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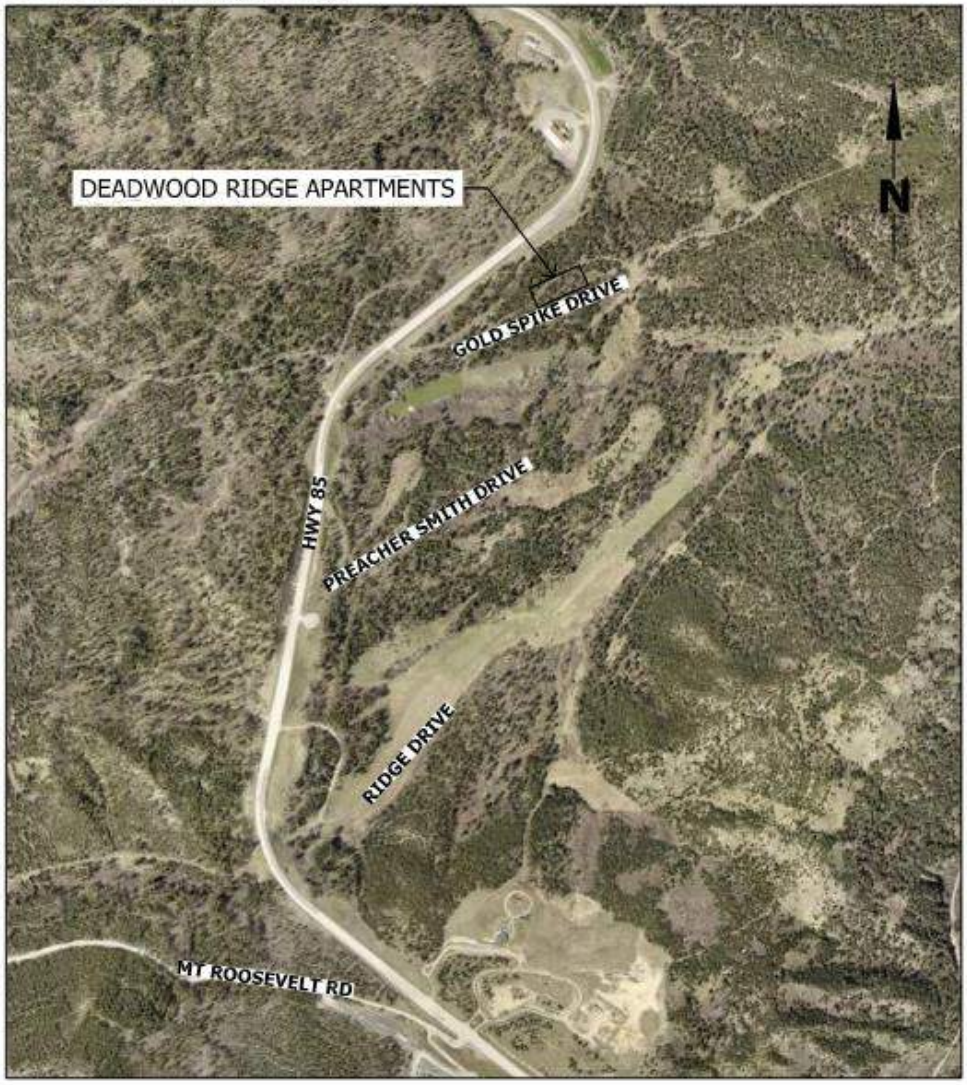
TECHNICAL SPECIFICATIONS

Deadwood Ridge Apartments

Utility Improvements Project
Deadwood, South Dakota

Owner:
Deadwood Ridge Apartments
2525 W Main, Suite 209
Rapid City, SD 57702

LOCATION MAP (LOCAL):



REGISTERED PROFESSIONAL ENGINEER
REG. NO. 16882
JACE D. CHRISTIANSEN
SOUTH DAKOTA
4/4/2025

CONSTRUCTION SET

SEI No: 24135

SECTION 333260 – LIFT STATION

PART 1 - GENERAL

1.1 SUMMARY

A. The work covered by this section of the specifications consists of furnishing materials and labor to install two new sewage lift stations. The lift stations are duplex with two submersible pumps. The wet well will be a 6-foot diameter lined precast unit manhole and the valve vault will be a 6-foot diameter non-lined precast unit manhole. Both manholes will have aluminum hatches as shown on the plans. A control system and monitoring system will be provided.

