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March 20, 2024

Re: West Edge Subdivision
Aberdeen, SD
Helms A-8668

ADDENDUM NUMBER 2

The following modifications are made to the plans and specifications for the West Edge Subdivision, Aberdeen, SD.

1.) Construction Contract and Specifications Documents; Part 1 – Bidding Documents – Bid Form, Section 00 42 43, Article 5 – Basis of Bid: Clarification of Bid Item wording:

Please remove the word Composite from Bid Item #80 – Asphalt Concrete ~~Composite~~ (3.5" depth or 5" depth).

2.) Technical Specification; Section 31 34 19 – Geotextile Separator Fabric. Revision to Section 2.02.A. Clarification.

A non-woven geotextile separator fabric is acceptable so as long as it meets the requirements as listed in Table 1 of Section 31 34 19.

3.) Technical Specification; Section 33 05 23.16 – Utility Pipe Jacking. This is a new technical spec section. This new section is attached.

4.) Technical Specification; Section 33 31 00 – Sanitary Sewer Piping and Fittings. Modified this section for the addition of PVC forcemain piping and fittings. This revised section is attached.

5.) Technical Specification; Section 33 31 12 – Storm Sewer and Wastewater Valves and Appurtenances. This is a new technical spec section. This new section is attached.

6.) Technical Specification; Section 33 32 13-13 Sanitary Sewer Duplex Submersible Pump Lift Station. This revised section is attached.

7.) Technical Specification; Section 33 42 00 Duplex Storm Water Submersible Pump Lift Stations. This revised section is attached.

8.) Construction Plan Sheet: Sheet 6 of 109. Revision of a plan Note. Remove and replace with the attached sheet.

9.) Construction Plan Sheet: Sheet 49 of 109. Clarification of wet well structure.

A round PVC lined wet well structure can be substituted in lieu of the rectangle wet well. It shall be the Contractors responsibility to assure that lift station piping, pumps and all components appropriate fit and function in the round structure.

10.) Construction Plan Sheet: Sheet 57 of 109. Addition of Forcemain Outlet Structure Detail. Remove and replace with the attached sheet.

ALL OTHER ITEMS OF THE PLANS AND SPECIFICATIONS REMAIN UNCHANGED.

BY: _____

PROJECT ENGINEER - HELMS AND ASSOCIATES

==========

COMPANY NAME: _____ BY: _____

TITLE: _____ DATE: _____

ATTACH THIS SIGNED ADDENDUM NUMBER 2 TO THE BID FORM WHEN SUBMITTING AND/OR ACKNOWLEDGE THE ADDENDUM ON THE BID FORM.

SECTION 33 05 23.16 – UTILITY PIPE JACKING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions, shall apply to the Work covered in this Section.

B. Related Work specified elsewhere:

1. Traffic Regulation and Barricades - Section 01 55 26
2. Existing Underground Utilities - Section 33 01 00
3. Sheeting, Shoring and Bracing - Section 31 23 14
4. Trenching, Backfilling and Compacting - Section 31 23 33
5. Water Utility Piping and Fittings – Section 33 11 00
6. Sanitary Sewer Piping and Fittings – Section 33 31 00
7. Standard Drawing 01 33 23.16-1 Type I Crossing

1.02 DESCRIPTION OF WORK

A. The work covered by this section of the specifications includes all labor, material, equipment, and services necessary to furnish and install the types of road crossings as shown on the plans and as specified herein.

1.03 SUBMITTALS

A. The Contractor shall submit, for review, copies of Shop Drawings for materials specified herein in accordance with the requirements of Section 01 33 23.

B. Certificates from the manufacturer that the materials furnished meet or exceed the specified requirements.

1.04 QUALITY ASSURANCE

A. All pipelines, conduit, and casing pipe installed on railroad property and/or within federal, state, or county highway right-of-way shall conform to the most recently adopted codes for the system involved, the State Accommodation of Utilities Policy, and all permits as issued to the Owner by the permit issuing authority having jurisdiction over the area affected.

1.05 DEFINITIONS

A. Type 1 Crossing: A crossing utilizing a casing installed by boring or jacking as hereinafter described.

PART 2 MATERIALS

2.01 STEEL CASING

A. Steel casing pipe shall conform to ANSI Specification B36.10, and shall have a minimum yield strength of 35,000 psi. Minimum wall thickness shall be in accordance with the

following:

PIPE MINIMUM WALL	
DIAMETER (INCHES)	THICKNESS (INCHES)
12 or less	0.188
14 to 16	0.282
18	0.313
20	0.344
22	0.375
24	0.407
26	0.438
28 to 30	0.469
32	0.501
34 to 36	0.532
38 to 42	0.563

B. All casing pipe joints shall be welded.

2.02 CASING SPACERS

A. Use manufactured casing spacers to position carrier pipe in casing. Wood skids will not be allowed.

B. Use the following material requirements for casing spacers:

1. HDPE Band/Panel and Riser: ASTM D 638.
2. Stainless Steel or Carbon Steel Band/Panel and Riser: Type 304 stainless steel per ASTM A 240 or carbon steel per ASTM 36.
3. Liner: Elastomeric PVC per ASTM D 149.
4. Spacer Skid/Runner: Abrasion resistant polymer with a low coefficient of friction.
5. Fasteners: Type 304 (18-8) stainless steel per ASTM A193.

C. Watermain piping will be centered and restrained within the casing pipe. Spacers shall be sized such that the height of the risers and runners are to center the carrier pipe in the casing pipe with a top clearance of three-fourths inch minimum.

D. Sanitary sewer piping will be in a restrained position such that the carrier rests near the bottom of the casing pipe and the height of the risers and runners are to provide a bottom clearance not less than one-half inch between the casing pipe and the extreme outside diameter of the joint (bell, seam weld, joint clamp, ...) of the carrier pipe and a top clearance of three-fourths inch minimum.

2.03 END SEALS

A. Casing pipe end seals will be a “Pull-On” or “Wrap Around” type seal manufactured from a minimum 1/8” thick neoprene rubber. End seals will be sealed to the carrier pipe and casing pipe by ½” wide T304 stainless steel bandings with 100% non-magnetic worm gear mechanism.

B. Casing end seals shall specifically designed to conform to eccentric or concentric carrier/casing configuration.

2.04 CARRIER PIPE FOR CASED BORINGS

A. The pipe material to be used shall meet ASTM D2241 or AWWA C900 standards for Polyvinyl Chloride pressure pipe and fittings. All other pipe shall have the written approval of the ENGINEER and meet all submittal review as an optional approved product.

B. The pipe shall be joined using separate PVC coupling with beveled edges, built-in sealing gaskets and restraining grooves. The restraining splines shall be square or rectangular, and made from Nylon 101.

C. Exposed splines shall be cut flush to coupling to reduce soil drag.

D. Couplings shall be beveled on leading edges to minimize soil friction.

E. CONTRACTOR shall adhere to the pipe manufacturer's most current calculations regarding tensile load limitations for trenchless application. This calculation shall be part of the required submittal. (See chart below)

F. Pre-Approved piping systems are Yelomine (ASTM D2241) or Certa-Lok C900/RJ as manufactured by CertainTeed Corporation or Engineer approved equal.

Certa-Lok C900/RJ, C905/RJ

Size	Pipe O.D.	DR	Note	Pressure			Mi. Wall Thickness	Bell/ Coupling O.D.	Tightest Permissible Bend		Maximum Pull-In Force, Tightest Bend Radius lbs.	Maximum Pull-In Force, Straight Pull (No Bending) lbs.
				Value psi	C900 Class	C905 Class			Radius, Ft.	% Change in Pitch per 10'		
4"	4.800	18	2	150	x		0.267	5.964	100	10.0	6,700	8,200
6"	6.900	18	2	150	x		0.383	8.366	150	6.7	9,000	12,800
8"	9.050	18	2	150	x		0.503	10.947	200	5.0	18,000	25,200
10"	11.100	18	2	150	x		0.617	13.361	250	4.0	25,600	35,200
12"	13.200	18	2	150	x		0.733	15.836	300	3.3	26,440	41,100
4"	4.800	14	2	200	x		0.343	5.964	100	10.0	8,000	10,300
6"	6.900	14	2	200	x		0.493	8.366	150	6.7	9,300	14,700
8"	9.050	14	2	200	x		0.646	10.947	200	5.0	18,900	28,800
10"	11.100	14	2	200	x		0.793	13.361	250	4.0	24,900	38,300
12"	13.200	14	2	200	x		0.943	15.836	300	3.3	28,300	48,300
16"	17.400	25	3	165		x	0.696	18.624	450	2.2	44,000	68,500
16"	17.400	18	3	235		x	0.967	18.624	450	2.2	44,000	68,500

① Integral Bell PVC Products ② PVC Coupling ③ Composite Coupling

Yelomine (ASTM D2241)

Size	Pipe O.D.	SDR	Note	Pressure Rating, psi	Mi. Wall Thickness	Bell/ Coupling O.D.	Tightest Permissible Bend		Maximum Pull-In Force, Tightest Bend Radius lbs.	Maximum Pull-In Force, Straight Pull (No Bending) lbs.
							Radius, Ft.	% Change in Pitch per 10’		
2"	2.375	17	2	250	0.140	3.200	60	16.8	1,600	1,900
3"	3.500	17	2	250	0.206	4.380	90	11.2	4,500	5,200
4"	4.500	21	1	200	0.214	5.112	100	10.0	6,800	8,700
4"	4.500	17	1	250	0.265	5.264	100	10.0	6,800	9,000
6"	6.625	21	1	200	0.315	7.500	150	6.7	7,100	10,900
6"	6.625	17	1	250	0.390	7.737	150	6.7	9,000	15,000
8"	8.625	21	1	200	0.411	9.750	200	5.0	14,800	20,600
8"	8.625	17	2	250	0.507	10.190	200	5.0	10,700	17,200
10"	10.750	21	2	200	0.512	12.438	250	4.0	20,400	27,200
12"	12.750	21	2	200	0.607	14.648	300	3.3	21,000	31,500
16"	16.000	26	2	90	0.615	17.400	400	2.5	14,100	27,000
16"	16.000	26	3	160	0.615	17.500	400	2.5	45,000	57,000
16"	16.000	21	3	200	0.762	17.500	400	2.5	45,000	57,000

① Integral Bell PVC Products ② PVC Coupling ③ Composite Coupling

G. CONTRACTOR shall adhere to the pipe manufacturer’s most current calculations regarding tensile load limitations for trenchless application. This calculation shall be part of the required submittal. (See chart below)

Size	SDR	Class	Pipe O.D.	Coupling O.D.	Maximum Pull-In Force Tightest Bending	Maximum Pull-In Force Straight Pull (No Bending)
4”	14	200 psi	4.800”	5.964”	8,000 lbs.	10,300 lbs.
6”	14	200 psi	6.900”	8.366”	9,300 lbs.	14,700 lbs.
8”	14	200 psi	9.050”	10.947”	18,900 lbs.	28,800 lbs.
10”	14	200 psi	11.100”	13.361”	24,900 lbs.	38,300 lbs.
12”	14	200 psi	13.200”	15.836”	28,300 lbs.	48,300 lbs.

H. CONTRACTOR shall adhere to the pipe manufacturer’s most current recommendations regarding radius of curvature used for trenchless application. This calculation of each bore shall be part of the required submittal prior to work.

Pipe Diameter	Min. Radius of Curvature	Offset per 20’ Length	Deflection per 20’ Length
4”	100’	24”	11.5 Degrees
6”	150’	16”	7.6 Degrees
8”	200’	12”	5.7 Degrees
10”	250’	9.6”	4.6 Degrees
12”	300’	8”	3.8 Degrees

PART 3 EXECUTION

3.01 GENERAL

A. All work shall be planned and coordinated so as to not unduly interfere with the movement of traffic.

B. The Contractor shall comply with the regulations of the permitting authority. The Contractor shall notify the SDDOT prior to construction. Prior to construction of the crossing, the Contractor shall notify the permit-issuing agency.

C. Road crossings shall be located so as to cross tracks or highways approximately at right angles. The location shall be such so as to not restrict drainage, endanger existing structures, or interfere with maintenance or reconstruction procedures.

D. All topsoil shall be saved and replaced upon completion of the crossing.

3.02 TYPE 1 STREET/HIGHWAY/RAILROAD BORING

A. Casing pipe shall be installed by boring, jacking, or directional bore with distance to the headers conforming to permit and/or code requirements.

B. When pipes are installed by the boring method, the pipe must be jacked through the soil as the soil is removed by the auger. Installing pipe through pre-bored holes is not permitted. Removal of material from the bored hole by washing or sluicing is not permitted.

C. The casing pipe shall be uniform in alignment and grade as shown on the plans.

D. The casing pipe under highways and roads shall extend from jacking pit to receiving pit. The jacking and receiving pits for highway and road crossings shall be no closer than the toe of the inside slope.

E. The casing pipe under railroads shall extend a minimum of 30 ft from either side of the centerline of the track. The jacking and receiving pits for shall not be closer to the roadway than the toe of slope.

