DROP INLET 24" X 36" - CONVERT EXISTING CATCH BASIN (ROOF/GRA	EA	2	\$ -	\$ -
35	7207001	CONCRETE FLUME (AT BIO-SWALE)	EA	4	\$ -	\$ -
36	7203110	CONCRETE CURB AND GUTTER(1'-6") VERTICAL FACE	LF	280	\$ -	\$ -
37	7204100	CONCRETE FOR APRONS AT CROSSWALKS (4" UNIFORM)	SY	25	\$ -	\$ -
38	7204900	DETECTABLE WARNING SURFACE	SF	45	\$ -	\$ -
39	8072000	RESET CHAIN LINK FENCE	LF	65	\$ -	\$ -
40	8114011	TREE PROTECTION	LS	NEC	\$ -	\$ -
41	8151110	TEMP. EROSION CONTROL BLANKET	MSY	1.135	\$ -	\$ -
42	8151101	TURF REINFORCEMENT MATTING (TRM) TYPE 1	MSY	0.113	\$ -	\$ -
43	8152004	INLET STRUCTURE FILTER - TYPE F (WEIGHTED)	LF	150	\$ -	\$ -
44	8152007	SEDIMENT TUBES FOR DITCH CHECKS	LF	40	\$ -	\$ -
45	8152006	INLET STRUCTURE FILTER- TYPE F (NON-WEIGHTED)	LF	150	\$ -	\$ -
46	8153000	SILT FENCE	LF	300	\$ -	\$ -
47	DETAIL	GRAVEL FILTER RING AT OUTLET STRUCTURES	EA	2	\$ -	\$ -
48	DETAIL	GRAVEL FILTER UNDER ELLIPTICAL PIPES - #57 STONE	TN	48	\$ -	\$ -
49	DETAIL	FILTER FABRIC FOR GRAVEL UNDER ELLIPTICAL PIPES (MIRAFI 140N)	SF	1180	\$ -	\$ -
50	DETAIL	FLARED END SECTION (GEORGIA DOT)	EA	3	\$ -	\$ -
51	DETAIL	CONCRETE WHEEL STOPS	EA	12	\$ -	\$ -
52	SPECIAL	RECONSTR. ASPHALT FOR REPLACEMENT OF EXIST. RCP	LS	NEC	\$ -	\$ -



**LEMOYNE AVENUE PROJECT**  
**SP-6 WATER LINE RELOCATION**  
**RFP 2016 – 0025 – ADDENDUM 1**



- NOTES:
- SEE SHEETS 4 AND 4A FOR ALIGNMENT DATA.
  - PLACE TYPE F WEIGHTED AND NON-WEIGHTED INLET FILTERS ON ALL CATCH BASINS, DROP INLETS, AND MANHOLES. SEE SCDOT STANDARD Dwg. 815-60-101.
  - ALL EXISTING HIGHWAY SIGNS (STOP, SPEED LIMIT, ETC.) TO BE STORED AND RELOCATED AFTER CONSTRUCTION.



**INFRASTRUCTURE**  
CONSULTING & ENGINEERING



TOWN OF HILTON HEAD ISLAND  
SOUTH CAROLINA

**6" WATER LINE REPLACEMENT**

LEMOYNE AVENUE  
ROADWAY AND DRAINAGE IMPROVEMENTS

## Section V

### WATER DISTRIBUTION SYSTEM

#### DESIGN GUIDELINES

##### A. GENERAL

1. The following water system design guidelines are based on Federal, State and local health requirements and the South Island Public Service District's engineering design criteria.
2. Design criteria not indicated herein shall comply with "Ten States Standards" where applicable.
3. All installations are to meet the bacteriological and chemical quality standards of the South Carolina Department of Health and Environmental Control (SCDHEC).
4. These design guidelines are applicable to all developments including but not limited to residential, commercial and industrial developments, subdivisions, commercial and industrial developments, subdivisions and/or parks requiring water service from the South Island Public Service District.

##### B. SYSTEM DESIGN CRITERIA

1. Design data and design calculations shall include the following:
  - a. Maximum Instantaneous Flow. Refer to Ameen's Table XXI.
  - b. Number and type of proposed connections.
  - c. Fire flow requirements – Shall equal  $500 + 1/5$  of the maximum instantaneous flows.
  - d. Fire flow test results, conducted in the past 12 months, at a location near the proposed connection to the existing system. The results shall include the static and residual pressures when a known flow, time and date of test, existing pipe size, type of pipe, and the elevation and distance between test point and connection. Known flow must be in excess of the demand for the extension.

- e. Design head loss calculations, including elevation changes shall show 25 psi minimum residual when either instantaneous demand occurs or when the flushing flow in excess of peak hourly flow occurs, whichever is greater.
2. No line extension shall be made of an existing line when the existing line does not meet the minimum pressure and flow requirements.
3. Minimum size water mains for providing fire protection (fire hydrants) shall be 6 inches in diameter. Larger size mains shall be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum required residual pressure.
4. Line extensions of an existing line must not be made when the existing line does not meet the minimum pressure and flow requirements specified in section R.61-58.4.D.(4)(a).
5. Dead ends shall be minimized by looping of all water mains, whenever practical.
6. Avoid dead-end lines, if possible. Check lines less than 200 feet to ensure that they have sufficient flow to avoid stagnant water in the lines in addition to maintaining a chlorine residual. Should have plans to extend these types of lines within a year.
7. The lengths of small dead end lines (**service lines only**) shall not exceed:
  - a. 1 inch diameter - 150 feet.
  - b. 1.25 inch diameter - 200 feet.
  - c. 1.5 inch diameter - 300 feet.
  - d. 2 inch diameter - 1,500 feet.
8. Provide for a readily accessible means of flushing all water mains at a minimum velocity of 2.5 fps. To a degree, service lines may be used to flush a line. For example, where you have a dead-end line running down a cul-de-sac serving 2 homes.
10. Blow-offs required where changing pipe size, unless engineer can demonstrate that there is adequate pressure to flush the lines. Plans should specify size of blow-off. Dead end lines shall be provided with a fire hydrant if flow and pressure are sufficient, or with a post hydrant or blow-off valve in a box for flushing purposes, except for lines:
  - a. 1.5 inches in diameter and less will not require blow-offs but will require a service connection.
  - b. 200 feet or less in length will not require blow-offs, unless specifically required by the Department.