1.2 QUALITY ASSURANCE

A. All materials and appurtenant items shall be new and of first class construction, design and guaranteed to perform the service required, shall conform to the plans and the following specifications and shall be the product of the listed manufacturer(s) or similar and equal thereto as approved by the Engineer.

B. The contractor is hereby notified that responsibility for the complete and satisfactory operation or function of all equipment and material is definitely a part of this contract, regardless of the manufacturer's guarantee on any item furnished by him. It is the contractor's responsibility to place all equipment in operation, furnish all lubrication, check all fittings for tightness, and see that proper operating and maintenance instructions are prepared and followed.

1.3 SUBMITTALS

A. Submit four (4) copies of complete assembly and installation drawings, together with detailed specifications and data for each unit including but not limited to the following:

1. Pumps:

   a. Manufacturer
   b. Type and Model
   c. Design rotative speed
   d. Performance curves showing capacity, head, pump efficiency and bhp requirements

2. Motors:

   a. Type
   b. Rated size of motor hp
   c. Temperature rating
   d. Full load rotative speed
   e. Full load current

3. Complete Pumping Unit:

   a. Maximum overall dimensions

b. Total weight

4. Control Panel

a. Master wiring diagram for all control panel(s)
b. Product data

B. Submit four (4) copies of operation and maintenance manuals including but not limited to the following:

1. Assembly, disassembly, installation, alignment, adjustments, and checking instructions
2. Operating instructions for start-up, routine, and normal operations
3. Lubrication and maintenance instructions
4. Guide to "troubleshooting"
5. Parts list and predicted life of parts subject to wear
6. Outline, cross-section and assembly drawings, engineering data, and electrical diagrams
7. Pump performance curves
8. Programming Manuals

1.4 WARRANTY

A. The manufacturer shall guarantee the pump unit or any part thereof to be free from defects in materials and workmanship for a period of three (3) years from the date of start-up. All consumable parts such as pump seals, oil, grease, etc., shall be considered part of routine maintenance and shall not be covered under the terms of the manufacturer's warranty.

1.5 FACTORY TEST

A. The pump station shall be operationally tested at the manufacturer's plant before shipment. All electrical equipment and controls shall be tested for correct operation. The pumps and pipe shall be pressure tested with water to ensure that no leaks exist. As test stand limitations permit, a full running test of the pumps shall be made, simulating the actual field design conditions. This test shall include capacity, head amperage draw and R.P.M. checks at various points along the pump curve.

1.6 START-UP

A. The manufacturer(s) shall provide the services of trained representative(s) for a maximum period of one day, to assist the contractor with the initial start-up of the pump station. It shall be the responsibility of the contractor to inform all parties of this initial start-up, and to ensure their attendance. The manufacturer's representative shall instruct all personnel attending the start-up in the correct and required operation, maintenance and service procedures for the pump station.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. These specifications were written based upon Grundfos submersible pumps. The pump supplier shall have a service truck and equipment to repair and service pumping stations and shall be available for emergency service with 24 hours.

B. Equipment by other manufacturers will be considered if they are of equal quality and efficiency. Equipment and supplier proposed for this project must meet the following requirements prior to bidding on this project:

1. A list of five (5) satisfactory new pumping stations of similar type and size installed in South Dakota.
2. Evidence of equipment and manpower capability to install and provide future maintenance of the pumping equipment.
3. Ability to provide onsite emergency service with 24 hours.

2.2 PUMP EQUIPMENT

A. The following performance and design requirements are based upon a submersible Grundfos Submersible Pump.

B. General:

1. Sealed, submersible, non-clog, centrifugal pump
2. Pump volute, motor and seal housing shall be cast iron, ASTM A-48
3. All exposed nuts or bolts shall be 316 stainless steel
4. Cast iron discharge elbow for each pump. Pump shall be automatically and firmly connected to the discharge elbow when lowered into the wet well. Sealing by means of gaskets or o-rings are unacceptable.
5. The pump shall be triple protected with a compression fitting and two epoxy potted areas at the power cord entry to the pump
6. Pump shaft shall be stainless steel
7. Pump shall have two mechanical seals separated by an oil filled chamber
8. The pump impellers shall be dynamically balanced
9. The pumping unit shall be explosion proof
10. Each pump shall have steel pump carrier with stainless steel lifting chain rated for the weight of the pump, motor, etc.