F. Casing spacers for watermain piping will be placed within two (2) feet on either side of the bell joint and equally spaced at approximate 5 to 6 feet intervals thereafter for a total of four casing spacers per 20-foot pipe length. Casing spacers for sanitary sewer piping will be placed within two (2) feet on either side of the bell joint and equally spaced at approximate 4 to 5 feet intervals thereafter for a total of three casing spacers per 13-foot pipe length.

G. The Contractor will install the end seals prior to making connection on either side of the boring. End seals will be installed to provide a water tight seal on each end of the casing pipe.

H. Directional boring shall be completed as per 3.04 below.

3.03 TESTING PIPE

A. Cleaning and flushing are to be done by the CONTRACTOR in accordance with the requirements of Section 33 13 00.

B. Directional drilling pipe shall be tested by CONTRACTOR after pullback. Testing shall be in accordance with Section 33 13 01.

3.04 SITE RESTORATION

A. Following drilling operations, CONTRACTOR will de-mobilize equipment and restore the work site to the original conditions or better. All excavations will be backfilled and compacted according to the specifications.

B. Surface restoration shall be completed in accordance with the requirements of the contract, to a condition as good as or better than existed prior construction.

3.05 BACKFILL AND COMPACTION

A. The backfill and compaction shall be completed in accordance with the requirements of Section 31 23 33 - Trenching, Backfilling and Compacting.

PART 4 MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

A. The carrier pipe for Type 1 crossings will not be measured separately for the type of piping installed.

B. Measurement for Type 1 crossings will be per lineal foot of casing pipe actually bored and jacked as measured in the field from boring pit to receiving pit. Measurement will be based on the size of carrier pipe installation as provided in the bid form. Casing spacers and end seals will be considered incidental to the crossing bid items.

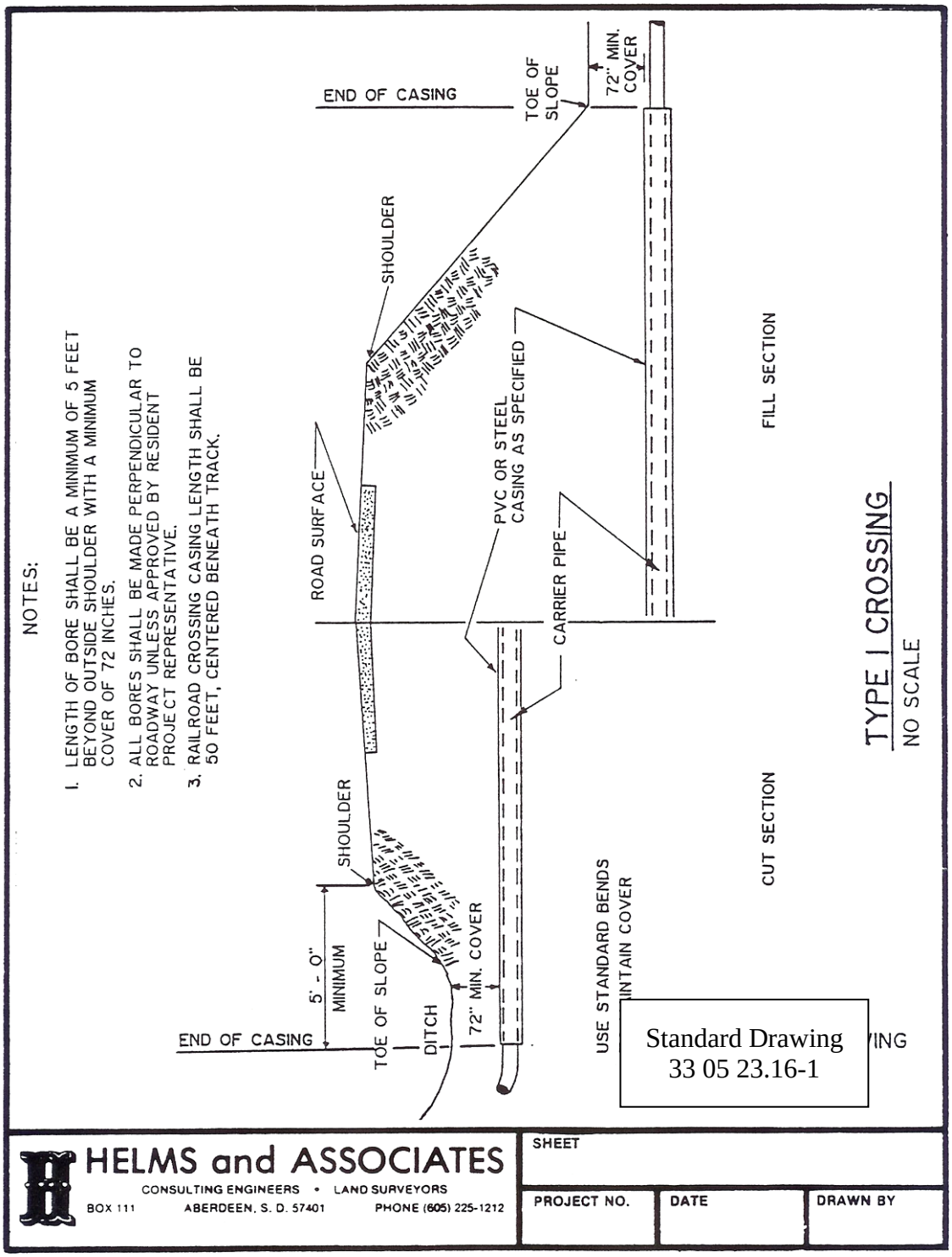
C. Measurement for Steel Casing Pipe will be per lineal foot of casing pipe actually installed as measured in the field for the size of casing pipe provided in the bid form.

4.02 PAYMENT

A. Payment for carrier pipe installed in Type 1 crossings will be included in the contract unit price for the size of piping included on the bid form.

B. Payment for Type 1 crossings will be at the contract unit price per foot for the appropriate types and sizes of crossings.

C. Payment for Steel Casing Pipe will be at the contract unit price per foot for the size of casing pipe installed.


NOTES:
1. LENGTH OF BORE SHALL BE A MINIMUM OF 5 FEET BEYOND OUTSIDE SHOULDER WITH A MINIMUM COVER OF 72 INCHES.
2. ALL BORES SHALL BE MADE PERPENDICULAR TO ROADWAY UNLESS APPROVED BY RESIDENT PROJECT REPRESENTATIVE.
3. RAILROAD CROSSING CASING LENGTH SHALL BE 50 FEET, CENTERED BENEATH TRACK.
END OF CASING
TOE OF SLOPE
72" MIN. COVER
SHOULDER
ROAD SURFACE
PVC OR STEEL CASING AS SPECIFIED
CARRIER PIPE
FILL SECTION
TYPE I CROSSING
NO SCALE
5' - 0" MINIMUM
SHOULDER
TOE OF SLOPE
DITCH
72" MIN. COVER
END OF CASING
USE STANDARD BENDS TO MAINTAIN COVER
CUT SECTION
Standard Drawing
33 05 23.16-1
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DATE
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* * * END OF SECTION * * *

SECTION 33 31 00 – SANITARY SEWER PIPING AND FITTINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions shall apply to the Work covered in this section.

B. Related Work Specified Elsewhere:

1. Trenching, Backfilling and Compacting - Section 31 23 33
2. Sanitary Sewer and Manhole Testing - Section 33 01 30.13
3. Wastewater Valves and Appurtenances - Section 33 31 12
4. Pressure Piping Tied Joint Restraint System - Section 33 05 19
5. Standard Drawing: 33 31 00-1

1.02 DESCRIPTION OF WORK

A. The work covered under these specifications shall include the furnishing of all labor, material, tools, and equipment necessary to furnish and install, complete in place, all piping and fittings as shown on the drawings and as specified herein.

1.03 SUBMITTALS

A. The Contractor shall submit for review 5 copies of shop drawings for materials specified herein as hereinafter specified.

B. Certificates from the manufacturer that the materials meet or exceed specified requirements.

C. The manufacturer's installation recommendations, including types and amounts of gasket lubricant, where applicable, to be used.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. All materials shall be packed, loaded, transported, unloaded, and handled in such a manner so as to prevent damage to the materials.

B. All material shall be loaded and unloaded by lifting with slings or hoists or skidding so as to avoid shock or damage. Dropping or rolling will not be permitted. The use of end hooks to install or move piping will not be allowed.

C. All materials shall be stored on the site in accordance with the manufacturer's recommendations. Do not store materials directly on the ground.

D. All materials shall be kept clean and dry. The insides of all piping and fittings shall be kept free of dirt and debris.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE

A. The wall thickness of ductile iron pipe shall conform to the requirements of ANSI/AWWA C151/A21.51 for a type 2 laying condition and the depth of cover encountered unless specifically shown otherwise on the plans.

B. Mechanical joints and push-on-joints for ductile iron pipe buried underground shall conform to the requirements of ANSI/AWWA C151/A21.51.

C. Flanged joints for ductile iron pipe in "non-buried" locations shall be furnished with full-face rubber gaskets and shall conform to the requirements of ANSI/AWWA C115/A21.15. The flanged faces shall be drilled to standard 125-pound template.

D. All ductile iron pipes shall be lined with cement mortar in accordance with ANSI/AWWA C104/A21.4. Pipe shall have a coal tar varnish exterior finish not less than 1 mil thick.

E. A rust preventative coating, soluble in commercial solvent for removal prior to pipe installation, shall be applied to the machined faces of flanges. The back of these flanges and the boltholes shall be coated with not less than a 1 mil thickness of asphaltic varnish.

2.02 DUCTILE IRON FITTINGS

A. Ductile iron fittings shall conform to the requirements of ANSI/AWWA C110 & C153/A21.10 & A21.53.

B. Ductile Iron Fittings to be installed underground shall be mechanical joint or push-on joint type conforming to the requirements of ANSI/AWWA C 111/A 21.11.

C. Ductile Iron Fittings to be installed in "non-buried" locations shall be provided with flanged joints with rubber full-face gaskets. Flanged faces shall be drilled to standard 125-pound template unless otherwise noted.

D. All Ductile Iron Fittings shall be lined with cement mortar in accordance with ANSI/AWWA C104/A21.4 the exterior finishes shall be an asphaltic varnish coating not less than 1 mil thick.

2.03 PRESSURIZED POLYVINYL CHLORIDE (PVC) PIPE

A. Polyvinyl Chloride pipe shall be pressure Class 200, SDR 21 rated pipe.

B. The pipe shall be made from Type 1, Grade 1, Class 12454-B compounds conforming to ASTM D1784 with a hydrostatic design basis (HDB) of 4,000 psi as per ASTM 2837.

C. All pipe shall be marked with the following: Nominal pipe size, material code designation, SDR, pressure rating, manufacturer's name or trademark, NSF seal and ASTM numbers. All sanitary sewer forcemain pipes shall be installed with a locating tape to distinguish forcemain sewer from potable water.

D. The PVC pipe shall be furnished in 20 foot laying lengths. Longer lengths will be allowed only if the Contractor certifies that he will provide equipment on the project to fully support the pipe while being transported and distributed over the project.

E. All PVC pipe shall be furnished with gasket joints conforming to ASTM D 3139. Rubber gaskets shall conform to the requirement of ASTM F 477.

F. Manufacturer's proof of design tests and joint dimensions shall be submitted to the Engineer

for gasket joints, which do not maintain SDR throughout the joint.

G. Gasket joint couplings used for plain end pipe shall have a pressure rating equal to the pipe on which used. Centering of pipe within the coupling will be assured by means of an integral positive stop in the coupling. All couplings must be of the double gasket type. Couplings requiring welds will not be allowed.

H. All gasket joints shall have a seating depth equal to at least 50% of the nominal pipe diameter.

I. The ends of the pipe to be inserted into couplings or joints shall be factory marked to allow field checking of the depth of setting of the pipe in the joint socket.

2.04 FITTINGS FOR PRESSURIZED PVC PIPE

A. Repair couplers and gaskets will be pressure rated 200 psi if not otherwise indicated and meet the following specifications, standards and approvals:

1. NSF Standards 14 & 61
2. ASTM D-1784 materials
3. ASTM D-3139 joints
4. SDR 21 dimensions and pressure ratings per ASTM D2241
5. ASTM F-477 gaskets

B. All other fittings for use on four (4) inches and larger PVC pipe will be ductile iron fittings conforming to the requirements of paragraph 2.01 above, with the exception of transition couplers as specified in paragraph 2.08 below.

2.05 GRAVITY PVC PIPE

A. Polyvinyl Chloride (PVC) gravity pipe shall be Type I, Grade I, conforming to the requirements of ASTM Specification D 3034 for Rigid Poly (Vinyl Chloride) Sewer pipe. The pipe shall following the minimum wall thickness for SDR 35 piping.

B. Solvent Cement for PVC pipe joints shall conform to ASTM Specification ASTM D 2564 and shall be applied in conformance with ASTM D 2855. Solvent weld joints will be allowed on PVC cleanout risers only.

C. Gasket type joints shall be made with rubber gaskets conforming to the requirements of ASTM F-477.

D. The pipe shall be capable of withstanding trench loads imposed on it.

2.06 GRAVITY PVC PIPE FITTINGS

A. Repair couplers, tees, wyes, and bends for Polyvinyl Chloride (PVC) gravity pipe fittings shall be of PVC with material and dimensions conforming to the requirements of ASTM Specification D 3034.