11. Blow-offs sized to provide a minimum velocity of 2.5 fps in the line & maintain a residual pressure of 25 psi.
12. Post-type hydrants are acceptable for flushing on lines 4 inches in diameter and can be used on 3 inch diameter lines where the design flow is increased to 100 GPM in excess of the peak hourly flow. Standard fire hydrants required on lines 6 inch in diameter and greater.
13. Lines 10 inches in diameter and larger require flows in excess of 500 gpm to achieve a 2.5 fps scouring velocity. This requires a standard fire hydrant or other approved blow-off, for flushing designed to provide at least 500 gpm in excess of peak hourly flow and a minimum residual pressure of 20 psi.
14. No flushing device shall be directly connected to any sewer.
15. Sufficient valves shall be provided on water mains so that customer inconvenience and sanitary hazards will be minimized during repairs.
16. Valves required at all intersections and on loops.
17. Where standard 4 to 6 inch diameter hydrants are proposed, the design flow shall not be less than 500 gpm over and above peak hourly flow. Standard hydrants shall not be placed on systems using only hydropneumatic storage, unless standby power is provided and the pumping capacity from wells or ground storage exceeds the fire flow demand with the largest well or pump out of service. Standard hydrants shall not be connected to lines not designed to carry fire flows.
18. Where post-type hydrants are proposed, they must meet the flow requirements for blowoffs. Post hydrants shall not be used on water lines smaller than 3 inches in diameter.
19. Use DIP with mechanical joints for any lines being installed in rock.
20. Water services and plumbing must conform to relevant local plumbing codes or the National Plumbing Code.
21. Individual home booster pumps are not allowed to meet the 25 psi minimum pressure at the service connection.
22. Water Loading Stations - To prevent contamination of the public water supply, the following criteria must be met:

- a. Air Gap - A device must be installed on the fill line to provide an air break and prevent a submerged discharge line.
  - b. Hose Length - The fill hose and cross connection control device must be constructed so that when hanging freely it will terminate at least 2 feet above the ground surface.
  - c. Fill line terminus - The discharge end of the fill line must be unthreaded and constructed to prevent the attachment of additional hose, piping or other appurtenances.
23. Distribution main size: minimum 6" diameter.
24. Arrange mains so they are looped and interconnected at intersections.
25. Comply with all application requirements of the SCDHEC, the Town of Hilton Head and Hilton Head Fire Marshall.
26. Hazen and Williams design coefficient:
- a. PVC: C=140
  - b. Ductile iron pipe: C=120
27. Air relief valves shall not be allowed. Hydrants shall be placed at high points in water systems as required to expel air when necessary.
28. Chambers, pits or manholes containing valves, blow-offs, meters, or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer.

C. SOUTH ISLAND PUBLIC SERVICE DISTRICT MASTER PLAN

1. Design system to comply and be compatible with the District's Water System Master Plan.

D. FIRE HYDRANTS

1. Comply with the Town of Hilton Head Fire Code.
2. Fire hydrant spacing:
  - a. Low density residential, less than 5 units per acre: 1,000 feet or at each intersection.
  - b. High density residential, single family homes, more than 5 units per acre: 600 feet.
  - c. High density residential, apartments, condominiums, etc.: 500 feet.
  - d. Commercial and isolated industrial: 500 feet.
3. Fire hydrant leads to be a minimum of 6" diameter with an isolation valve.

E. SIZING OF LINES

1. Pipe size 6" and larger:
  - a) Size piping based on either 1/5 the instantaneous maximum flow plus fire flow or maximum instantaneous demand, whichever is greater.
2. Pipe size 4" and smaller:
  - a) Size piping based on either 1/5 of maximum instantaneous demand plus blow off flow to meet flushing requirements or maximum instantaneous demand whichever is greater.
3. The maximum instantaneous demand is to be calculated using the **Community Water System Source Book** by Joseph S. Amen, as a reference.
4. Design for flushing velocity per SCDHEC regulations.

5. Minimum design residual pressure: 20 psi.
6. The Developer's Design Engineer is to determine available static and residual pressures at the delivery point for the water to a new development. The data is to be obtained under the direction of an engineer who is registered in the State of South Carolina.

F. VALVES AS INDICATED BELOW

1. Provide three (3) valves for a tee intersection.
2. Provide four (4) valves for a cross intersection.
3. Maximum valve spacing: 1000 feet.

G. INDUSTRIAL OR SPECIAL DESIGN CONDITIONS

1. Design of water systems for industrial or other systems not covered under this section shall be approved on a special case basis only. Special requests need to be made to the South Island Public Service District.

H. DEAD ENDS

1. Minimize dead ends by looping of all mains.
2. Where dead ends occur provide a fire hydrant on lines 6".
3. Do not connect any flushing device to any sanitary sewer.

I. SEPARATION OF WATER MAINS AND SEWERS

1. Where possible, locate water line at least ten (10) feet away, horizontally, from sewer pipes.
2. Should ten (10) foot separation not be practical, then the water main may be located closer provided:
  - a. It is laid in a separate trench.

- b. It is laid in the same trench with the water main located at one side of a bench of undistributed earth.
  - c. In either of the above cases, crown elevation of the sewer shall be at least 18" below invert elevation of water line.
3. Where water lines cross over sewers, maintain 18" minimum clearance between crown of sewer and invert of water lines.

J. THRUST BLOCK DESIGN

- 1. Maximum soil pressure: 2000 lbs/sq ft.
- 2. Minimum water pressure: 150 psi.

K. COVER

- 1. Provide suitable cover on all distribution mains. Minimal cover depth as follows:
  - a. Less than 8" diameter: 30".
  - b. 10" and 12" diameter: 36".
  - c. 14" diameter and larger: 48".
  - d. All piping located within the right-of-way of the South Carolina Department of Transportation shall have a cover as indicated above or 36" below the elevation of the road, whichever is greater.
  - e. Special conditions other than those listed above may be approved if requested in writing from the South Island Public Service District.

L. DUCTILE IRON PIPE LOCATIONS

- 1. Use ductile iron pipe where water line:
  - a. 12" or larger.
  - b. Crosses beneath sewers.

- c. Crosses beneath storm drainage pipe with less than three (3) feet of clearance.
- d. Crosses above a storm drainage or other pipe with less than two (2) feet of clearance.
- e. Crosses creeks, rivers and other water bodies. f.

Installed in casing.

- g. Cover is less than minimum prescribed in Part K above.

## Section VI

### WATER DISTRIBUTION SYSTEM

#### MATERIALS FOR CONSTRUCTION

##### A. GENERAL

1. Unless otherwise noted or approved by the Hilton Head No.1 Public Service District all materials shall be manufactured in the United States.
2. All material or products which come into contact with drinking water shall be third party certified as meeting the specifications of the American National Institute/National Sanitation Foundation Standard 61, Drinking Water System Components - Health Effects. The certifying party shall be accredited by the American National Standards Institute.
3. All pipe, fittings, packing, jointing materials, valves and fire hydrants shall conform to Section C of the AWWA Standards.
4. Water mains which have been previously used for conveying potable water may be reused provided they meet applicable criteria from AWWA Section C, ANSI/NSF 61, and ASTM D1785 or D2241. The mains must be thoroughly cleaned and restored practically to their original condition.
5. Asbestos cement pipe shall not be used.
6. Thermoplastic pipe shall not be used above grade.
7. Steel pipe will not be used.
8. Natural rubber or other material which will support microbiological growth may not be used for any gaskets, O-rings, and other products used for jointing pipes, setting meters or valves, or other appurtenances which will expose the material to the water.
9. Lubricants which will support microbiological growth shall not be used for slip-on joints.
10. The use of vegetable shortening is prohibited.