C. Performance and Design Requirements:

1. Number of Identical Units: 4
2. Rated Total Dynamic Head, ft: 113
3. Single Pump Capacity at rated Head, gpm: 200
4. Max Speed, rpm: 1,750, 60 Hz
5. Name plate horsepower, bhp: 20
6. Min. Pump Efficiency at Rated Conditions: 50%
7. Pump Discharge Size, inches: 3

8. Vertical Distance from wet well Floor to top of wet well, ft: 17.15 ft and 21.01ft

D. Motor:

1. Furnish motor suitable for operation on 230 Volt, three phase
2. Motor shall be completely sealed, oil filled motor
3. Starter windings shall have Class F insulation and constant speed motors
4. Heat sensors shall protect the motor at temperatures above 120 deg. C and shall activate a warning light on the control panel when tripped
5. Heavy duty lifting lugs shall be cast into the motor housing
6. Starters must be capable of being repaired by local motor service station
7. The motor will be designed for continuous duty operation

E. Protection:

1. The pump shall be equipped with a sensor to detect leakage past the seals
2. Detection of leakage shall activate a warning light installed in the cover of the starter
3. All cables, float cables, signal cables will be Class 1 division 1 rated. All conduit runs will need seal offs

F. Guide Rail:

1. The guide rails shall be a Metal-to-Metal rail system provided by the pump manufacturer and specially designed and fitted for the pump.
2. Pumping unit shall be guided from the slab above the wet well to the discharge elbow at the floor of the wet well by 2, 2-inch stainless steel grade 316 guide rails
3. All fasteners, brackets, nuts, bolts and steel members used in the wet well shall be 316 stainless steel
4. The rail system shall be equipped with a sealing flange/rail guide bracket with machined mating flange matching the base elbow connection
5. Guide rail shall be plumb
6. The rail system shall be furnished with necessary stainless-steel hardware to connect the rails to the aluminum hatch and properly aligned for pump removal

G. Trash Basket

1. Trash Basket shall be Halliday Products or approved equal
2. Model B4B stainless steel basket
3. 316 Stainless steel channel rail system
4. No ladder rungs

H. Accessories:

1. Contractor is responsible for furnishing and installing all accessories and materials called out on the plan sheet(s)
2. Check valves shall be flanged and suitable for raw sewage in horizontal application. APCO series CVS250 resilient swing check valve with external spring, lever and weight suitable for raw sewage application is acceptable. The check valves shall be supported
3. Furnish and install a Thern Commander, 2000 lb Davit Crane w/Hand winch, SS cable and Flush Mount Base

I. Float Switches:

1. Three (3) direct acting float switches
2. Polyurethane foam resin bodies encapsulating mercury type switches
3. Type SJO power cords; minimum 50 feet of cord length each
4. Rated 20 amps at 115 volts
5. Minimum 35' stainless steel chain with plastic coated boat anchor

J. Control Panel:

1. The control panel shall be 48"x60" or as designed, NEMA 4X steel painted enclosure with hinged/lockable cover. All panels and fittings will be installed outside and shall be suitable for outdoor use
2. Breakers, relays, timers and wiring raceway shall be neatly arranged on a removable galvanized steel back plate and stainless steel dead front door
3. Selector switches and indicating lights shall be mounted on and through die cut openings in the enclosure door
4. Control panel shall conform to NEC specifications and shall be UL listed and labeled in accordance with UL standard No. 508 for industrial control panels
5. A pump alternator with on/off switch shall be included to change sequence of pump operation upon completion of each pump cycle. One seal failure relay, fuse protection with fuse failure monitor for alarms
6. A phase monitor included to protect motors from single phasing, low voltage, voltage balance and reversing phase
7. Two (2) 20-HP 230v 3-phase pump contactors with adjustable overload relays with running time meters included, panel work lights and required control panel push buttons
8. Indicator lights:

   a. Red – Phase Failure
   b. Red – High water
   c. Red – High temperature
   d. Red – Pump failure
   e. Green – Pump #1 running
   f. Green – Pump #2 running

2.3 ACCESSORIES

A. Remote Alarm Circuit: Include contacts for connection to remote alarm panel.

1. Controls to be provided with 8-channel cellular auto-dialer capable of 8 call-out numbers and 8 alarm notifications. Verify with owner the cellular service provider. Panel provider to provide first year of cellular service. Auto-dialer to be mounted in control panel and antenna to be mounted on exterior of control panel

END OF SECTION

SECTION 402300 – PROCESS PIPING, VALVES, AND ASSOCIATED EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Process Piping, Fittings, Valves.
2. Process Piping Accessories and Related Equipment.
3. Testing of Installed Piping.