B. Gaskets for elastomeric joints shall conform to the requirements of ASTM F-477.

C. Solvent Cement for solvent weld joints shall conform to the requirements of ASTM Specification D 2564 and shall be applied in conformance with ASTM D 2855. Solvent weld joints will be allowed on PVC cleanout risers only.

D. Sewer "Wyes" for service connections shall be in-line sewer wyes. Saddle wyes will not be permitted for use without permission from Project Engineer.

2.07 TRANSITION COUPLINGS (PRESSURE PIPING)

A. The couplings used for transitions between piping of different materials shall be a wide-range flexible coupler with a sleeve type design meeting the requirements of AWWA C219.

1. The coupling body shall be a center sleeve fabricated of high strength carbon steel tubing equivalent to ANSI/AWWA C200. The transition couplers will be readily available in nominal diameter ranges from 1.5 to 24 inches on all pipe classes.
2. Compression End Rings: One gasket compression end ring per coupling end. End rings to be of either one or two bolt design, fabricated of carbon steel equivalent to ASTM A576. (One bolt per end in Nominal Size ranges of 2 to 12 inches and two bolts per end on the 16 to 24 inch nominal diameter coupling.)
3. Hydraulic Wide Range Gasket: Chloramine Resistant NSF-61 approved EPDM gasket designed with a multi-layered wide range removable outer layer. Gasket hydraulically actuated with a pressure-equalizing dam, pressure cavity and sealing lip for working pressure of 260 psi (1.5 to 16 inches) and 232 psi (18 to 24 inch nominal diameter coupling).
4. Fasteners shall be grade 304 (A2) or 316 (A4) stainless steel with yield strengths that conform to all nationally recognized standards. Bolts to be coated with an anti-seize type coating to prevent galling.
5. The interior and exterior coatings shall NSF-61 approved fusion bonded epoxy coating conforming to AWWA C213.
6. When properly installed the coupling will provide a minimum deflection of 8 degrees, up to 260 psi working pressure and 3/8 inch longitudinal pipe movement without leakage. (Flanged adapters will provide half the longitudinal movement and deflection.)
7. All products will be proof tested to a minimum of 1.5 times working pressure.

B. Flanged couplers shall consist of one compression end and gasket, coupling center sleeve, and AWWA Class "D" Flange (per AWWA C207).

C. Pre-Approved transition couplers are: Hymax-2000 Series wide range coupling; Hymax-2100 Series wide range flanged coupling adapter; “Macro” extended range coupling by Romac Industries, Inc.; or Engineer approved equal.

2.08 TRANSITION COUPLINGS (GRAVITY PIPING)

A. GASKET

1. Manufactured to meet the material requirements of:
   a. CSA B602 - mechanical couplings for drain, waste, vent pipe and sewer pipe
   b. ASTM D 5926 - Standard Specification for Poly Vinyl Chloride (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems
   c. ASTM C 1173 - Standard Specification for Flexible Transition Couplings for Underground Piping Systems

d. Hardness, Shore"A", Inst. -+5.....65

e. Tensile Strength, Min. psi 1000

f. Elongation at Rupture, Min. %.....250

g. Tear Strength, Min..... 150 lb/in.

h. Brittleness Temperature..... -40°F

B. CLAMPS

1. Manufactured to the requirements of CSA B602
2. Clamp Housing- 301 Stainless Steel
3. Clamp Band - 301 Stainless Steel
4. Clamp Screw - 305 Stainless Steel
5. Installation torque 60" lbs

C. SHEAR RING

1. 0.012" Thick, 300 Series Stainless Steel
2. Width manufactured according to coupling width (1.50", 2.13", or 4")
3. Length manufactured according to coupling diameter
4. Clamps spot welded in place

D. COUPLING

1. Manufactured to conform to the performance requirements of:
   a. ASTM C 1173 - standard specification for flexible transition couplings for underground piping systems
   b. CSA B602 - mechanical couplings for drain, waste, vent pipe and sewer pipe
   c. Maximum test pressure: 4.3 PSI (29.6KPA)
   d. Maximum operating temperature: 140° F nonconsistent

E. Pre-Approved transition couplers are Strong Back RC Series Repair Couplings manufactured by Fernco Inc. or Engineer approved equal.

2.09 BEDDING MATERIAL

A. Borrowed granular bedding material shall conform to the gradation indicated below.

Sieve Opening	Bedding Material (Percent Passing)
1"	95-100
No. 200	< 15

B. Borrowed granular bedding material for unstable trench bottom shall conform to the gradation indicated of size 67 Course Aggregate, ASTM C33 which is indicated below.

Sieve Opening	Bedding Material (Percent Passing)
1-1/2"	100
3/4"	90-100
3/8"	20-55
No. 4	0-10
No. 8	0-5

2.10 FASTENERS

A. All fasteners in buried locations shall be Grade 304 (A2) or Grade 316 (A4) stainless steel. Anti-Seize shall be applied to all threads prior to installation.

2.11 LUBRICANT FOR GASKETED PIPE

A. Lubricant shall be an emulsified polymer based product, specifically formulated to be water-soluble without causing turbidity. Lubricant shall not transfer taste and/or odor to new water main installations. Lubricant must not promote bacterial growth and be safe for use on all metal and plastic pipes. Lubricant shall be easily flushed from the line and be non-reactive to chlorinated water. Lubricant should work easily on both wet and dry surfaces.

2.12 POLYETHYLENE WRAP

A. All ductile fittings shall be wrapped with polyethylene plastic film having a minimum thickness of 0.008 inches or with a cross woven polyethylene plastic film having a minimum thickness of 0.004 inches.

2.13 TRACER WIRE (FORCEMAIN)

A. Tracer wire shall be 12-gauge solid copper or high strength stainless steel wire with a 45-mil polyethylene coating. Provide sufficient length to be continuous over each separate run of nonmetallic pipe.

B. All tracer wires are to be connected to a cast iron or ABS/PVC tamper proof tracer wire access box. The cover is to be manufactured of cast iron and ABS/PVC components produced in the USA. Cast iron collar & cover is to be manufactured in accordance with ASTM A48 Class 25. The ABS is to be manufactured in accordance with ASTM D 1788. The cover shall be lettered “Sewer” and shall have a standard AWWA size cast-in pentagonal bolt. Box will be a minimum of 3 inches in diameter and adjustable from 18 to 24 inches.

PART 3 EXECUTION

3.01 GENERAL

A. The areas to receive piping shall be examined for defects that may adversely affect the execution and quality of Work. Prior to the start of piping installation, all measurements shall be checked for deviations from allowable tolerances for piping. **Minimum bury for all forcemain piping shall be seven (7) foot as measured from the final ground surface to the top of pipe.**

3.02 BURIED PIPING INSTALLATION

A. All piping and fittings shall be laid true to line and grade as shown on the plans. Each section of pipe shall be so laid and fitted together that when complete the piping will have a smooth uniform flow line. The inside of all pipe shall be cleaned before installation and kept thoroughly clean during and after the laying. Pipe ends shall be cleaned inside and outside.

B. Apply lubricant liberally to the inside of the pipe bell and spigot. Make sure lubricated surfaces remain free of dirt, gravel, or other debris. Assemble the pipe joint immediately after application of the lubricant.

C. All pipe and fitting shall be examined for defects before being lowered into the trench. The interior and exterior protective coating shall be inspected and field repaired, if required.

D. The pipe shall be handled and installed in accordance with manufacturer's recommendations and the requirements of AWWA C 600 for Ductile Iron pipe, ASTM D 2774 for PVC pressure piping and ASTM D 2321 for PVC gravity sewer piping.

E. When pipe laying is not in progress, including the noon hours, the open ends of pipe shall be closed. No trench water, animals, or foreign material shall be permitted to enter the pipe.

F. Class "C" Bedding shall be used with all piping. The bedding material shall conform to the requirements of Part 2 above. General requirements for placement are shown on Standard Drawing 333100-1. On all non-rigid piping, care will be taken to provide maximum support in the haunch area of the pipe. This area extends from the bedding material to the center of the pipe. If coarse materials with voids have been used for bedding materials, the same bedding materials will be used for haunching. When a trench box or similar device is used during excavation, the box will be raised sufficiently to recompact the haunch area in the natural trench to 95% maximum dry density as determined by ASTM D 698.

G. After each pipe has been graded, aligned, and placed in final position on the bedding material and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and alignment during subsequent pipe joining and embedment operations.

H. The pipe shall be laid upon properly placed bedding material so that the barrel of the pipe will have a bearing for its full length. No blocking will be allowed to bring the piping up to grade. Bell holes and depressions for joints shall be excavated after the trench bedding has been graded to provide uniform support for the entire pipe.

I. The Contractor shall provide and maintain all necessary means and devices at all times to remove and dispose of all water entering the trench during the process of pipe laying. The trench shall be kept dry until the pipe laying and jointing are completed. Removal of water shall comply with Section 31 23 33.

J. Thrust blocks or restraining fittings to restrain pressurized piping shall be provided at all abrupt changes in direction, tees, bends, dead ends and hydrants, and shall be in accordance with the pipe manufacturer's recommendations.

K. The Contractor shall place backfill material in lifts not exceeding 1-foot and compact to 95% Standard Proctor Density. Stones equal to or larger than 3-inches in diameter shall not be placed within 2-feet of the pipe.

3.03 EXPOSED PIPING INSTALLATION

A. Each item or system shall be furnished complete and installed as shown on the plans and in accordance with the manufacturer's recommendations, instructions, and directions. All installed equipment and systems shall be properly protected during subsequent construction operation.

B. The Contractor shall inspect all material or equipment as it is received to determine damage and/or missing parts. It shall be his responsibility to repair or replace damaged items in accordance with the manufacturer's instructions.

C. The Contractor shall provide all scaffolding required for the proper installation of this work in conformance with the standards of any local and state safety codes applying to scaffolding.

D. All pipe shall be set such that the vertical and horizontal centerlines are properly aligned. Installation of piping by means of springing, forcing or stressing the pipe or adjacent fittings, valves or equipment will not be allowed.

3.04 MECHANICAL JOINTS AND COUPLINGS

A. Mechanical joints shall be carefully assembled in accordance with the manufacturer's recommendations. If effective sealing is not obtained, the joint shall be disassembled, thoroughly cleaned, and reassembled or replaced. Over tightening bolts to compensate for poor installation practice will not be permitted.

B. The holes in mechanical joints with tie rods shall be carefully aligned to permit installation of the tie rods. In flange and mechanical joint pieces, holes in the mechanical joint bells and the flanges shall straddle the top (or side for vertical piping) centerline. The top (or side) centerline shall be marked on each flange and mechanical joint piece at the foundry.

3.05 TRACER WIRE INSTALLATION

A. Tracer wire shall be installed in the trench at the same time as the pipe or immediately prior to starting the backfill of the trench.

B. Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.

C. Splices will be allowed at pipeline intersections, manholes, bored crossings, and at other locations as agreed upon by the Resident Project Representative. Splices in tracer wire will be made with split bolt or compression-type connectors. Wire nuts may not be used. A waterproof connection is necessary to prevent corrosion. Splices shall be completed in accordance with the manufacturer's recommendations.

D. Prior to final acceptance, all tracer wire shall be electrically tested for continuity from one exposed end to another.

E. Bring the wire to the ground surface at each manhole connection and loop the wire in a tracer wire terminal box. These boxes shall be located perpendicular to the manhole on the north side in the boulevard with at least two feet of extra wire inside the box. The tracer wire terminal box must be installed flush with the finished grade.

3.06 TESTING

A. All piping shall be cleaned and flushed after completion of installation.

PART 4 MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT

A. Piping of the different types and classes, as shown on the plans, and as called for on the Bid Form shall be measured on a per lineal foot, in-place basis. Measurement shall be considered full compensation for all labor, materials, and equipment necessary to furnish and install the material, as needed, to obtain the appropriate grades as specified herein.

B. Bedding material shall be considered incidental to the piping.

C. All fittings specifically called for on the Bid Form will be measured on a per each basis for each type and size of fitting, including all fasteners, gaskets, coatings, blocking, and miscellaneous hardware to install the fitting properly in the locations designated on the plans.

D. Incidental items associated with the piping materials for which no separate measurement will be made include but are not limited to:

1. Gaskets
2. Lubricants
3. Protective Coatings
4. Linings
5. Bedding Material

E. Measurement for inline service wyes shall include all additional fittings necessary to make the connection on the sewer main.

4.02 BASIS OF PAYMENT

A. Piping of the different types and classes as called for on the Bid Form shall be paid at the contract unit price provided in the Bid Form.

B. Fittings listed in the Bid Form shall be paid at the contract unit price provided in the Bid Form.

- * * * END OF SECTION * * *

SECTION 33 31 12 – STORM SEWER AND WASTEWATER VALVES AND APPURTENANCES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions shall apply to the Work covered in this Section.