11. The use of solvent-weld PVC pipe and fittings in water mains 4 inches and larger is prohibited.
12. Any pipe, solder, or flux which is used in the installation or repair of any public water system, used in any plumbing which provides water through connection to a public water system, for human consumption, shall be lead free. Lead free, for solder and flux, means those containing not more than 0.2% lead. Lead free, for pipes and pipe fittings, as those containing not more than 8.0% lead. Leaded joints necessary for the repair of CIP shall be exempt from the above.

B. DUCTILE IRON PIPE (DIP):

1. Provide for 12" and larger pipe.
2. Comply with ANSI/AWWA C151/A21.51.
3. Wall thickness in accordance with Table 51.1 of ANSI/AWWA C151/A21.51 with working pressure of 150 psi, depth of cover indicated and Type 2 bedding conditions, minimum thickness Class 50.
4. Use cement mortar lining: ANSI/AWWA C104/A21.4, standard thickness.
5. Use mechanical or push-on joints: ANSI/AWWA C111/A21.11 as modified by ANSI/AWWA C151/A21.51.
6. Use rubber gaskets and lubricant: ANSI/AWWA C111/A21.11.
  - a. Natural rubber gaskets are not acceptable.

C. PLASTIC PIPE

1. General:
  - a. Use integral bell or coupling type with elastomeric gaskets.
  - b. Integral bells: ASTM D2672.
  - c. NSF approved.
  - d. Couplings: ANSI/AWWA C900.
  - e. Gaskets: ASTM F477.
    - 1) Natural rubber gaskets are not acceptable.

- f. Gaskets to be factory installed and integral with the pipe.
  - g. Lubricants shall be compatible with pipe and gasket materials, shall not support bacteria growth and shall not adversely affect potable quality of line contents.
    - 1) NSF approved.
- 2. PVC 4" and larger:
    - a. Comply with ANSI/AWWA C900, Table 2, Pressure Class 150.
  - 3. PVC 3" and smaller:
    - a. Comply with ASTM D 1785 for PVC 1120.
    - b. Schedule 40 with solvent weld joints.
    - c. Mark with National Sanitation Foundation approval at 18" intervals.
  - 4. Service pipe:
    - a. Minimum size - 1"
    - b. Provide PVC as specified above for services 1½" and larger.
    - c. Provide high molecular weight flexible polyethylene pipe.
      - 1) ASTM D1248 and AWWA C901, Type III, SDR 9, copper tubing size (CTS).
    - d. Mark with National Sanitation Foundation approval at 18" intervals.

D. FITTINGS AND SPECIALS

- 1. General:
  - a. Cast iron fittings are not acceptable.
- 2. Ductile iron pipe:

- a. Use 250 psi pressure rated ductile iron fittings or specials unless otherwise indicated.
    - 1) ANSI/AWWA C110/A21.10.
    - 2) ANSI/AWWA C153.
  - b. Fittings for use with push-on joint pipe.
    - 1) ANSI/AWWA C111/A21.11.
  - c. Compact fittings for piping 3" - 16" may be provided in accordance with ANSI/AWWA C153/A21.53.88.
  - d. Use cement mortar lining: ANSI/AWWA C104/A21.4, Standard thickness.
3. Plastic pipe 4" and larger:
- a. Use 150 psi pressure rated ductile iron fittings or specials unless otherwise indicated.
    - 1) ANSI/AWWA C110/A21.10.
  - b. Provide adapter glands, gaskets, etc. as required to accommodate any differences in pipe and fitting dimensions.
4. Plastic pipe 3" and smaller:
- a. Use PVC fittings, 160 psi at 73°F pressure rating, joint design to conform to pipe joints, solvent weld.

E. RESTRAINED JOINT PIPE AND FITTINGS

- 1. Provide restrained joint pipe and fittings on all piping at each fitting, including valve connections and on the pipe joints to a distance of 36' on each side of the fitting.
- 2. Ductile iron pipe and fittings:
  - a. Fittings:
    - 1) Provide for use with mechanical joint pipe and fittings.

- 2) Provide "MEGALUG" as manufactured by EBAA Iron Sales, Inc. of Eastland, Texas, ROMAGRIP, or other approved equal.
  - b. Pipe:
    - 1) Provide retainer gaskets with stainless steel locking elements on the inner surface, for use with slip joint pipe.
      - i) Provide gaskets for 250 psi minimum working pressure.
      - ii) Provide gaskets conforming to ANSI/AWWA C111/A21.11.
      - iii) Approved gaskets are the Field Lok Gasket manufactured by U.S. Pipe and Fast-Grip Gasket manufactured by American Ductile Iron Pipe, or approved equal.
3. PVC pipe and fittings:
  - a. Fittings:
    - 1) Provide for use with mechanical joint fittings and PVC pipe.
      - i) Provide "Series 2000 PV" as manufactured by EBAA Iron Sales, Inc. of Eastland, Texas.
  - b. Pipe:
    - 1) Provide for use with PVC pipe bells.
      - i) Provide "Series 1600" as manufactured by EBAA Iron Sales, Inc., of Eastland, Texas.

F. COUPLINGS - 4" AND LARGER

1. Provide couplings where needed to make piping connections.
2. Provide full-length mechanical joint ductile iron sleeve, 12" minimum length.
3. Provide cutting-in sleeve where installing fittings in an existing line.
  - a. Provide ductile iron with mechanical joint.
4. Provide restrained joint couplings: where restrained joints are indicated on the plans or when coupling is located within 18' for 12" piping and less and 36' for larger piping of a bend, tee or valve.
5. Compact fittings are not acceptable.

6. Acceptable product – Transition Coupling: Viking Johnson\*  
\*Note: Fittings must be manufactured in USA

G. PLUGS OR CAPS - 4" AND LARGER

1. Provide at all pipe ends and unused branches of fittings.
2. Tap and provide with 2" plug.
3. Provide restrained joint.

H. METALLIC DETECTION TAPE

1. Provide 2" wide metallic detection tape on all buried PVC and polyethylene piping.
  - a. Provide 5.0 mil overall thickness with no less than a 50-gauge solid aluminum foil core.
  - b. Foil to be visible from both sides.
  - c. No inks or printing extended to the edges of the tape.
  - d. Encase printing to avoid ink rub-off.
  - e. Tensile strength - 28 lbs/inch.
  - f. Use heat set mylar inks.
2. Color to be Safety Precaution Blue.
3. Wording on tape to indicate "Potable Water" at no greater than 24" on center.