B. Related Sections:

1. Section 099600 – High Performance Coating for Process Equipment and Piping

1.2 REFERENCE

A. American Society of Mechanical Engineers (ASME)

1. B31.1.0 ASME code or pressure piping

B. American Society for Testing and Materials (ASTM):

1. A53-90b - Specification for pipe, steel, black and hot dipped zinc coated welded and seamless
2. A126-93 - Specification for gray iron castings for valves, flanges and pipe fittings
3. A240.83 - Specification for heat- resisting chromium and chromium- nickel stainless steel plate, sheet and strip for pressure vessels
4. A312 - Specification for Seamless, Welded, and Cold Worked Austenitic SS Pipe
5. A351 - Specification for Castings, Austenitic, for Pressure Containing Parts
6. A380 - Specification for Corrosion Protection, Acid Pickling
7. A403 - Specification for Wrought Austenitic Stainless Steel Piping Fittings
8. A480 - Specification for Stainless Steel Finish
9. A530-88 - Specification for General Requirements for specialized carbon and alloy steel pipe
10. A536 - Specification for Ductile Iron Castings
11. A554 - Specification for Welded Stainless Steel Mechanical Tubing
12. A554-81 - Specification for as-welded wrought austenitic stainless steel fittings for general corrosive service at low and moderate temperatures
13. A743 - Specification for Castings, Iron- Chromium-Nickel, for General Applications
14. A744 - Specification for Castings, Iron- Chromium-Nickel for Severe Service
15. A774 - Specification for Stainless Steel Welded Fittings

16. A778-82 - Specification for welded unannealed austenitic stainless steel tubular products
17. D1171 - Specification for Elastomer Deterioration
18. A774-91 - Specification for as-welded wrought austenitic stainless steel fittings for general corrosive service at low and moderate temperatures
19. A778-90a - Specification for welded, unannealed austenitic stainless steel fittings for general corrosive service at low and moderate temperatures
20. B62-93 - Specification for composition bronze or ounce metal castings
21. F439-93a - Specification for socket type chlorinated polyvinyl plastic (CPVC) pipe fittings
22. F441-93 - Specification for chlorinated polyvinyl chloride (CPVC) Schedule 40/80 piping
23. D1785-93 - Specification for polyvinyl chloride (PVC) Schedule 04/80/120 (for pressure piping applications
24. D2310-91 - Classification for machine - made (fiberglass) reinforced thermosetting resin pipe
25. D2464-93 - Specification for threaded poly (vinyl chloride)(PVC) plastic pipe fittings, Schedule 80
26. D2467-93 - Specification for socket type poly (vinyl chloride) (PVC) plastic pipe fittings
27. D2997-90 - Specification for centrifugally cast (fiberglass) reinforced thermosetting resin pipe
28. D3034-93 - Specification for type PSM poly (vinyl chloride)(PVC) sewer pipe and fittings
29. D3350-93 - Specification for polyethylene plastic pipe and fittings material

C. American Water Works Association (AWWA)

1. C104-95 - American National standard for cement - mortar lining for ductile iron pipe and fittings for water
2. C110-98 - American National Standard for ductile iron and gray iron fittings, 3- inch through 48-inch for water and other liquids
3. C111-00 - American National Standard for rubber gasket joints for ductile iron and gray iron pressure pipe and fittings
4. C115-99 - American National Standard for flanged ductile iron pipe with threaded flanges
5. C150-96 - American National Standard for flanged ductile iron pipe with threaded flanges
6. C151-96 - American National Standard for ductile iron pipe, centrifugally cast- in-metal molds or sand line molds, for water and other liquids
7. C153 - American National Standard for Ductile Iron Compact Fittings for Water Service
8. C200-97 - Standard for steel water pipe 6-inch or larger
9. C203-97 - Standard for coal-tar protective coatings and linings for steel water pipelines - enamel and tape - hot applied
10. C207-94 - Standard for steel pipe flanges for waterworks service - sizes 4-inch through 144-inch
11. C500-93 - Standard for gate valves, for water and sewerage systems
12. C504-00 - Standard for rubber seated butterfly valves
13. C508-93 - Standard for swing check valves for waterworks service, 2-inch through 24-inch NPS

14. C517-09 - Standard for Resilient-Seated Cast-Iron Eccentric Plug Valves
15. C606-97 - Standard for grooved and shouldered joints