B. Related requirements specified elsewhere:

1. SECTION 33 32 13.13 – SANITARY SEWER DUPLEX SUBMERSIBLE PUMP LIFT STATION
2. SECTION 33 42 00 – DUPLEX STORM WATER SUBMERSIBLE PUMP LIFT STATIONS

1.02 DESCRIPTION OF WORK

A. This section covers the furnishing and installation of valves and appurtenances as specified herein and as shown on the plans.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. All valves and related appurtenances shall be shipped in accordance to the requirements of AWWA C509 or C515. Valve ends shall be sealed to prevent the entry of foreign matter into the valve body. The boxes and crates in which valves are shipped shall completely enclose and protect the valve and accessories from foreign matter.

B. Valves and accessories shall be stored in a manner so as to be protected from weather, moisture, and other possible damage. Materials shall not be stored directly on the ground.

C. All material shall be handled in a manner that will prevent damage to the interior and exterior surfaces.

1.04 SUBMITTALS

A. The Contractor shall submit for review copies of shop drawings for materials specified herein in accordance with the requirements of Section 01 33 23 and the requirements as hereinafter specified.

B. Certification of performance, leakage, and hydrostatic tests as described in Section 5 of AWWA C-509/515 shall be furnished when requested by the Engineer.

C. Certifications for all fasteners shall be provided for valves, fittings, and all other appurtenances provided under this specification.

PART 2 PRODUCTS

2.01 GATE VALVES

A. Gate valves shall be resilient wedge type manufactured to meet all applicable requirements of AWWA Standard for Resilient Seated Gate Valve C509 or C515.

B. All valves shall have non-rising stems, opening by turning left and provided with standard handwheel operator with arrow cast in metal to indicate direction of opening.

C. Cast iron wedge shall have sealing surfaces of the wedge permanently bonded with resilient material to meet ASTM tests for rubber to metal bond ASTM D429. Each valve shall have a smooth unobstructed waterway free from any sediment pockets. Stuffing boxes shall be O Ring seal type with 2 rings located in stem above thrust collar. Low friction torque reduction thrust bearings shall be located both above and below the stem collar.

D. Body and cover bolts and nuts shall be Grade 304 (A2) or 316 (A4) stainless steel. Anti-Seize shall be applied to all threads prior to installation.

E. Exterior and interior coatings in accordance with ANSI/AWWA C550 for potable water.

F. Non-rising stems shall be in full compliance with AWWA specification with cast integral stem collar and furnished of bronze conforming to ASTM B584 Alloy A. Stem nuts shall be independent of wedge and shall be made of solid bronze conforming to ASTM B 62.

G. Valves shall have hydrostatic shell test of 400 psi and shut-off test of 200 psi. At the 200-psi shut-off test, valve must be bubble-tight with a zero (0) leakage allowance.

H. Resilient wedge gate valves shall be the product of a manufacturer having a minimum of five (5) years experience in the manufacture of water works and distribution valves.

I. Pre-Approved resilient wedge gate valves are as manufactured by: American Darling Valve Co., Birmingham, Alabama; Mueller Company, Decatur, Illinois; Clow Valve Division, Oskaloosa, Iowa; or Engineer approved equal.

2.02 PLUG VALVES

A. Plug Valves shall be quarter-turn, non-lubricated, eccentric type with resilient faced plug. The valves shall be designed, manufactured and tested in accordance with American Water Works Association Standards ANSI/AWWA C517.

B. The valve plug shall be constructed of cast iron (semi-steel) conforming to ASTM - A126, Class B. The plug shall have cylindrical seating surface that is offset from the center of the plug shafts. The plug shafts shall be integral. The entire plug shall be 100% encapsulated with Buna-N rubber in all valve sizes.

C. Mechanical Joint valves shall fully comply with ANSI/AWWA C111/A21.11.

D. Port areas of not less than 100% of pipe area shall be supplied on valves 4” (100 mm) and smaller, 85% on 16" (400 mm) and smaller, 80% on 18"-24" (150 mm - 600 mm), and 75% on 30" (800 mm) and larger.

E. Valve seat surface shall be welded-in overlay, cylindrically shaped of not less that 90% pure nickel.

F. Plug valve shaft seals shall be on the multiple V-ring type and shall be adjustable. All packing shall be replaceable without removing the bonnet or actuator and while the valve is in service. Shaft seals shall be made of Buna-N.

G. Manual valves shall have actuators with 2" square nuts. The nut actuator shall be compatible for valve box mounting. Actuators shall be packed with grease and sealed for temporary submergence to 20 feet of water.

H. Plug Valves shall be PEF by Sartel Valves; Series 5900R by Val-Matic Valve & Mfg. Corporation, Elmhurst, IL. USA., Series F5413 by Clow, or approved equal.

2.03 BALL VALVES

A. Ball Valves ½” through 3" shall be designed to safely block full system pressure in either direction to allow on-line system maintenance.

B. Materials of construction shall be:

1.	Body	Unleaded Bronze C89833
2.	Ball	Chrome/Plated Brass ASTM B16
3.	Seats	TFE teflon
4.	Stems	Brass ASTM B16
5.	Stem Packing	TFE teflon
6.	Thrust Washer	TFE teflon
7.	Handle	Electroless Nickel Plated
8.	Handle Nut	Electroless Nickel Plated

C. Each valve shall be fully pressure and cycle tested before leaving the factory.

D. Valves shall be capable of installation in either vertical or horizontal pipe run.

2.04 CHECK VALVES

A. Check valves 4” or larger shall be of swing type and shall meet the material requirements of AWWA specification C508. The valve shall be iron body, bronze mounted, single gate for non-shock working pressure 175 psi 2"-12", 150 psi 14"-24" and hydrostatically tested at double the working pressure. Valves shall be furnished with 125 lb. ANSI flanged ends. Valves shall be furnished with outside lever and spring. Spring shall be stainless steel.

B. The valve shall be so constructed that by simply unbolting and lifting off the cover, the internal working parts may easily be removed and replaced without removing the valve from the line.

C. Check valves shall be suitable for mounting in horizontal lines or vertical lines when water flow is up. When there is no flow through the line the gate shall hang lightly against the seat.

D. Check valves shall have stainless steel hinge pin. Hinge pin shall operate in bronze support bearings (2"-12") or babbitt support bearings (14"-24").

E. Body and cover bolts and nuts shall be Grade 304 (A2) or 316 (A4) stainless steel. Anti-Seize shall be applied to all threads prior to installation.

F. Exterior and interior coatings in accordance with ANSI/AWWA C550 for potable water.

2.05 BALL CHECK VALVES

A. A nonclog sinking type ball check valve for horizontal or vertical operation in domestic sewage. Design valve such that the ball is out of liquid flow when the valve is open. Ball to move freely in housing and not to experience concentrated wear. Guide ball to and from seat by smooth ribs cast into valve body. Valve body interior to have no projections or pockets to trap solids or stringy material. Valve cover to be removable for cleaning and ball inspection or replacement.

B. Valve Body: Epoxy coated ductile iron or cast iron with ANSI Class 125 flat faced flanges or nominal pipe threads.

C. Ball: Sinking type hollow steel ball with vulcanized nitrile rubber coating. Coating to be resistant to grease, petroleum products, animal and vegetable fats, dilute concentrations of acids and alkalies (pH 4 - 10), tearing and abrasion; have a high load bearing capability and low compression set.

2.06 SEWAGE AIR RELEASE VALVES

A. Sewage Air Release Valves shall allow unrestricted venting or re-entry of air through the valve during filling or draining of the forcemain, to prevent water column separation or pipeline collapse due to vacuum.

B. The valve shall incorporate an air-gap separation between the sewage and sealing mechanism. This will be obtained by a single float or combination of floats. The float(s) shall withstand 230-psi test.

C. All internals shall be easily removed without removing the main valve from the lines.

D. Valve shall be fitted with blow off valves or back flush adapters with quick disconnect couplings and minimum 15 feet of hose.

E. The valve inlet shall be 2 inch N.P.T. All fitting shall be brass or stainless steel.

F. The body shall be cast iron conforming to ASTM A126 (GR. B), Steel DIN ST.37 or Stainless Steel SAE 316.

G. The sewage air release valve shall be as manufactured by Valve and Primer Corporation, APCO Series 400, Model 400, A.R.I. Flow Control Accessories Model S-020, or approved equivalent

H. Bolting: All body bolts shall be Grade 304 stainless steel. Anti-Seize shall be applied to all threads prior to installation.

2.07 FLANGED AND MECHANICAL JOINT VALVES

A. Valves located in non-bury locations shall be flanged style with 125 lb. ANSI flanged ends. Valves located in buried locations shall be mechanical joint type conforming to the requirements of ANSI Specification A21.11.

2.08 FASTENERS

A. All fasteners in buried locations shall be Grade 304 (A2) or 316 (A4) stainless steel. Anti-Seize shall be applied to all threads prior to installation.

2.09 POLYETHYLENE WRAP

A. All ductile fittings shall be wrapped with polyethylene plastic film having a minimum thickness of 0.008 inches or with a cross woven polyethylene plastic film having a minimum thickness of 0.004 inches.

PART 3 EXECUTION

3.01 VALVE INSTALLATION

A. All valves shall be installed in lift station locations as shown on the plans or as directed by the Owner's Resident Project representative.

B. The valve and joints shall be installed in accordance with the manufacturer's recommendations.

PART 4 MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT

A. All sewer and storm valves and related appurtenances will not be directly measured as they shall be considered incidental to the appropriate Lift Station Bid Item as provided in the bid form.

4.02 BASIS OF PAYMENT

A. Sewer and storm lift station valves are not listed in the Bid Form. Payment shall be to the appropriate Lift Station Bid Item and shall include all fasteners, gaskets, coatings, operators, blocking, and miscellaneous hardware to install the valve properly in the locations designated on the plans.

* * * END OF SECTION * * *

SECTION 33 32 13.13 – SANITARY SEWER DUPLEX SUBMERSIBLE PUMP LIFT STATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and provisions of Division 1, Special Requirements, apply to work covered by this section.

B. Related work specified elsewhere:

1. Section 31 23 14 – Sheeting, Shoring, and Bracing
2. Section 31 23 16 - Structural Excavating, Filling and Grading

1.02 DESCRIPTION OF WORK

A. The Work covered by this Section includes all labor, material and equipment necessary to furnish, install and place in satisfactory operating condition a submersible pump lift station, including submersible pump, electrical controls, SCADA radio equipment, pre-cast reinforced concrete wet well, pump installation and removal system, along with all piping, valving, and other appurtenances required to make a complete operating unit.

1.03 OPERATING CONDITIONS

A. Each pump in the lift station shall be capable of pumping 250 gpm against a total dynamic head of 35.0 feet.

B. Maximum allowable motor size shall be 5.0 horsepower with a minimum efficiency rating of 50%. All furnished motors shall operate on 120/208 volts, 60 hertz, three-phase power. Motors shall be explosion proof. Motors shall be sized with a minimum 1.15-service factor under the maximum continuous load.

C. Maximum allowable pump speed shall be 1750 revolutions per minute. Units operating at lower speeds will be considered.

1.02 QUALITY ASSURANCE

A. The pump manufacturer shall have a minimum of 1,000 units of similar type pump, installed and operating for no less than five years in the United States. A certificate of conformance with this requirement shall be furnished by the manufacturer and shall be submitted with the shop drawings. Upon request by the Engineer, the manufacturer shall furnish a listing of installations, including names and addresses of contact persons.

B. The pump cable end will be sealed with a high quality protective covering to make it impervious to moisture or water seepage prior to electrical installation.

C. Each pump shall be tested at start-up by the Contractor's electrician and voltage, current, and other significant parameters recorded. The manufacturer shall provide a formal test procedure and forms for recording data.

1.03 SUBMITTALS

A. The Contractor shall provide 2 copies of shop drawings for Engineers review.

B. The Contractor shall provide 2 copies of Operation and Maintenance manuals for operation of pumps and controls to the Engineer prior to operation of facility.

C. A copy of the manufacturer's warranty shall be submitted with the shop drawings.

D. A copy of the written installation instructions shall be furnished to the Engineer before shipment of the equipment.

1.04 WARRANTY

A. The requirements of the General Conditions and the requirements as specified hereinafter shall apply.

B. The Contractor shall be responsible for the costs of materials, repair or replacement, at point of installation and use, without cost to the Owner, such equipment, or any part thereof, that is found to be defective.

C. Warranties by the manufacturer, or as specified herein, which extend beyond the period specified above, shall be extended in writing to the Owner.

D. Specifically exempted from the warranty shall be those items such as oil, grease, filters, etc., which is normally consumed in service. These items shall be considered as part of routine station operation and maintenance.

1.05 SYSTEM LOGIC AND FUNCTION

A. The pump control system shall be designed to manually or automatically control the operation of two (2) pumps based on wet well level. The wet well level shall be sensed by a pressure transducer system. The analog equivalent of the wet well level from the analog system shall be fed into a Programmable Logic Controller (PLC) which acts as the primary pump controller and as well as a Supervisory Control and Data Acquisition (SCADA) system to transmit the status of the control and pumping equipment at this site to a central site. Secondary control of the two pumps shall be from set points in the pressure transducer controller. The secondary controller can be manually switched on to replace the primary PLC pump control.

B. A float operated backup controller, using one high level float and timers, shall be provided to provide backup pump control to replace both the primary and secondary pump controllers if the wet well rises to a level beyond the normal high level alarm of the primary or secondary control systems.