I. COPPER TRACER WIRE

1. Provide a continuous 12 gauge insulated copper tracer wire on all buried PVC and polyethylene piping.
2. Tracer wire is to be approved for direct burial by the manufacturer.

J. VALVES

1. General:

- a. 2½" and smaller: Use ball valves. b. 3" through 12": Use gate valves.
- c. 14" and larger: Use gate valves.
- d. Open by turning counterclockwise.
- e. End connections as required for the piping in which they are installed. f. Two inch metal operating nut with arrow indicating direction of opening. g. Use valves designed for a working pressure of not less than 150 psi unless otherwise specified herein.
- h. Provide stem extensions on all valves where the top of the operator nut is located greater than 36" below the top of the valve box.

2. Ball valves, 2½" and smaller:

- a. Use all bronze ball valves, ¼" turn with stop. b. Provide 2" square nut.
- c. Acceptable Products: Ford Model B11-QT67 or Mueller Model B-20200.

3. Gate valves:

- a. Use resilient seated wedge valves: ANSI/AWWA C500/C509.
- b. Internal ferrous metal surfaces to be fully coated with two part thermosetting epoxy.
- c. Provide two-part thermosetting epoxy coating on valve exterior. d. Provide integrally cast bronze stem nut.
- e. Design for external stem failure when excessive closing torque is applied with no failure of the pressure retaining parts.
- f. Double disc valves to have bevel gears with grease case, provide all

necessary appurtenances for horizontal installation.

- g. Provide double disc valves on 14" and larger with valved bypass.
- h. Provide valves for 250 psig maximum working pressure and 500 psi static test pressure.
- i. Provide stainless steel fasteners.
- j. Acceptable product: Mueller or AVK.

4. Butterfly valves:

- a. Provide butterfly valves conforming to AWWA Standard C504, latest revision, for Class 150B, unless otherwise specified.
- b. Resilient seats are to be synthetic rubber (BUNA N).
- c. Shafts to be turned, ground and polished, constructed of 18-8 Type 304 stainless steel.
  - 1) Shafts to be of one piece design.
  - 2) Attach disc to shaft with stainless steel tapered pins and locking nuts.
- d. Spray coat all interior wetted ferrous surface with two component epoxy applied to a nominal thickness of 3 to 4 mils.
  - 1) Coating material to be AWWA and U.S. Food and Drug Administration approved for use with potable water.
- e. Provide operators with not less than maximum operator torque, as determined in accordance with Appendix A of AWWA C504, to operate valves under actual line pressures and velocities.
  - 1) Provide worm and gear, or traveling nut type, self-locking to prevent the valve disc from creeping or fluttering when it is in any intermediate position between open and closed.
  - 2) Gear operators to be permanently lubricated, totally enclosed, with adjustable stops for the open and closed position, and except on units for buried service, shall have a valve disc position indicator.
- f. Provide position indicator and extension shaft for all valves and operators.
  - 1) Position indicator shall be hermetically sealed for installation in a C.I. valve box.

- 2) Show valve disc position, direction of rotation and number of turns from full open to full close.
- 3) Shaft extension and pins to be stainless steel.
- 4) Base plate and housing to be aluminum.
- 5) Provide all bronze gearing.
- 6) Provide 2" AWWA square nut.
- 7) Approved manufacturer: Dyna-Torque, Inc. of Mukegon, Michigan.

g. Acceptable product: DeZurik

K. VALVE OPERATOR

1. Provide one T-handle operator for each ten buried valves with nut operator.
2. Operator to be epoxy coated.

L. FIRE HYDRANTS

1. Comply with ANSI/AWWA C502.
2. Waterway valve opening, 5¼".
3. Six inch bell connection, two 2½" hose connections, one 4½" steamer connection with cap chain on all connections.
4. National Standard screw threads on outlet nozzles.
5. Open by turning counterclockwise, with arrow cast in top indicating direction of opening.
6. Two part breakable safety flange shall be an integral part of barrel casting.
7. Depth of bury, 3'6".
8. Install with break away flange at least 2" above grade.
9. Finish coat with industrial enamel, yellow color ("old yellor") to match the District's standard.

9. Provide one hydrant wrench for each ten hydrants.
10. Acceptable product: Mueller Model Super Centurion, AVK Series 2780.
11. See valve box section below for color requirement.

M. FIRE HYDRANT REFLECTOR

1. Provide industry standard blue hydrant reflector for paved roadway.

N. FIRE HYDRANT OFFSET FITTING

1. Locate between the shut-off valve and each hydrant.
2. Provide a 12" offset.
3. Provide Grade Lok as manufactured by Assured Flow Sales, Inc., or approved equal.

O. VALVE BOXES

1. Provide at each buried valve.
2. Cast iron extension type, suitable for minimum cover of 3'6" over the pipe.
3. Minimum inside diameter at the top of 5", minimum wall thickness 3/16".
4. Have the word "WATER" cast into the cover.
5. Coat box and cover with two (2) shop coats of bitumastic paint.
6. Acceptable product: Tyler Model 461S.
7. Fire hydrant valve boxes shall be painted the same color as the hydrant.

P. VALVE BOX PROTECTION RING

1. Provide at each valve box a precast concrete protection ring.

2. Provide two (2) rings of #3 reinforcing steel, one 21" in diameter, and one 15" in diameter; or one (1) ring of #3 reinforcing steel, 22" in diameter with fibermesh concrete.
3. Inside dimensions to be 9¼".
4. Outside diameter to be 27".
5. Provide 5" thickness at interior with a continuous slope to 2" thickness at the outside.
6. Minimum weight of 110 lbs.

Q. SERVICE AND TAPPING SADDLES

1. Provide of the following materials:
  - a. Body - Ductile Iron ASTM-A536.
  - b. Bales and straps - Type 304 stainless steel.
  - c. Studs - Type 304L stainless steel.
  - d. Hardware - Type 304 stainless steel.
2. Provide double strap for sizes 5" and larger. One strap is acceptable if width of the strap matches the width of the saddle.
3. Finish - Provide fusion bonded nylon to an average thickness of 12 mils.
4. Provide a 6" long brass nipple on the outlet for PVC pipe outlet connections.
5. Acceptable products: Smith Blair (Rockwell) 317, JCM 406, or Romac style 202N, Ford.