D. American Iron and Steel Institute (AISI):

1. 304 - Specification for 304 Stainless Steel Plate
2. 304L - Specification for 304L Stainless Steel Plate
3. 316 - Specification for 316 Stainless Steel Plate
4. 316L - Specification for 316L Stainless Steel Plate

E. American National Standards Institute (ANSI):

1. B-16.1 - Specification for Pipe Flanges
2. B-16.5 - Specification for Pipe Flanges

1.3 SUBMITTALS

A. Shop drawings including:

1. Location and style of pipe hangers supports and anchors.
2. Length of pipe and pipe spools for exposed pipelines.
3. Detailed piping layout for connection to existing and proposed pipe and equipment.
4. Product data on valves, fittings, couplings, and other piping accessories.

B. Certifications as required by Article 1.4 below.

C. Leak Test Data and Results.

D. Operation and maintenance data. Clearly identify all pertinent drawings of valves, operators, etc. and cross off unrelated data.

1.4 QUALITY ASSURANCE

A. All pipe welding shall be done by ASME qualified welders.

B. All grooved joint couplings, fittings, valves, and specialties shall be of a single manufacturer.

C. All castings used for coupling housings, fittings, and valve bodies shall be date stamped for quality assurance and traceability.

D. Pipe Source Quality Control:

1. Test pipe prior to shipment in accordance with the appropriate standard under which the pipe is manufactured.
2. Submit certified copies of tests to Engineer before shipment.

1.5 DELIVERY, STORAGE AND HANDLING

A. Inspection:

1. Inspect all pipe and products as it is received to determine damage and/or missing parts.
2. Notify Engineer of any missing, damaged, or defective products.
3. Remove all products found to be defective by the Engineer from the site.
4. Repair or replace damaged items in accordance with the manufacturer's instructions.

B. Handling and Storage: Handling and storage of products shall be in accordance with Section 22 of AWWA C600.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS

A. All interior process piping shall be flanged ductile iron, except as noted on the Drawings.

B. No buried ductile iron shall be used, except pipes under structures, encased in concrete may be DIP.

C. Ductile iron pipe shall conform to the requirements of AWWA C151.

D. All interior ductile iron pipe shall be ANSI/AWWA thickness Class 50 (minimum).

E. The weight, class or nominal thickness, manufacturer's mark, casting period, and the letters "DI" shall be cast or stamped on the pipe.

F. Flexible grooved joints shall be in conformance with AWWA C606.

G. Flanged pipe shall be in accordance with AWWA C115. Pipe barrel shall extend past flange face and then machined flush to prevent threads from exposure to pipe pressure and corrosion. For all process pipe use 1/8-inch thick rubber ring gaskets.

H. Fittings for flanged or grooved ductile iron pipe shall conform to AWWA C110 / ANSI A21.10. Flanges shall conform to ANSI B16.1 Class 125. Mechanical joint glands, bolts, and gaskets shall be in accordance with AWWA C111. Gaskets shall be full- face gaskets. Fittings shall have the pressure rating, nominal diameters, manufacturer's identification, number of degrees or fraction of a circle and the letters "DI" or "ductile" cast upon them. All ductile iron pipe and fittings shall be lined with cement mortar in accordance with AWWA C104 unless otherwise noted in this Section or on the Drawings. Pipe for encasement or buried use shall have an asphaltic cement coating in accordance with AWWA C151 no less than 1 mil thick. Pipe for interior use shall be coated in accordance with Section 099600.

I. Ductile Iron pipe shall be cement lined ANSI/AWWA minimum pressure Class 125. Gaskets shall be Viton/Fluorel FKM.

J. Ductile iron pipe and fittings as manufactured by American Cast Iron Pipe company, U.S. Pipe, or equal, and which meet these specifications will be accepted.

K. Cement Lined Ductile Iron Pipe and Fittings:

1. Furnish cement-lined pipe and fittings for all non-buried piping as shown on the Plans.
2. Formulate cement lining for compatibility with treated water. Bond between cement and metal shall be sufficient to permit a strain in metal of 0.001 inch per inch without damage to cement.
3. Ensure finished lining is a minimum of 0.010 inch, has a hardness of approximately 5 to 6 on the Mohs Scale, and density of 2.5 to 3.0 grams per cubic centimeter.
4. Formulate lining to withstand thermal shock of 350 degrees F without crazing, blistering, or spalling, and show a maximum weight loss of 3 milligrams per square inch when tested in accordance with ASTM C283. Provide corrosion resistance from solution between pH 3 to pH 10 at 125 degrees F.
5. Factory assemble flanges on pipe prior to glossing. Use not more than one field cut pipe per pipe run. Field cut for closure purposes only. Field cut pipe that spalls, fish scales, or crazes more than 1/8 inch from cut section is not permitted. Follow manufacturer's recommendations for cutting pipe.
6. The applicator shall have a minimum of 5 years of successful experience in the application of high temperature cement linings for the wastewater industry. All cement lining of pipe and fittings should be from one manufacturer.
7. Gaskets shall be full faced rubber rated for the fluid medium that the pipe carries.
8. Bolts shall be carbon steel ASTM.