C. Manual Operation

By turning the hand-off-automatic switch to the hand position, the pumps can be run manually provided that the motor over temperature circuit is not open, the motor overloads are not tripped, and the phase failure relay has not detected a phase failure.

D. Automatic Operation

The liquid level in the wet well shall be sensed by a pressure transducer type level sensing system and an electronics package that is mounted in the pump control panel.

E. Primary Level Controller

A PLC shall act as the primary pump controller. This PLC shall be a new Allen Bradley Micrologix 1400 or CompactLogix with input and output cards and analogue card to make

the radio function.

F. OTHER PLC INPUTS AND FUNCTIONS

An “operator” selector switch shall be mounted on the inner door of the enclosure. This switch shall have three purposes. The first function shall be to silence the open door alarm, which also shall provide a signal a t the central terminal unit to log this entry into the panel. The second function shall be that if the operator does not change the switch position from OFF to ON at least every hour after its initial switching an alarm shall be developed at the central monitoring point.

A solid state alarm device shall be mounted on the inner door of the enclosure and controlled by an output bit of the PLC. This alarm shall be programmed to emit a pulsating alarm when the door of the enclosure is initially opened. This alarm shall be to alert the operator to change the position of the operator switch after the door of the enclosure has been opened. The solid state alarm shall also emit a steady sound if the operator switch is moved to the ON position for a “panic” alarm condition.

An inner door mounted pilot light shall be provided to indicate when the PLC is acting as primary controller for the pumps. If secondary control is manually selected or the PLC is not in RUN mode the light shall not be illuminated.

This PLC shall also act as a remote terminal for a SCADA system. The following analog signals are fed to the PLC for sending to the central terminal:

Wet Well Level

AC current (future)

Flow (future)

The following digital ON/OFF signals shall be fed to the PLC to be sent to the remote central terminal:

Low enclosure temperature

Enclosure door open

Operator Switch

Wet Well high level alarm

Pump #1 running

Pump #2 running

Backup float system operation

Pump #1 overload trip

Pump #2 overload trip

Power Failure (phase failure)

Pump #1 seal failure

Pump #2 seal failure

Pump #1 high temperature

Pump #2 high temperature

Enclosure heater ON

G. SECONDARY LEVEL CONTROLLER

The pressure transducer level controller shall also have adjustable set points that can be set anywhere I the calibrated range of the control system. When an inner door mounted manual switch is moved to the "secondary control" position, the PLC shall be disconnected and these set points will be used to start and stop the pumps and to give a high wet well level alarm.

H. RISING LEVEL

As the level in the wet well begins to rise, the signal from the pressure transducer controller will increase. This analog signal shall be connected to the analog input card of the PLC. At a preset point the pump controller in the ladder logic programming of the PLC shall be energized to energize an output bit of the PLC to start the lead pump. If the capacity of the lead pump is less that the influent flow, the lag pump will start when the level rises to the lag pump start set point.

I. FALLING LEVEL

When the level in the wet well beings to drop, the signal from the pressure transducer level controller will decrease to drop out the active pump controller to the lag pump at the lag pump stop elevation. The lead pump will stop when the level reaches the lead pump stop elevation.

J. BACKUP FLOAT CONTROL SYSTEM

One high level float shall be provided for acting as a completely independent backup pump control system to the PLC and pressure transducer system. This float shall be set to close above the normal high level alarm in the wet well.

If the level in the wet well rises to close the high level float, a timer shall energize to start the first pump. At the same time, a door mounted pilot light shall light and a signal shall be sent via the SCADA system that this float has been closed.

If the high level float remains closed for the time period preset on the timer, a contact shall start the 2nd pump. The 2nd pump will continue to run for a preset minimum time period as determined by an adjustable timer.

PART 2 PRODUCTS

2.01 SUBMERSIBLE PUMP

A. Submersible pumps shall be as manufactured by Gorman-Rupp, Flygt, Hydromatic, Fairbanks Nijhuis, Crane, Barnes, Wilo, KSB, Sulzer, or Engineer approved equal.

B. The pump shall be capable of handling raw, unscreened sanitary water. The discharge connection elbow shall be cast iron permanently installed in the wet well along with the discharge piping. The discharge elbow shall have 125-lb ANSI flanges. The pump shall be automatically connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection or service. There shall be no need for personnel to enter pump well. Sealing of the pumping unit to the discharge connection elbow shall be

accomplished by a simple linear downward motion of the pump. A sliding guide bracket shall be an integral part of the pump unit. The entire weight of the pump unit shall be guided by a preapproved similar rail system, and pressed tightly against the discharge connection elbow. The pump with its appurtenances and cable shall be capable of continuous submergence under water without loss of watertight integrity.

C. The impeller shall be of closed nonclog design, having dual vanes capable of handling coarse solids of a minimum 3 inch size, long fibers, and gas and air inclusions as maybe normally found in wastewater and storm water. Back vanes shall be provided to minimize axial loads.

   The impeller shall be a one piece casting of grey cast iron (ASTM A48 Class 30). It shall be smooth, well finished, free from blowholes and imperfections, and be dynamically balanced. The impeller shall be securely fitted to the pump shaft in such a manner that it does not loosen or become detached if the pump is operated in the wrong direction as may happen by reversed flow or reversed motor connections.

D. The volute shall be gray cast iron, of single piece design with smooth fluid passages large enough at all points to pass any size solid, which can pass through the impeller. The pump discharge shall be furnished with 125-lb ANSI flanges.

E. A wear ring system shall be installed to provide efficient sealing between the volute and impeller.

F. Major pump components shall be of Class 30 gray cast iron conforming to ASTM A48, with smooth surfaces devoid of blowholes and other irregularities. All nameplates, exposed nuts and bolts shall be of Grade 308 or 316 (A4) stainless steel. All surfaces coming into contact with sewage, other than stainless steel, shall be protected by an approved sewage resistant coating. Pump exterior shall be sprayed with PVC epoxy primer and an alkyd enamel finish resistant to sewage.

G. All mating surfaces where watertight sealing is required shall be machined and fitted with nitrile rubber O-rings. Fitting shall be such that sealing is accomplished by metal-to-metal contact between machined surfaces, which will result in controlled compression of nitrile rubber O-rings without requirement of a specific torque limit. No secondary sealing compounds, rectangular gaskets, grease, or other devices shall be required to make a watertight seal. All Elastomer components shall be nitrile rubber.

2.02 SUBMERSIBLE MOTOR

A. Each submersible sewage pump shall be driven by a completely sealed electric submersible motor conforming to the requirements of paragraph 1.03. The motor nameplate horsepower rating shall not be exceeded by the brake horsepower requirements of the pump for the specified head and GPM conditions.

B. The submersible pump motor shall be designed for a Class 1 Groups C and D, Division I hazardous location as defined by the National Electric Code. The unit shall be listed with Underwriters Laboratories as Class 1, Groups C and D, Division I, explosion-proof, for installation in sewage.

C. The pump motor shall be squirrel cage, induction, shell type design, housed in either an oil-filled or air filled, watertight chamber, NEMA Design B Type of the size specified in Paragraph 1.03. The stator winding and stator leads shall be insulated with moisture resistant

Class F insulation, which will resist a temperature of 155 C (311 F). The motor shall be designed for continuous duty, capable of sustaining a minimum of 10 starts per hour. Automatic reset, normally closed thermal overloads shall be installed in adjacent phases of the motor winding to provide the overheating protection.

D. The pump motor shaft shall be one-piece stainless steel. The pump shaft shall rotate on 2 permanently lubricated bearings with a minimum B10 rated bearing life of 40,000 hours.

E. Connection between the power cable conductors and stator leads shall be made without soldering. The cable entry water seal design shall preclude specific torque requirements to insure a watertight and submersible seal. All leads and cables are to be sealed and designed to prevent cable-wicking to or from the motor junction chamber. The junction chamber shall be sealed from the motor by O-ring or other approved method to isolate the motor interior from foreign material gaining access through the pump top.

F. The pump motor cable, installed, shall be suitable for submersible pump application with STWA approval and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC specifications for pump motors.

G. Each unit shall be provided with an adequately designed cooling system. Thermal radiators (cooling fins) integral to the stator housing shall be adequate to provide the cooling required by the motor. Water jacket or other cooling devices shall not be necessary for continuous pumping at sump liquid levels below mid-point of stator housing.

H. Each pump motor unit shall be provided with a double-faced or tandem mechanical rotating shaft seal system. The seal chamber shall be oil filled. Each seal shall be held in contact by its own spring contact. Each unit shall be provided with an oil chamber for the shaft sealing system. The oil chamber drain and inspection plug, with positive anti-leak seal, shall be easily accessible from the outside. Moisture sensing probes or micro switches shall be used to detect any influx of conductive liquid past the outer seal and provide ample warning of seal failure. Said probes or switches will activate a moisture alarm system but will not cause motors to shut down.

2.03 VARIABLE FREQUENCY DRIVE

A. Operating speed of pumps shall be controlled by variable frequency drive equipment, consisting of the following components:

1. 240 VAC Variable Torque VFD
2. 115 VAC Control Interface Card
3. 115 VAC Control Power Transformer
4. Hand/Off/Auto Selector Switch
5. Human Interface Module, PLC, digital pot

B. The variable frequency drive equipment shall be wall-mounted beside the power distribution panel. The VFD shall be in an enclosure rated NEMA-1.

C. Variable frequency drives shall be Allen Bradley PowerFlex 400, Eaton, Danfoss or Mitsubishi Series F700, or Engineer approved equal.

D. The drives shall be supplied with 3% output filters for AC-PWM variable frequency drives.

The line reactor shall improve the VFD performance, protect the drives input rectifier from failure or damage and tame the drive harmonic demands. The line reactors shall act as interface buffers between solid state power circuits and the line or the motor.

2.04 GUIDE RAILS AND LIFTING CHAINS

A. Each unit shall be fitted with a sufficient length of Grade 316 (A4) stainless steel lifting chain having adequate strength to permit raising and lowering the pump. The chain will extend from the lift ring to the top of the station at ground level with one (1) foot extra slack minimum.

B. Provide and install dual pipe guide rail system, of the size indicated on the plans, or required by the manufacturer, for lowering and raising the submersible pump. Guiderails to be a minimum of 2", 304 Stainless Steel.

2.05 PUMP CONTROL PANEL (PCP)

The Control panel shall consist of a one-compartment enclosure: one door.

The Power portion shall contain individual pump circuit breakers.

The Control portion shall contain the following major components:

VFD's

H-O-A Selector switches for each pump

RUN (green) pilot lights for each pump.

Elapsed run time meters for each pump, with readings in hours and tenths of hours.

Outer seal failure lights (red) for each pump.

Inner seal failure lights (red) for each pump

Motor winding high temperature alarms for each pump

Liquid level controller, with features as specified below.

Pump seal failure shall be sensed by an adjustable sensitivity relay connected to probes in the pump motors. When the pump seal chamber resistance drops below the seal failure relay resistance set-point, its respective seal failure relay will energize and light the door mounted alarm light.

Thermoswitches shall be provided in the windings of each pump motor. If a motor overheats the thermoswitches in the motor shall open stopping the motor. A factory installed jumper is connected across the thermoswitches. This jumper shall be removed when the thermoswitch is connected to the control panel.

Other operator features in this system shall include a thermostat with 150 watt condensation heater, 15 amp control circuit breaker, 20 amp circuit breaker and GFI receptacle, pump running lights, elapsed time meters and power line lightning arrestor.

The system enclosure shall consist of a single, surface mounted 14 gauge, stainless steel exterior enclosure with all stainless steel hardware. The outer enclosure shall be rated NEMA 3X, with hinges and lockable door.

The control compartment shall have a dead front steel inner door with gasketing, to protect

control components. All indicator lights, control switches, and operation devices shall be cut into and mounted on this inner door.

In lieu of an inner & outer seal fail light a common seal fail light is acceptable.

The Control Panel shall be free standing with a vented skirt. Field located by Owner or Engineer.

2.06 LIQUID LEVEL CONTROLLER

The liquid level controller shall provide indication of liquid level in the lift station wet well, and shall control the lift pumps accordingly. The controller shall be suitable for use with pressure transducer.

Easily adjustable set points (maximum 0.083 feet (1") increments) for the following functions:

1. Start Lag Pump
2. Start Lead Pump
3. Stop Lag Pump
4. Stop Lead Pump
5. High Level Alarm On
6. High Level Alarm Off

Manual level simulator to verify proper system operation. Simulator switch shall automatically reset after manual operation to return system to normal automatic operation.

Liquid level control system shall be suitable for 120V AC power supply.

Control Panel shall be mounted in the face of the inner PCP panel door.

The pressure transmitter level sensor shall be submersible and shall have a range of 0 to 30 feet with a 4-20mA output signal.

The sensor shall be 316 stainless steel with a chemical resistant polyurethane cable jacket.

A Grade 304 (A2) or 316 (A4) stainless steel chain attached to a poly coated boat anchor shall be furnished and installed and shall extend from the top of the wetwell to the base of the wetwell as shown on the plans. The float cables shall be attached to the chain to prevent "bouncing" and "tangling" of the floats and cables in the wetwell.