R. TAPPING SLEEVE AND VALVE

1. Tapping sleeve:
  - a. Provide Type 304 stainless steel sleeve with stainless steel flanged outlet.

- b. Provide full circumferential gasket.
  - c. Provide for maximum working pressure of 150 psi.
  - d. Provide Type 304 stainless steel nuts and bolts.
  - e. Provide ¾" NPT test plug.
  - f. Acceptable Products: JCM 432, Romac SST III, or approved equal.
2. Tapping valve:
- a. Construct of material compatible with tapping sleeve.
  - b. Valve to conform to gate valve specifications above.
  - c. Joints - Flange to tapping sleeve, for pipe end.
3. Tie rods:
- a. Provide steel rods complying with ASTM Designation A242, galvanized in accordance with ASTM Designation A123.
  - b. Acceptable products: Super Star Tie Rod Figure No. SS12 and Tie Bolt Figure No. SST7 as manufactured by Star National Products or approved equal.

S. AIR RELEASE VALVES

- 1. Provide cast iron body with stainless steel internal trim and float.
- 2. Provide stainless steel seat with BUNA-N rubber valve.
- 3. Provide Crispin Type "N" Model PL10.
  - a. ¼" orifice.
  - b. 0 to 150 psi working pressure.
  - c. 1" NPT connection.

4. Provide a heavy duty cast iron meter box to house valve.

T. BLOW-OFF HYDRANT

1. Provide non-freezing, self-draining type.
2. Provide all working parts of bronze-to-bronze design.
3. Hydrant shall be lockable.
4. Provide Eclipse No. 78 as manufactured by Kupferle Foundry Company.
  - a. 2" FIP inlet.
  - b. Bronze 2½" NST outlet.
  - c. Non-turning operating rod.
  - d. Open left.
5. Set below grade in a cast iron meter box.
  - a. Coat meter box with two (2) coats of bitumastic paint.
  - b. Minimum opening in meter box of 10".

U. CORPORATION STOPS

1. Acceptable product:
  - a. Ford Model F1000, CCxCTS.
  - b. Mueller Model H-15008.

V. CURB STOPS

1. Acceptable product:
  - a. Ford Model B41-444W CTS x female IPS.

- b. Mueller Model B25170.

W. REPAIR COUPLINGS

- 1. Pipe 2½" and smaller: PVC
- 2. Pipe larger than 2½":
  - a. Full length mechanical joint ductile iron couplings, 12" minimum length, or mechanical sleeve.
  - b. Ductile iron transition couplings for joining plain end pipe, as manufactured by JCM, or equal.

X. MISCELLANEOUS PARTS AND ACCESSORIES

- 1. Use standard commercial grade suitable for the type of installation or system involved, and conforming to the applicable standards and specifications of the AWWA.

## Section VII

### WATER DISTRIBUTION SYSTEM

### CONSTRUCTION PROCEDURES

This section covers construction procedures normally required for work within the District. It does not cover any special construction procedures which may be encountered for abnormal conditions.

Special construction procedures are to be presented to the District by the Developer's Design Engineer.

#### A. SHIPPING OF PVC PIPE

1. Protect pipe from exhaust fumes during shipping.

#### B. HANDLING OF MATERIALS

1. Handle pipe so as to ensure delivery to the trench in sound, undamaged condition:
  - a. Carry pipe into position - do not drag.
  - b. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.
  - c. Use care not to injure pipe linings.
2. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during layout operations by plugging or other approved method.
3. Before installation, inspect each piece of pipe and each fitting for defects:
  - a. Replace material found to be defective before or after laying with sound material meeting the specified requirements.
4. Rubber gaskets: Store in a cool dark place until just prior to time of installation.

C. PIPE CUTTING

1. Cut pipe neatly and without damage to the pipe.
2. Unless otherwise recommended by the pipe manufacturer, cut pipe with mechanical cutter only.
  - a. Use wheel cutters when practicable.
  - b. Cut plastic pipe square and remove all burrs.

D. LOCATING

1. Where possible, locate water line at least ten (10) feet away, horizontally, from sewer pipes.
2. Should ten (10) foot separation not be practical, then the water main may be located closer provided:
  - a. It is laid in a separate trench.
  - b. It is laid in the same trench with the main water located at one side on a bench of undisturbed earth.
  - c. In either of the above cases, crown elevation of the sewer shall be at least 18" below invert elevation of water line.
3. Where water lines cross over sewers, maintain 18" minimum clearance between crown of sewer and invert of water lines.
4. Where water lines cross under sewers, each line shall be ductile iron.
  - a. A full length of water line shall be located over the sewer so that joints will be equal distance from the sewer.
5. No water pipe shall pass through or come in contact with any part of a sewer manhole.
6. Service lines:

- a. Provide a separate service to each subdivision lot.
  - b. Install service lines from the distribution main to the property lines at each lot, or at each location indicated or directed by the Engineer.
  - c. Locate service line on new lots 5' from one front corner property pin.
    - 1) The sewer service is to be installed 5' from the other front property pin.
7. Force Mains: There shall be at least a 10 foot horizontal separation between water mains and sanitary sewer force mains. There shall be an 18 inch vertical separation at crossing as required in R.61-58.4(D)(12)(a) and (b).
8. Drain-fields and Spray-fields: Potable water lines shall not be laid less than 25 feet horizontally from any portion of a waste-water tile-field or spray-field, or shall be otherwise protected by an acceptable method approved by the Department.

E. ALIGNMENT OF PIPE

1. Pipe lines intended to be straight shall be so laid.
2. Where vertical or horizontal alignment requires deflection from straight lines or grade, do not exceed maximum deflection recommended by the pipe manufacturer.
3. If alignment requires deflection exceeding recommended limits, furnish special blends to provide angular deflections within the allowable limits.

F. PLACING AND LAYING

1. General:
  - a. Lower pipe and accessories into trench by means of derrick, ropes, belt slings, or other equipment approved by the manufacturer.
  - b. Do not dump or drop any of the materials into the trench.
  - c. Except where necessary in making connections to other lines, lay pipe with the bells facing in the direction of laying.

- d. Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated to accommodate bells, couplings, and joints.
  - e. Take up and relay pipe that has the grade or joint disturbed after laying.
  - f. Do not lay pipe in water, or when trench conditions are unsuitable for the work; keep water out of the trench until jointing is completed.
  - g. Securely close open ends of pipe, fittings, and valves when work is not in process.
  - h. Replace pipe where any part of coating or lining is damaged.
  - i. Bell pipe using manufacturer's approved leverage bar.
    - 1) Do not use machinery to bell pipe.
    - 2) Home line is to be clearly visible when pipe is joined.
2. Installation of water mains and appurtenances shall be conducted in accordance with Section C of the AWWA Standards and/or manufacturer's recommended installation procedures.
3. Bedding:
- a. A continuous and uniform bedding shall be provided in the trench for all buried pipe.
  - b. Back-fill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe.
  - c. Stones, other than crushed bedding, shall not come in contact with the pipe and shall not be within 6 inches of the pipe.
4. Ductile iron pipe:
- a. Mechanical and push on joints, install in accordance with ANSI/AWWA C600.
  - b. Gaskets: Handle, lubricate where necessary and install in strict accordance with manufacturer's recommendations.
5. Plastic pipe:

- a. Clean gasket, bell or coupling interior, especially groove area.
  - b. Lubricate gasket as recommended by manufacturer.
  - c. Align spigot to bell, insert spigot into bell until it contacts gasket uniformly.
  - d. Push pipe "home" until reference mark is at proper location.
6. Restrained joints:
- a. Install in accordance with manufacturer's instructions.
  - b. Tighten set screws to the manufacturer's rated torque using a torque wrench.
    - 1) If twist-off nuts are provided, tighten screws until nut breaks loose.
7. Underwater crossings:
- a. Underwater crossings: A minimum of 2 feet of cover shall be provided over the pipe. When crossing water courses that are greater than 15 feet in width, the following shall be provided:
    - 1) The pipe material and joints shall be designed appropriately.
    - 2) Valves shall be located so the section can be isolated for testing or repair; the valves (on both sides of crossing) shall be easily accessible and not subject to flooding and installed in a manhole or vault.
    - 3) A blow-off shall be provided on the side opposite the supply service sized in accordance with Section R.61-58.4.(D)(7). Direct away from streams, over ground.
    - 4) Use DIP with ball type joints.
    - 5) Make  $\frac{3}{4}$ " permanent taps on each side of the valve on the source side.
8. Above-water crossings:

- a. Use ductile iron pipe.
  - b. Adequately support and anchor the pipe, protect from damage and freezing and be accessible for repair.
  - c. Hardware, straps, etc. to be stainless steel.
9. All tees, bends, plugs and hydrants on lines 2.5 inches in diameter and larger shall be provided with reaction blocking, tie rods, or other approved method of restraint.

G. SERVICE LINES

1. Locate service lateral within five (5) feet from property corner on opposite corner of sewer lateral.
2. Install flexible service lines in one continuous piece from main to curb stop.
3. Depth of the service connection shall be no less than the top of the main connection to and shall be 12" deep at the curb stop.
4. Do not exceed an angle of 45° to the horizontal on the top.
5. Connections to ductile iron mains:
  - a. Drill and tap pipe barrel and install corporation stop therein.
6. Connections to PVC mains, 4" and larger:
  - a. Provide factory tapped coupling sleeve in new mains, located within 3½' of designated service location.
  - b. Use approved tapping saddle on existing mains.
7. Connections to mains, 3" and smaller.
  - a. Provide tees and tapped couplings in new mains.
  - b. Use approved tapping saddle on existing mains.
8. Provide corporation stops on all mains.

9. Terminate each service line with curb stop and cap.
  - a. Mark with a steel rod flush with the ground and blue PVC stake surrounding the rod installed to 16" above grade.

H. METALLIC DETECTION TAPE

1. Provide on all buried PVC and polyethylene pipe.
2. Locate 12" below the ground surface in the pipe trench.

I. COPPER TRACER WIRE

1. Provide on all buried PVC and polyethylene pipe.
2. Tracer wire shall be taped to the top of the water main.
3. Terminate tracer wire at each valve and meter and make provisions to allow for connection of testing apparatus without interfering with the proper operation of valves and meters.

J. SETTING VALVES AND VALVE BOXES

1. Center valve boxes on the valves, setting plumb.
2. Tamp earth fill around each valve box to a distance of 4' on all sides, or to the undisturbed trench face if less than 4'.
3. Install shaft extensions plumb without any binding.
4. Fully open and close each valve to assure that all parts are in working condition.

K. VALVE BOX PROTECTION RING

1. Place valve box protection ring around top of valve box as detailed.
  - a. Install ring level with top 1" above finished grade.
  - b. Top of ring to be level with or no more than 1" above the top of the valve box.

L. INSTALLATION OF HYDRANTS

1. General:

- a. Inspect carefully, insuring that all foreign material is removed from the barrel.
- b. Rotate Grade Lok fitting so hydrant is plumb and at the elevation detailed.
- c. Install stone drainage bed and thrust blocking.
- d. Fully open and close each hydrant to assure that all parts are in working condition.
- e. Install blue hydrant reflector on centerline of paved roadway marking the perpendicular location of hydrant with reference to the road centerline.
- f. Color of fire hydrant is to be "Old Yeller" to match the District's standards.
- g. Install with breakaway flange at a minimum of 2" above finished grade.
- h. Hydrants shall be covered by a black bag prior to system acceptance to insure they will not be mistaken by Fire Department officials as active hydrants.

M. BLOW-OFF HYDRANT

1. Set below grade in a cast iron meter box.
2. Hydrant should be serviceable from above grade with no digging.

N. THRUST BLOCKS

1. Provide thrust blocks, on plugs, caps, tees, hydrants and bends deflecting 11¼" or more either vertically or horizontally, and on water lines 2.5" in diameter or larger.

2. Thrust blocking is not required where restrained joints are provided unless shown on the details.
3. Provide concrete thrust blocking with a compressive strength of 3000 psi in 28 days.
4. Size of the blocking as detailed. For soil bearing capacities less than 2000 psf or water pressures greater than 150 psi, design for specific soil and water pressure conditions.
5. Locate thrust blocking between solid ground and the fitting to be anchored.
6. Provide 8 mil polyethylene film between the thrust block and fitting.
7. Place the base and thrust bearing sides of thrust blocking directly against undisturbed earth.
8. Sides of thrust blocking not subject to thrust may be placed against forms.
9. Place thrust blocking so the fitting joints will be accessible for repair.

O. CONNECTION OF WATER MAINS

1. Any physical connection of untested water mains with existing water mains is prohibited, except when a District approved and inspected backflow prevention device has been installed.
  - a. Water for filling or flushing new water mains will be obtained through a temporary jumper connection to the existing water main.
  - b. The District will provide the backflow prevention device and water meter required to make the temporary connection.
  - c. Physically disconnect the temporary jumper connection from the existing system after sufficient water for hydrostatic testing, disinfection and flushing are obtained.
  - d. A hydrant meter may also be used for construction water supply. The District will supply the meter and backflow prevention device for this connection.

P. HYDROSTATIC TESTING

1. General:
  - a. Conduct tests on each line or valved section of line.
    - 1) Tapping sleeves are to be tested at 150 psi for a minimum of 15 minutes prior to making tap. No leakage is allowed.
  - b. Clean and flush line of dirt and foreign material. The Contractor shall be responsible for the cost of the water used for flushing if it is obtained from District sources. In lieu of metering, the Contractor may pay an amount equal to normal District rates using ten (10) times the volume of the entire new water system.
  - c. Do not perform hydrostatic tests until at least five days after installation of concrete thrust blocking.
  - d. Test pressures shall be 150 psi based on the elevation of the lowest point of the section under test and corrected to the elevation of the test gauge.
  - e. Tests are to be conducted in the presence of a representative of the District.
2. Pressure tests:
  - a. After the pipe is laid, the joints completed, fire hydrants permanently installed and the trench backfilled, subject the newly laid pipe and valved sections to a hydrostatic pressure of 150 psi.
  - b. Open and close each valve within the section being tested several times during the test period.
  - c. Replace cracked pipe, defective pipe, and cracked or defective joints, fittings and valves with new material and repeat the test until results are satisfactory.
3. Leakage test:
  - a. Conduct leakage test after the pressure test has been satisfactorily completed.

- b. Duration of each leakage test: at least two hours.
- c. Pressure and leakage tests must be conducted in accordance with AWWA Standards C600. The pressure must be at least 1.5 times the maximum working pressure and the duration of this test must be at least two (2) hours. (R.61-58.4.D.(11)(e)). The formulas to be used for calculating the allowable leakage per hour shall be:

**Ductile Iron:**

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

*L* = allowable leakage (gals./hr.)

*S* = length of the pipeline tested (feet)

*D* = diameter of pipe (inches)

*P* = average test pressure (psig)

**PVC:**

$$L = [ND(P)^{1/2}] \quad 7,400$$

*L* = allowable leakage (gals./hr.)

*N* = # of joints in pipeline being tested

*D* = diameter of pipe (inches)

*P* = average test pressure (psig)

- 1) All visible leaks shall be repaired regardless of the amount of leakage.
- 2) Should any test of pipe disclose leakage greater than that specified above, locate and repair the defective joint or joints until the leakage is within the specified allowance.

**Q. DISINFECTION**

1. General:

- a. Upon completion of testing, disinfect all water lines to meet requirements of the South Carolina Department of Health and Environmental Control.
- b. Newly laid valves or other appurtenances shall be operated several times while line is filled with chlorinating agent.
- c. Should initial treatment fail to meet results specified, repeat procedures until satisfactory results are obtained.

2. Procedure:

- a. Flush line to extent possible with available pressure and outlets, prior to disinfection.
  - 1) Hydrant openings required to produce proper flushing velocity at 40 psi are:

<b>Pipe Size (Inches)</b>	<b>Hydrant Openings</b>
4 through 12	one 2½"
14 through 18	two 2½"
20	one 4½"

- b. Apply chlorine as liquid chlorine and chlorine compound such as calcium hypochlorite with known chlorine content.
  - c. Apply through corporation cock in top of main, at beginning of section being sterilized.
  - d. Use proper feeder and flow regulator to introduce chlorinating agent.
  - e. Application rate shall be not less than 50 ppm.
  - f. Retain chlorinated water in main not less than 24 hours.
  - g. At end of retention period, at least 10 ppm of chlorine shall remain in the water at the extreme end of section.
  - h. Dechlorinate and flush line thoroughly.
3. Acceptance:
- a. Provide two separate samples for each sample location, taken at 24-hour intervals, free of coliform bacteria.
    - 1) Contractor to take first and second samples, deliver to South Carolina Department of Health and Environmental Control (SCDHEC) approved laboratory for testing.
    - 2) The first and second sample results shall include the free chlorine residual at the time the samples were collected.
    - 3) Notify SCDHEC to take a third sample.
  - b. At a minimum, sample locations shall be as required by SCDHEC and the following:
    - 1) The tie-in location of new and existing water lines.
    - 2) The end of all dead end lines.
    - 3) At intervals of no more than 1,200 feet for all new lines longer than 1,200 feet in length.

- c. All sample locations are to be given an identifying label and a corresponding identification label is to be included on the record drawings indicating each sample location.
- d. Prior to sampling, the chlorine residual must be reduced to normal system residual levels or be non-detectable in those systems not chlorinating.
- e. If the membrane filter method of analysis is used for the coliform analysis, non-coliform growth must also be reported.
- f. If the non-coliform growth is greater than eighty (80) colonies per one hundred (100) milliliters, the sample result is invalid and must be repeated.

R. DECHLORINATION OF CHLORINATED DISINFECTION WATER

- 1. Dechlorinate the chlorinated water used for disinfected water lines to meet requirements of the South Carolina Department of Health and Environmental Control.

S. NOTICE OF CONSTRUCTION ACTIVITY

- 1. Immediately prior to the beginning of construction the "Notice of Construction Activity" form as included in the appendix is to be completed and mailed to the District Representative with a copy mailed to the District's Engineering Representative.

T. CROSS CONNECTION CONTROL (Backflow Prevention Devices):

- 1. There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contamination materials may be discharged or drawn into the system.
- 2. No by-passes shall be allowed, unless the bypass is also equipped with an equal, approved back-flow prevention device.
- 3. High hazard category cross connections shall require an air gap separation or an approved reduced pressure backflow preventer.
- 4. Reduced pressure principal backflow prevention assemblies shall not be installed in any area location subject to possible flooding. This includes pits

or vaults which are not provided with a gravity drain to the ground's surface that is capable of exceeding the discharge rate of the relief valve. Generally, if installed in a pit, the drain line shall be 2 times the size of the line entering the backflow prevention device. The drain cannot empty into any type of ditch, storm drain, or sewer, which could flood water back into the pit.

5. All piping up to the inlet of the backflow prevention device must be suitable for potable water. The pipe must be AWWA or NSF approved. Black steel pipe cannot be used on the inlet side of the device.
6. Fire line sprinkler systems and dedicated fire lines, except those in the high hazard category shall be protected by an approved double check valve assembly.

## SECTION XXIII

### EXCAVATION AND BACKFILLING

This section includes guidelines for excavation and backfilling of utilities and structures.

#### A. DEFINITIONS

1. Open areas: Those areas that do not include building sites, paved areas, street rights-of-way and parking areas.
2. Maximum density: Maximum weight in pounds per cubic foot of a specific material.
3. Optimum moisture: Percentage of water in a specific material at maximum density.
4. Muck: Materials unsuitable for foundation because of organic content, saturation to the extent that it is somewhat fluid and must be moved by dragline, dredge, or other special equipment, are designated as muck. No extra payment will be made for muck removal.
5. Unsuitable material: Earth material unsatisfactory for its intended use and as classified by the soils technicians. In addition to organic matter, sod, muck, roots, and rubbish, highly plastic clay soils of the CH and MH descriptions, and organic soils of the OL and OH descriptions, as defined in the Unified Soil Classification System shall be considered as unsuitable material.
6. Suitable material: Earth or materials designated as being suitable for their intended use by soils technicians or the soils engineer. Suitable material shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GW, GC, SC, SM, ML, CI or as designated in these specifications.
7. Select material: Granular material to be used where indicated on the drawings or where specified herein consisting of soils conforming to the Unified Soil Classification types SW, SM, GW, or GM or as otherwise approved by the Engineer as select fill. Select material shall contain no stones or rubble larger than 1½" in diameter.