2.07 REDUNDANT HIGH LEVEL AND LOW LEVEL SENSOR

A. Provide mercury float switches, suspended in the sump pit to provide a backup high level and low level alarm in the event of the pressure transducer level sensing system failure.

B. Mercury float switch shall be 4-1/2" diameter with polypropylene shell, stainless steel suspension chain and anchor mount. Switch shall be rated for 120V AC operation. Float switch assembly shall be provided with #18/2 type STO cable, with sufficient length to extend un-spliced to the PCP.

C. Float switch shall be integrated into the control system so as to provide both redundant level alarm and redundant pump start command functions, as previously described.

2.08 RADIO EQUIPMENT

A. The Contractor shall furnish and install the necessary radio equipment to integrate the lift station into the City of Aberdeen's SCADA master control. This includes but not limited to the following items to ensure a complete and working system:

1. SD Series, Secure long range IP/Ethernet MDS SD4 Radio Controller.
    a. Sub-band 450-512 MHZ
    b. MS 4710 Emulation
2. Yagi Antenna suitable for the application and distance of data transmission.
3. Ethernet Switch, 24VDC, Din Mount 5TP RJ45 Ports 10/100 mps
4. 100 Watt 24 VDC and 30 Watt 12 VDC power supply
5. Coordinate with the City of Aberdeen to confirm SCADA radio equipment prior to Bid.

Coordinate all requirements with City of Aberdeen.

2.09 OTHER MICELLANEOUS CONTROL ITEMS

A. Provide the following miscellaneous items:

1. Three Phase Pump motor saver voltage protection to protect the pump from the following conditions
    a. Overvoltage
    b. Under voltage
    c. Phase Loss
    d. Phase Reversal
2. Lightning/surge protection for both incoming power line and the low voltage/electronic control systems.

2.10 VALVES

A. A check valve for each pump shall be furnished and installed in the valve pit as shown on the plans to prevent backflow into the wet well when only one pump is operating.

B. A gate valve for each pump with a hand wheel operator shall be furnished and installed in the valve pit as shown on the plans.

C. All valves shall be included in the unit bid price for the lift station. Refer to Section 33 31 12 – Wastewater Valves and Appurtenances, Part 2 and 3 for valve details.

D. Bolting: All fasteners shall be Grade 304 (A2) or Grade 316 (A4) stainless steel. Anti-Seize shall be applied to all threads prior to installation.

2.11 LIFT STATION PIPING

A. Refer to Section 33 31 00 - Sanitary Sewer Piping and Fittings, Part 2 and 3.

B. Uni-Flanges or other field bolted flanges will not be allowed.

2.12 WET WELL STRUCTURE

A. All lifting holes shall be sealed to prevent groundwater infiltration. Grouting of lifting holes shall be completed as detailed in Section 33 39 13.

B. Refer to plans.

2.13 ACCESS HATCH

A. Access hatches shall be single door as shown on the plans sized to allow access to the pump for ease of removal.

B. Access doors shall have a minimum clear opening as shown on the plans. Access doorframe shall be provided with sliding nut rails to attach the accessories required.

C. Angle frame shall be 1/4" aluminum with strap anchors bolted to the exterior. Door leaf shall be 1/4" aluminum diamond pattern plate with stainless steel hinges bolted to the underside and shall pivot on torsion bars for ease of operation. The door shall open to 90 degrees and lock automatically in that position. A grip handle shall be provided to raise and lower cover. Doors shall be built for a minimum live load of 150 pounds per square foot. Hardware shall be stainless steel or aluminum.

D. Provide doors with snap locks and removable handle.

E. Safety grates shall be provided beneath the hatch covers for fall through protection when the covers are open. The safety grates shall be reinforced to support a minimum live load of 300 psf with a maximum deflection of $1/150^{th}$ of the span. Each safety grate shall be provided with a permanent hinging system that will lock the grates in the 90-degree position once opened.

F. Provide an aluminum or stainless steel cable rack underneath the latch for pump and float switch cables. Equip with non-sparking upper guide rail support, float bracket, and flush locking mechanism.

2.14 SPARE PUMPS AND MOTORS

A. One spare pump complete with all hardware for installing into wetwell on rail system provided, shall be supplied. The spare pump shall be identical to the ones supplied for the lift station.

2.15 MISCELLANEOUS SUPPLIES

The following shall be provided to the Owner as a spare parts inventory

1. One complete kit for upper and lower mechanical seals with nut, bolt, and key and one impeller matching the pumps and motors supplied for the Duplex Pumping Station.
2. Supply two (2) replacements for each style of fuse; relay and timers utilized in the control panel.
3. Two (2) replacement indicator lights for each style utilized.
4. Provide one (1) spare VFD.

2.16 FASTENERS

A. All fasteners in wetwell and/or valve pit shall be Grade 304 (A2) or 316 (A4) stainless steel.

Anti-Seize shall be applied to all threads prior to installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Each pumping unit shall be leveled, plumbed, aligned, and set into position to fit connecting piping. Installation procedures shall be as recommended by the pump manufacturer, the Hydraulic Institute Standards, and as required herein.

B. The rail base shall be mounted on the floor of the lift station wetwell with stainless steel anchor bolts and nuts. The base shall be aligned for installation of pumps and connecting piping. Special care shall be taken to maintain alignment of pumping unit components. No stresses shall be transmitted to the pump flanges. After final alignment and bolting, pump connections shall be tested for applied piping stresses by loosening the flange bolts. If any movement or opening of the joints is observed, piping shall be adjusted to proper fit.

C. Couplings shall be realigned after grouting. Shimming between machined surfaces will not be permitted.

D. The Pump Control System shall be install per all applicable manufacturers' recommendations. The system shall be thoroughly check out and tested prior to being placed in service.

E. Power to the site will be coordinated by the Contractor, Power Supply Company, and the City of Aberdeen.

3.02 INSPECTION, SUPERVISION, AND START-UP

A. Each pump supplier shall furnish a qualified process engineer for supervision of installation procedures and the system's start-up. He shall train the operating personnel in the operation and maintenance of the system. He shall also instruct the Owner's personnel in storage of the spare pumping unit.

B. Each pump supplier shall furnish a minimum of 6 hours operator training to the Owner's operators on the operation and maintenance of the Lift Station mechanical operation including the pump overview, operation and maintenance. After the system has been placed in operation, the supplier's representative shall make all final adjustments for the proper operation of the equipment.

C. The Contractor shall provide the Owner a minimum of four (4) hours of instruction in the proper operation and maintenance of the Pump Control Panel and its features.

D. The Contractor PCP supplier/Integrator shall work with the City of Aberdeen's SCADA Integrator to incorporate the new lift station into the City of Aberdeen's SCADA Master Control. The Contractor shall include in their bid price, as described in Part 3.02, the cost of the City Integrator.

E. Maintenance and operating instruction manuals shall be submitted to the Engineer for review of material and completeness, and when approved shall be turned over to the City of Aberdeen.

1. The manual shall include, but not limited to, the following: Installation instructions; maintenance and overhaul instructions; procedures for start, operation and shut down of

equipment and systems; complete wiring and control diagrams; cleaning of equipment; safety precautions; diagrams and illustrations; manufacturers'' name and catalog data; test procedures; name and address of authorized service organizations and parts distributor for all material and equipment installed, a complete set of approved/stamped shop drawings, a set of "As Built" drawings, and Contractor's name, address, and phone number. Manual shall also include a complete table of contents with index tabs and copies of approved shop drawings.

2. If repair or replacement part lists are available, these are to be included as part of this manual.
3. This supplier shall also supervise the initial operation of all equipment and instruct the Owner's designated operator or maintenance representative in such operation as to acquaint him thoroughly with the best practices.
4. The City Integrator's contact information is

Ray Olson: 605-886-4672 or 605-881-7577

PART 4 MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT

A. No separate measurement shall be made for pumps, piping, valves, structures, electrical wiring and controls, and all other appurtenances necessary for a complete, operating unit as described herein and within the limits shown on the plans.

4.02 BASIS OF PAYMENT

A. Payment shall be made at the Contract unit price as indicated on the Bid Form. The lump sum price bid shall also include the cost for furnishing the spare parts as described in sections 1.09 and 1.10 of this specification. The Contractor shall also include in their Lump Sum price bid for 10 hours of City SCADA integrator labor at a rate of $100.00 per hour. This cost will be invoiced to the Contractor by the City of Aberdeen.

* * * END OF SECTION * * *

SECTION 33 42 00 – DUPLEX STORM WATER SUBMERSIBLE PUMP LIFT STATIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and provisions of Division 1, Special Requirements, apply to work covered by this section.

1.02 DESCRIPTION OF WORK

A. The Work covered by this Section includes all labor, material and equipment necessary to furnish, install and place in satisfactory operating condition a submersible pump lift station, including submersible pump, electrical controls, pump installation and removal system, along with all piping, valving, and other appurtenances required to make a complete operating unit.

1.03 OPERATING CONDITIONS

A. Each pump in the lift station shall be capable of pumping 1,650 gpm against a total dynamic head of 30 feet.

B. Maximum allowable motor size for the pumps shall be 24.0 horsepower with a minimum efficiency rating of 50%. All furnished motors shall operate on 240 volts, 60 hertz, 3-phase power.

C. Maximum allowable pump speed shall be 1750 revolutions per minute. Units operating at lower speeds will be considered.

1.04 QUALITY ASSURANCE

A. The pump manufacturer shall have a minimum of 1,000 units of similar type pump, installed and operating for no less than five years in the United States. A certificate of conformance with this requirement shall be furnished by the manufacturer and shall be submitted with the shop drawings. Upon request by the Engineer, the manufacturer shall furnish a listing of installations, including names and addresses of contact persons.

B. The pump cable end will be sealed with a high quality protective covering to make it impervious to moisture or water seepage prior to electrical installation.

C. Each pump shall be tested at start-up by the Contractor's electrician and voltage, current, and other significant parameters recorded. The manufacturer shall provide a formal test procedure and forms for recording data.

1.05 SUBMITTALS

A. The Contractor shall provide 5 copies of shop drawings for Engineers review.

B. The Contractor shall provide 5 copies of Operation and Maintenance manuals for operation of pumps and controls to the Engineer prior to operation of facility.

C. A copy of the manufacturer's warranty shall be submitted with the shop drawings.

D. A copy of the written installation instructions shall be furnished to the Engineer before shipment of the equipment.

1.06 WARRANTY

A. The requirements of the General Conditions and the requirements as specified hereinafter shall apply.

B. The Contractor shall be responsible for the costs of materials, repair or replacement, at point of installation and use, without cost to the Owner, such equipment, or any part thereof, that is found to be defective.

C. Warranties by the manufacturer, or as specified herein, which extend beyond the period specified above, shall be extended in writing to the Owner.

D. Specifically exempted from the warranty shall be those items such as oil, grease, filters, etc., which is normally consumed in service. These items shall be considered as part of routine station operation and maintenance.

PART 2 PRODUCTS

2.01 SUBMERSIBLE PUMP

A. Submersible pumps shall be as manufactured by Gorman-Rupp, Flygt, Hydromatic, Fairbanks Nijhuis, Crane, Barnes, Wilo, KSB, Sulzer, or Engineer approved equal or Engineer approved equal.

B. The pump shall be capable of handling raw, unscreened sewage. The discharge connection elbow shall be cast iron permanently installed in the wet well along with the discharge piping. The discharge elbow shall have 125-lb ANSI flanges. The pump shall be automatically connected to the discharge connection elbow when lowered into place and shall be easily removed for inspection or service. There shall be no need for personnel to enter pump well. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump. A sliding guide bracket shall be an integral part of the pump unit. The entire weight of the pump unit shall be guided by a preapproved similar rail system, and pressed tightly against the discharge connection elbow. The pump with its appurtenances and cable shall be capable of continuous submergence under water without loss of watertight integrity.

C. The impeller shall be of gray cast iron, dynamically balanced, enclosed non-clogging design. The impeller shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in normal sewage applications. The fit between the impeller and the shaft shall be a sliding fit with a key and self-locking threaded fastener.

D. The volute shall be gray cast iron, of single piece design with smooth fluid passages large enough at all points to pass any size solid, which can pass through the impeller. The pump discharge shall be furnished with a 125-lb ANSI flanges.

E. A wear ring system shall be installed to provide efficient sealing between the volute and impeller.

F. Major pump components shall be of Class 30 gray cast iron conforming to ASTM A48, with smooth surfaces devoid of blowholes and other irregularities. All nameplates, exposed nuts and bolts shall be of Grade 308 or 316 (A4) stainless steel. All surfaces coming into contact with sewage, other than stainless steel, shall be protected by an approved sewage resistant

coating. Pump exterior shall be sprayed with PVC epoxy primer and an alkyd enamel finish resistant to sewage.

G. All mating surfaces where watertight sealing is required shall be machined and fitted with nitrile rubber O-rings. Fitting shall be such that sealing is accomplished by metal-to-metal contact between machined surfaces, which will result in controlled compression of nitrile rubber O-rings without requirement of a specific torque limit. No secondary sealing compounds, rectangular gaskets, grease, or other devices shall be required to make a watertight seal.