8. Crushed stone (gravel): No. 57 aggregate or equal conforming to ASTM C-33.
9. Excavation: Excavation of every description regardless of materials encountered.

**B. EXCAVATION FOR UTILITIES**

1. Excavate for utilities by open cut.
2. Remove boulders and other interfering objects, and backfill voids left by such removals.
3. Remove wet, or other material unsuitable for foundation or sub-grade and replace with acceptable pipe foundation material.
4. Depressions:
  - a. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
  - b. Except where rock is encountered, do not excavate below the depth indicated or specified.
  - c. Where rock is encountered, excavate rock to a minimum overdepth of 4" below the trench depth indicated or specified, and to provide 6' clearance in any horizontal direction from all parts of the utility and appurtenances.
5. Provide depth of cover shown or minimum cover of 36", whichever is greater.
6. Where minimum cover only is required, carry excavations to depths necessary to properly grade the pipe on tangents and vertical curves as directed by the Engineer.
7. Provide minimum clearance of 6" between pipe walls and trench walls or sheeting and bracing lines.

8. Where lines are constructed in the rights-of-way of the South Carolina Department of Transportation, provide minimum cover of 36" below the elevation of the pavement.
9. Comply with pertinent OSHA regulations in regards to the excavation of utilities.

C. BACKFILLING FOR UTILITIES

1. Backfill trenches and excavations immediately after the pipe are laid, unless other protection is directed or indicated.
2. Select and deposit backfill materials with special reference to the future safety of the pipes.
3. In lower portion of trench, deposit approved backfill and bedding material in layers of 6" maximum thickness, and compact with suitable tampers to the density of the adjacent soil until there is a cover of not less than 12" using special care not to damage pipe and pipe coatings.
4. Except for special materials for pavements, backfill the remainder of the trench with material free from stones larger than 6" or ½ the layered thickness, whichever is smaller, in any dimension.
5. Under roads, streets and other paved area:
  - a. Mechanically tamp in 6" layers using heavy duty pneumatic tampers or equal.
  - b. Tamp each layer to a density equivalent of not less than 100% of an ASTM D698 Proctor Curve.
  - c. Provide additional compaction by leaving the backfilled trench open to traffic while maintaining the surface with crushed stone.
  - d. Refill any settlement with crushed stone and continue such maintenance until replacement of pavement is authorized by the Engineer.

D. EXCAVATING FOR STRUCTURES

1. Conform to elevations and dimensions shown within a tolerance of 0.10', and extending a sufficient distance from footings and foundations to permit placing and removing concrete formwork, installation of services, other construction required and for inspection.
2. Where earth will stand, shallow footing excavations may be cut to the exact size of the footing.
3. Separate suitable materials and stockpile for future use.
4. Dispose of unsuitable material and excess suitable material.
5. Foundation subgrades:
  - a. Excavate foundations and footings to a level bottom in firm, solid, suitable material.
  - b. Take care not to disturb the bottom of the excavation unless further compaction of the subgrade is required.
  - c. The Developer's Design Engineer is to inspect the completed excavation prior to work being performed on the foundation subgrade.
  - d. Should unsuitable or soft material be encountered at subgrade elevation, remove such material and replace with compacted suitable material or crushed stone from firm earth up to the indicated elevation.
    - 1) In wet excavations or where groundwater is normally present, replace unsuitable material with crushed stone or lean concrete.
    - 2) In dry excavations above the normal groundwater level, replace unsuitable material with compacted suitable material.
6. Provide drainage and control grading in the vicinity of the work to prevent drainage into the excavation.
7. Unauthorized excavation:
  - a. Excavation of material to depths below the grades indicated will be deemed unauthorized excavation.

- b. Backfill and compact unauthorized over excavation.
  - 1) In wet excavation or excavations below normal groundwater elevations: use crushed stone or lean concrete.
  - 2) In dry excavations above normal groundwater elevations: use compacted suitable material.
  
- 8. Dewatering:
  - a. Remove all surface and subsurface waters from excavations and maintain the excavation in a dry construction operations.
  
  - b. Maintain the water level below the excavation subgrade during excavation and construction.
    - 1) Remove material disturbed below the foundation subgrade due to improper dewatering and replace with crushed stone or lean concrete.
    - 2) Dewatering by trench pumping will not be permitted if migration of fine grained natural material (running sand) from bottom, side walls or bedding material will occur.

E. BACKFILLING AND COMPACTION FOR STRUCTURES

- 1. Use suitable material for all filling and backfilling operations.
  - a. Provide suitable material free from organic matter and deleterious substances, containing no rocks or lumps over 6" in greatest dimension, and with not more than 15% of the rocks or lumps larger than 2½" in their greatest dimension.
  
- 2. Fill under structures: Deposit suitable materials in layers not exceeding 8" in depth and compact each layer using proper equipment.
  - a. Do not place rock that will not pass through a 6" diameter ring within the top 12" of the surface of the completed fill or rock that will not pass through a 3" diameter ring within the top 6" of the completed fill.
  
  - b. Do not place broken concrete, bricks, or asphaltic pavement in fills.
  
- 3. Backfill excavations as promptly as progress of the Work permits, but not until completion of the following:

- a. Inspection and acceptance of construction below finish grade including, where applicable, dampproofing and waterproofing.
  - b. Inspecting, testing, approving and recording locations of underground utilities.
  - c. Removing concrete formwork.
  - d. Removing shoring and bracing, and backfilling of voids with satisfactory materials.
  - e. Removing trash and debris.
  - f. Cast in place foundation walls have been in place seven days.
4. Placing and compacting:
- a. Place backfill and fill materials in layers not more than 8" in loose depth.
  - b. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content with  $\pm 2\%$ .
  - c. Compact each layer to required percentage of maximum density for area.
  - d. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.
  - e. Place backfill and fill materials evenly adjacent to structures, to required elevations.
  - f. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.
  - g. Do not operate heavy equipment closer to foundation or retaining walls than a distance equal to height to backfill above the footing.
    - 1) Compact remaining area using power driven hand tampers.
  - h. Where the construction includes basement or other underground walls having structural floors over them, do not backfill such walls until the

structural floors are in place and have attained sufficient strength to support the walls.

5. Compaction requirements:

a. Compact soils to not less than the following percentages of maximum dry density as determined in accordance with ASTM D698, Method A (Standard Proctor).

b. Existing in place subgrade below structures where subgrade has been disturbed by water, improper dewatering, or construction traffic:

Top 12" of subgrade	100%
Below top 12" of subgrade	98%

c. Fill beneath structures and beneath an area extending 10 feet beyond the limits of the foundation:

Top 12" of subgrade	100%
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d. Compaction of suitable material used to replace unsuitable material below foundation subgrades:

Top 12" of subgrade	100%
Below top 12" of subgrade	98%