2.02 SUBMERSIBLE MOTOR

A. Each submersible sewage pump shall be driven by a completely sealed electric submersible motor conforming to the requirements of paragraph 1.03. The motor nameplate horsepower rating shall not be exceeded by the brake horsepower requirements of the pump for the specified head and GPM conditions.

B. The submersible pump motor shall be designed for a Class 1 Groups C and D, Division I hazardous location as defined by the National Electric Code. The unit shall be listed with Underwriters Laboratories as Class 1, Groups C and D, Division I, for installation in water or sewage.

C. The pump motor shall be squirrel cage, induction, shell type design, housed in either an oil-filled or air filled, watertight chamber, NEMA Design B Type of the size specified in Paragraph 1.03. The stator winding and stator leads shall be insulated with moisture resistant Class F insulation, which will resist a temperature of 155 C (311 F). The motor shall be designed for continuous duty, capable of sustaining a minimum of 10 starts per hour. Automatic reset, normally closed thermal overloads shall be installed in adjacent phases of the motor winding to provide the overheating protection.

D. The pump motor shaft shall be one-piece stainless steel. The pump shaft shall rotate on 2 permanently lubricated bearings with a minimum B10 rated bearing life of 40,000 hours.

E. Connection between the power cable conductors and stator leads shall be made without soldering. The cable entry water seal design shall preclude specific torque requirements to insure a watertight and submersible seal. All leads and cables are to be sealed and designed to prevent cable-wicking to or from the motor junction chamber. The junction chamber shall be sealed from the motor by O-ring or other approved method to isolate the motor interior from foreign material gaining access through the pump top.

F. The pump motor cable, installed, shall be suitable for submersible pump application with STWA approval and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC specifications for pump motors.

G. Each unit shall be provided with an adequately designed cooling system. Thermal radiators (cooling fins) integral to the stator housing shall be adequate to provide the cooling required by the motor. Water jacket or other cooling devices shall not be necessary for continuous pumping at sump liquid levels below mid-point of stator housing. Motor cavities shall be oil filled.

H. Each pump motor unit shall be provided with a double-faced or tandem mechanical rotating shaft seal system. The seal chamber shall be oil filled. Each seal shall be held in contact by

its own spring contact. Each unit shall be provided with an oil chamber for the shaft sealing system. The oil chamber drain and inspection plug, with positive anti-leak seal, shall be easily accessible from the outside. Moisture sensing probes or micro switches shall be used to detect any influx of conductive liquid past the outer seal and provide ample warning of seal failure. Said probes or switches will activate a moisture alarm system but will not cause motors to shut down. Float switches for seal leak indication are not acceptable.

2.03 GUIDE RAILS AND LIFTING CHAINS

A. Each unit shall be fitted with a sufficient length of Grade 308 or 316 (A4) stainless steel lifting chain having adequate strength to permit raising and lowering the pump. The chain will extend from the lift ring to the top of the station at ground level with one (1) foot extra slack minimum.

B. Provide and install preapproved guide rail system, of the size indicated on the plans or required by the manufacturer, for lowering and raising the submersible pump.

2.04 CONTROLS

A. The Contractor shall furnish and install one (1) NEMA/UL 4 Painted steel weather proof enclosure for 240 volts, 3 phase, 60 hertz, power supply. The control panel shall include the following:

1. A combination circuit breaker/overload unit providing overload protection, short circuit protection, reset and disconnect for all phases. All pilot devices and circuit breakers shall be operable from the inner door on the front side of the control panel;
2. Hand-off-automatic pump operation selector switch overload relay to be pre-calibrated to match motor characteristics, and factory sealed to insure trip setting is tamperproof;
3. 120 volt control circuitry;
4. 24-volt control circuit with disconnect circuit breaker and overload protection for liquid level sensors and pilot control circuits.
5. Terminal connections for field wiring.
6. Heater: A 125 watt (minimum), 120 VAC heater shall be provided to protect the enclosure from the harmful effects of condensation corrosion and low temperatures. The heater shall be complete with an adjustable thermostat. Branch protection shall be provided.

B. Additional features shall include a running time meter, lightning arrestor, and indicating lights for low level shut-down, thermostatic overheating, and seal moisture detection. Enclosure shall be provided with a dead front with separate removable inside panel. A locking hasp shall be provided for the outside door. The panel shall be furnished with a 120-volt LED alarm light with a red weatherproof protective globe mounted on the exterior of the panel. The alarm light shall be normally on and shall flash or shut off in alarm conditions.

C. All motor branch circuit breakers, motor starters and control relays shall be securely fastened to the removable back panel. Back panel shall be tapped to accept all mounting screws. Self-tapping screws shall not be used to mount any component.

D. Loss of phase, phase reversal and low voltage shall be monitored by an adjustable voltage

phase monitor. Time delays shall be included to prevent nuisance tripping caused by transients. The monitor shall be adjustable to allow for temporary low voltage on an auxiliary power source. The voltage lag time shall be adjusted for drops in voltage on initial startup up to 5 seconds while auxiliary power is used.

E. The control panel shall be equipped with high temperature shutdown for the motor and shall utilize the temperature switches embedded in the motor windings. In a high motor temperature condition, the switch shall open, de-energize the motor starter and stop the pump motor. The shut-down shall activate an indicator light on the control panel.

F. The control panel shall be equipped with a moisture detector control for the pump, which senses moisture in the motor housing. In a motor housing moisture condition, the switch shall open, de-energize the motor starter and stop the pump motor. The shut-down shall activate an indicator light on the control panel.

G. A lamp test button shall be provided on each control panel.

H. A 110 volt weatherproof, duplex receptacle shall be provided inside the control panel.

I. The control panel shall bear a serialized U.L. label certifying that the assembly is approved under "UL508-Enclosed Industrial Control Equipment".

J. Output contacts shall be provided for high and low level alarm. Normally open contacts shall be provided for pump control. Red LED's shall be provided to indicate alarm on and green LED's shall be provided to indicate pump control output on.

K. The following alarms shall be wired to terminal blocks in the control panel:

1. Wetwell High and Low Level
2. Pump #1 Fail
3. Pump Overtemp and Seal Fail
4. Power Failure

2.05 VARIABLE FREQUENCY DRIVE

E. Operating speed of pumps shall be controlled by variable frequency drive equipment, consisting of the following components:

1. 240 VAC Variable Torque VFD
2. 115 VAC Control Interface Card
3. 115 VAC Control Power Transformer
4. Hand/Off/Auto Selector Switch
5. Human Interface Module, PLC, digital pot

F. The variable frequency drive equipment shall be wall-mounted beside the power distribution panel. The VFD shall be in an enclosure rated NEMA-1.

G. Variable frequency drives shall be Allen Bradley PowerFlex 400, Eaton, Danfoss or Mitsubishi Series F700, or Engineer approved equal.

H. The drives shall be supplied with 3% output filters for AC-PWM variable frequency drives.

The line reactor shall improve the VFD performance, protect the drives input rectifier from failure or damage and tame the drive harmonic demands. The line reactors shall act as interface buffers between solid state power circuits and the line or the motor.

2.06 SYSTEM LOGIC AND FUNCTION

A. The controller is designed to start and stop pumps using the level control meter with a submersible pressure transmitter. The lead pump starts at the pump start level set point and continues to run until the liquid level decreases to the pump stop level set point as programmed in the level control meter. If the liquid level rises above the lead pump start level to the lag pump start level, the lag pump will start and continue to operate until the level decreases to the pump stop level set point.

B. If the level continues to rise above the lag pump start level, to the high-level alarm set point, a high level alarm will be annunciated until the level decreases below the high-level set point. Additionally, the high-level set point will call for the start of both pumps.

C. If the level decreases below the pump stop level, to the low-level set point, the alarm will be annunciated until the level increases to the pump stop level. Additionally, the low-level set point will stop pumps.

D. In addition to the level control and transducer, a secondary float control will be included. The secondary float system will consist of a low level alarm and shutdown and a high level alarm and pump start.

2.07 LIQUID LEVEL SENSORS

A. The pressure transmitter level sensor shall have a range of 0 to 11.5 feet with a 4-20 mA output signal.

B. Sensor shall be 316 stainless steel with a chemical resistant polyurethane cable jacket.

C. Sensor shall be mounted in a PVC stilling tube mounted to the wall of the lift station.

D. Two liquid level float sensors, with enough cable to reach the control panel, shall be supplied and installed. The first float shall be provided to signal the low level shutdown and to insure that the pumps do not operate dry for an extended period of time. The second float shall alarm a high level condition and call for the pumps to start.

E. All sensors shall have a mercury tube switch, which shall be sealed in a solid polyurethane float for corrosion and shock resistance. The support wire shall have a heavy neoprene jacket, and a weight shall be attached to the cord above the float to hold the switch in place in the wet well. The float switches shall hang in the wet well supported by the cord that is held to the underside of the access hatch.

F. A Grade 304 (A2) or 316 (A4) stainless steel chain attached to a poly coated boat anchor shall be furnished and installed and shall extend from the top of the wetwell to the base of the wetwell as shown on the plans. The float cables shall be attached to the chain to prevent "bouncing" and "tangling" of the floats and cables in the wetwell.

2.08 ACCESS HATCH

A. Access hatches shall be single door as shown on the plans sized to allow access to the pump for ease of removal.

B. Access doors shall have a minimum clear opening as shown on the plans. Access doorframe shall be provided with sliding nut rails to attach the accessories required.

C. Angle frame shall be 1/4" aluminum with strap anchors bolted to the exterior. Door leaf shall be 1/4" aluminum diamond pattern plate with stainless steel hinges bolted to the underside and shall pivot on torsion bars for ease of operation. The door shall open to 90 degrees and lock automatically in that position. A grip handle shall be provided to raise and lower cover. Doors shall be built for a minimum live load of 150 pounds per square foot. Hardware shall be stainless steel or aluminum.

D. Provide doors with snap locks and removable handle.

E. Safety grates shall be provided beneath the hatch covers for fall through protection when the covers are open. The safety grates shall be reinforced to support a minimum live load of 300 psf with a maximum deflection of $1/150^{th}$ of the span. Each safety grate shall be provided with a permanent hinging system that will lock the grates in the 90-degree position once opened.

F. Provide an aluminum cable rack underneath the latch for pump and float switch cables. Equip with non-sparking upper guide rail support, float bracket, and flush locking mechanism.

2.09 SPARE PUMPS AND MOTORS

A. One spare pump complete with all hardware for installing into wetwell on rail system provided, shall be supplied. The spare pump shall be identical to the ones supplied for the lift station.

2.10 MISCELLANEOUS SUPPLIES

A. The contractor shall supply the Owner one spare impeller and two spare mechanical seal's kits. The spare parts shall comply with the specifications in this section.

2.11 FASTENERS

A. All fasteners in wetwell and/or valve pit shall be Grade 304 (A2) or 316 (A4) stainless steel. Anti-Seize shall be applied to all threads prior to installation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Each pumping unit shall be leveled, plumbed, aligned, and set into position to fit connecting piping. Installation procedures shall be as recommended by the pump manufacturer, the Hydraulic Institute Standards, and as required herein. Grouting shall be as specified in the grouting section.

B. The pump base shall be grouted after initial fitting and alignment but before final bolting of connecting piping. Special care shall be taken to maintain alignment of pumping unit components. No stresses shall be transmitted to the pump flanges. After final alignment and bolting, pump connections shall be tested for applied piping stresses by loosening the flange

bolts. If any movement or opening of the joints is observed, piping shall be adjusted to proper fit.

C. Couplings shall be realigned after grouting. Shimming between machined surfaces will not be permitted.

3.02 INSPECTION, SUPERVISION, AND START-UP

A. Each pump supplier shall furnish a qualified process engineer for supervision of installation procedures and the system's start-up. He shall train the operating personnel in the operation and maintenance of the system. He shall also instruct the Owner's personnel in storage of the spare pumping unit.

B. Each pump supplier shall furnish a minimum of 4 hours operator training to the Owner's operators on the operation and maintenance of the pumps. After the system has been placed in operation, the supplier's representative shall make all final adjustments for the proper operation of the equipment.

PART 4 MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT

A. No separate measurement shall be made for pumps, piping, valves, structures, electrical wiring and controls, and all other appurtenances necessary for a complete, operating unit as described herein and within the limits shown on the plans.

4.02 BASIS OF PAYMENT

A. Payment shall be made at the Contract unit price as indicated on the Bid Form. The lump sum price bid shall also include the cost for furnishing the spare parts as described in sections 2.10 of this specification. The Contractor shall also include in their Lump Sum price bid for 10 hours of City SCADA integrator labor at a rate of $100.00 per hour. This cost will be invoiced to the Contractor by the City of Aberdeen.

* * END OF SECTION * * *

Note Regarding Existing Utilities

The Contractor is specifically cautioned that the location and/or elevation of existing utilities as shown on these plans are based on records of the various utility companies and, where possible, measurements taken in the field. The information is not to be relied on as being exact or complete. The Contractor shall call the appropriate utility companies at least 48 hours before any excavation to request exact field location of utilities.

It is the responsibility of the Contractor to relocate all utilities requiring relocation. It is the responsibility of the Contractor to verify in the field, the locations of existing water mains, water services, sewer mains and sewer services. The Contractor shall be responsible for locating and preserving all existing utilities in their present condition. Existing utilities shown on the plans are for general information only and are to be located by the Contractor prior to the start of construction.

Existing utilities included but not limited to:
Underground and overhead electrical
Underground and overhead cable television
Underground water system
Underground sewer system
Underground and overhead telephone
Underground natural gas

All water and sewer connections shall be coordinated with the City of Aberdeen.

Note Regarding Project Cleanup and Safety

The general Contractor shall take all precautions necessary to avoid property damage to adjacent properties during the construction phases of this project. The Contractor is held solely responsible for any damages to the adjacent properties occurring during the construction phases of this project.

The designs represented in these plans are in accordance with established practices of civil engineering for the design functions and uses intended by the owner. However, neither Helms and Associates, nor its personnel can or do warranty these designs or plans as constructed except in the specific cases where Helms and Associates personnel observe and control the physical construction on a contemporary basis at the site.

In accordance with generally accepted construction practices, the Contractor is solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work this requirement applies continuously and is not limited to normal working hours.

The duty of the engineer or owner to conduct construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

The Contractor shall clean the entire site on a daily basis and should not restrict local traffic over night.

Note Regarding Existing Culverts

Contractor is responsible for culverts damaged by his men or equipment through negligence.

Waste Disposal

The Contractor shall be required to furnish a site for the disposal of construction/demolition debris generated by this project. Construction/demolition debris may not be disposed of on owner's property.

Salvaging, Stockpiling, and Placing Topsoil

The Contractor shall remove a minimum of 16 inches of soil cover for topsoiling operations. The Contractor shall place a minimum of 12” of topsoil evenly over the disturbed areas upon completion of grading and paving operations.

Topsoil shall be neatly stockpiled on site for future use, at locations chosen by the owner or placed in an area to be filled.

Salvageable Materials

All materials salvaged by the Contractor that are not incorporated into the project or as noted in the plans, shall remain the property of the owner. The Contractor shall be responsible for the removal and disposal of all salvaged materials to a site selected by the owner.

Sequence of Operations and Traffic Control

During construction of the project, the existing traffic control devices shall be removed, reset or relocated as necessary by the Contractor to safely control traffic through or around the project. Devices no longer needed shall be neatly stockpiled on the project at a location designated by the engineer. This work shall be considered incidental work, no extra compensation will be considered.

The Contractor shall have qualified personnel to be responsible for traffic control items 24 hours per day and 7 days per week. The Contractor shall be responsible for maintaining all existing traffic control signing for safety of traveling public. Construction operations will be allowed during daylight hours only, unless otherwise allowed by the engineer.

Note Regarding Storm Drainage Provisions

Since the proposed construction activities involve the disturbance of more than 1-acre, an EPA National Pollutant Discharge Elimination Systems (NPDES) storm water general permit for South Dakota construction activities is required. The owner will file a notice of intent with the NPDES department prior to start of construction activities. The Contractor will submit the Contractor certification form and shall follow the owner's Storm Water Pollution Prevention Plan. A copy of this plan is included in the specifications and will be required to be onsite during construction activities. The Storm Water Pollution Prevention Plan uses best management practices to control runoff from the work site. The Contractor may contact the SD Department of Agriculture and Natural Resources at 605-773-3351 or 1-800-SDSTORM for more information concerning this program.

The Contractor shall provide for and maintain drainage of storm waters away from existing buildings, homes, and exposed surfaces or provide immediate pumping of ponded areas on the work site. No compensation will be made for damage resulting from improper drainage during construction.

Unclassified Excavation

All excavation that must be performed to construct the new grades in conformance with the cross-sections and plan details, will be included in the bid item “unclassified excavation”. Measurement and payment for “unclassified excavation” shall be as specified in the specifications. Material taken from excavated areas shall be used in the formation of embankments along the project. The excavated or other suitable material, as directed by the engineer, shall be replaced and recompacted to the density specified for the section constructed. Excess material shall be neatly stockpiled on the site, at locations chosen by the owner or placed in an area to be filled.

Note Regarding Water for Compaction

Contractor shall provide a source of water supply for construction operations. Contractor shall obtain all permits required and source shall be approved by the engineer.

The Contractor shall obtain a temporary water rights permit to use water for construction, testing, or drilling purposes from the SD Department of Agriculture and Natural Resources for all water sources. Contact DANR by phone at 605-773-3352 for more information.

Note Regarding Haul Roads

Contractor shall obtain written permission from the proper state, county, and municipal authorities for use of local roads as haul roads. A copy shall be sent to the owner and the engineer prior to construction. Contractor shall obtain a written release from all cities, counties, and townships owning or maintaining the haul roads used by the Contractor upon completion of the construction. Haul road restoration shall be the responsibility of the Contractor.

Note Regarding Proof Rolling

Upon completion of the subgrade preparation, base course and prior to asphalt surfacing and/or concrete surfacing, the Contractor will be required to proof roll road area with legal loaded tandem axle truck to affirm that no soft areas are present. Areas that deform more than 1 inch will be required to be reconstructed at no additional cost to the owner. Contractor will coordinate with Engineer and City of Aberdeen to set up this proof rolling test.

Coordination of Work

Owner reserves the right to award other work at or in the vicinity of the project site. Project Contractor shall coordinate his/her work with others to ensure the timely completion of work as-bid.

Note

Owner intends to solicit bids for the site grading outside of the Right-of-Ways (“Site Grading”) in the next 30 days. The Utility Bid Contractor work and the Site Grading Contractor work will have minimal overlap, but the Contractors must coordinate their work when necessary. Any coordination issues must be reported to the Engineer (who will consult with Owner) who will have final say on how the Contractors will coordinate their work.

No.	Revisions	By / App.	Date

I Hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the law of the State of South Dakota. Registration No.

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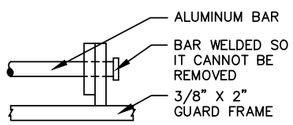
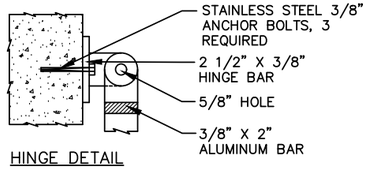
Helms & Associates
CIVIL ENGINEERS & LAND SURVEYORS

PLAN NOTES

CONSTRUCTION PLANS FOR
WEST EDGE SUBDIVISION
ABERDEEN, SOUTH DAKOTA

Drawn By:	CLB
Chk' By:	LAH
Proj. No:	A8668
Dwg. No:	8668-01
VP. No:	NOTE
Date:	3/8/24





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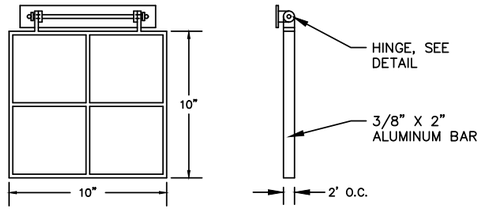

HINGED TRASH GUARD DETAIL

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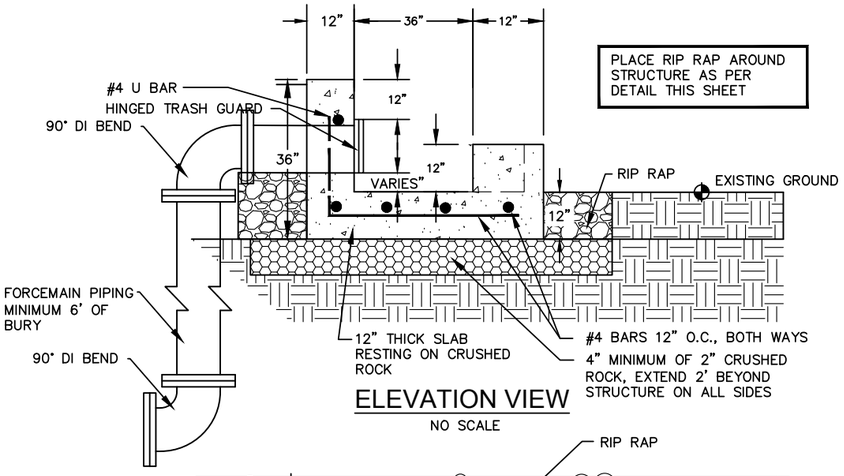
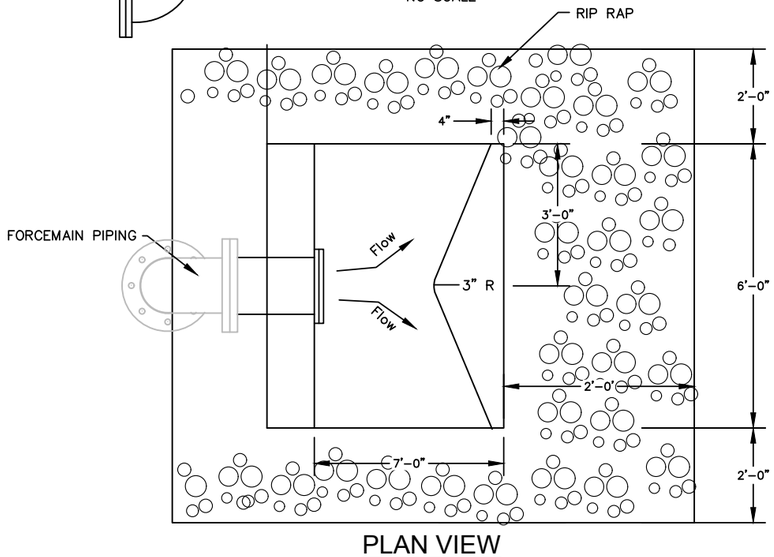


ELEVATION VIEW

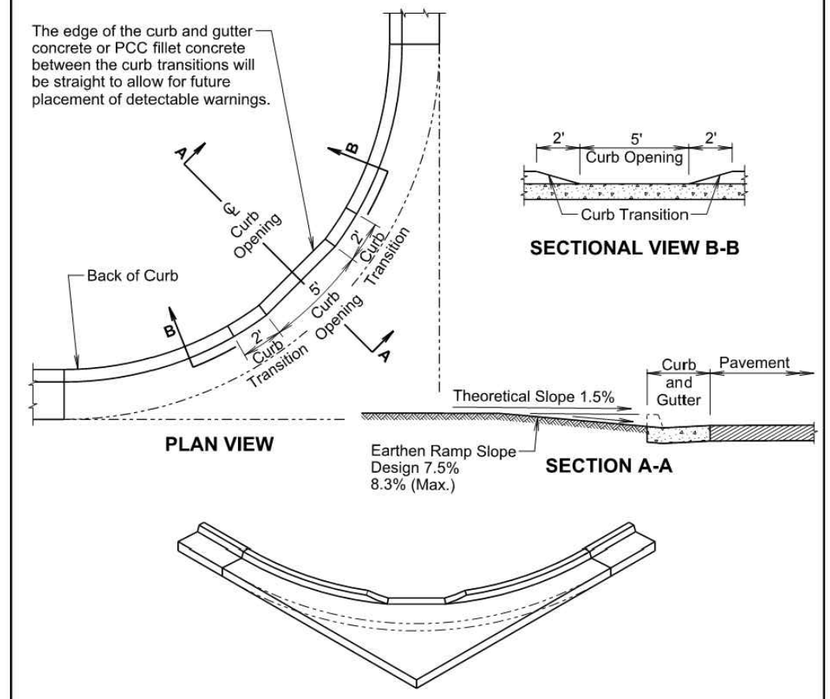
NO SCALE



PLAN VIEW

NO SCALE

STORM SEWER FORCEMAIN OUTLET STRUCTURE DETAIL



PERSPECTIVE VIEW

GENERAL NOTES:

For illustrative purpose only, the curb opening location is shown at the center of the fillet section. The curb opening will be placed at the location(s) stated in the plans.

For illustrative purpose only, PCC fillet sections are shown in the above drawings. The curb opening depicted on this standard plate may be used with a PCC fillet section or with curb and gutter.

* The curb opening width is 5' unless stated otherwise in the plans.

The normal gutter line profile will be maintained through the area of the opening.

The curb transitions and opening will be measured and paid for at the contract unit price per foot for the corresponding curb and gutter contract item when curb and gutter is used. The curb transitions and opening will be measured and paid for at the contract unit price per square yard for the corresponding PCC fillet section contract item when a PCC fillet section is used.

February 14, 2020

Published Date: 1st Qtr. 2023	SDDOT	CURB OPENING AND CURB TRANSITIONS IN CURB AND GUTTER FOR FUTURE CURB RAMP AND BOULEVARD SIDEWALK	PLATE NUMBER 651.16 Sheet 1 of 1

Registered Professional Engineer
Reg. No. 11124
LUCAS A. HOLMER
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of South Dakota.
3-19-2024

No.	Revision	By	App.	Date

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DETAILS

CONSTRUCTION PLANS FOR WEST EDGE SUBDIVISION ABERDEEN, SOUTH DAKOTA

Drawn By:	CLB
Chk' By:	LAH
Proj. No:	A8668
Dwg. No:	8668-01
VP. No:	DET (7)
Date:	3/19/24