2.2 STAINLESS STEEL PIPE AND FITTINGS

A. Type: Seamless to comply with ASTM A813

B. Schedule: Sch 40

C. Grade:

1. 304 for Drinking Water Applications
2. 316 for Raw Water and Sanitary Sewer Applications

D. Dimensions: Comply with ASTM A312

E. Fittings:

1. Grade: to match pipe grade
2. Type:

a. Piping 1.5 inch and Smaller: Sock welding.
b. Piping greater than 1.5 inch: Butt welding.
c. Threaded Fittings to comply with ASME B1.20.1
d. Butt-welding Fittings to comply with ASTM A403/A403M
e. Socket-welding to comply with ASTM A403/A403M
f. Flanged Fittings:

1). Welding neck, slip on, socket welding, lapped or threaded
2). Comply with ASTM A182/A182M
3). Class: ANSI 150
4). Facing: Raised or flat face
5). Backing flanges shall be stainless steel matching pipe grade and comply with ASTM A351/A351M

g. Flanged Connection: As required to connect stainless steel piping to fittings and equipment.

F. Gaskets shall be full face rubber rated for the fluid medium that the pipe carries.

G. Bolts shall be stainless steel, grade matching the pipe material.

2.3 VALVES

A. General:

1. All buried valves shall be protected from corrosion.
2. All buried valves shall be equipped with valve boxes and extension stems.
3. Extension stems for valves within structures or tanks shall be non-corrosive metal material, hot dipped galvanized steel or painted with 2- component polyamide epoxy coating system in accordance with Section 099600. Extend all stems to within 6- inches of top of structure or grade. Key and fasten stem to valve operating nut securely.
4. Extension stems, top nut and bottom socket shall be stainless steel if used in submerged conditions.

B. Operators:

1. Furnish geared manual operators for all exposed gate valves 6-inches and larger and for buried plug valves of all sizes that are not shown to receive an electric, pneumatic or hydraulic actuator.
2. Design geared operators to be totally enclosed and equipped with a 12-inch handwheel if located within 6-feet of floor, or a chain wheel if located more than 6-feet from the floor. Size actuator components to withstand a pull of 200 pounds, but not require more than 80 pounds rim pull. Provide adjustable open position memory stop lever on valves smaller than 6-inches. Valve manufacturer shall install operator on valves.

C. Handwheel Operators:

1. Handwheel Operators shall have a cast bronze lift nut machined to accurately mate with the operating stem.
2. Ball bearings shall be provided above and below the flange on the lift nut to take the thrust developed while opening and closing the valve.
3. Bearings shall be housed in an enclosed weatherproof housing and shall be furnished with lubrication fittings.
4. Each unit shall be fitted with a handwheel marked with direction of opening.
5. Handwheels shall be of such diameter that handwheel pull shall not exceed 40 lb. on the rim.
6. Handwheels shall be removable and shall be cast iron or fabricated steel.

D. Pressure Reducing Control Valves

1. Function :

    a. The Pressure Reducing Control Valve shall automatically throttle to reduce a higher incoming pressure and maintain an accurate and constant lower downstream pressure regardless of changing flow rate and/or inlet pressure. If downstream pressure increases above the pilot spring setting, the valve shall close.

2. Cla-Val Model 90-01 or equal
3. Size and quantity per plan
4. Body & Cover: Ductile Iron
5. Pattern: Globe
6. Main Valve Trim: Bronze, Stainless Steel
7. Seal: Bronze, Stainless Steel
8. Stem, Nut, and Spring: Stainless Steel
9. Seal Disc: Buna-N Rubber
10. Diaphragm: Nylon Reinforced Buna-N Rubber
11. Internal Trim Parts: Stainless Steel: Bronze; Brass
12. Pressure Rating: Class 150 (250 psi max)
13. Coating: Manufacturer's standard fusion bonded epoxy
14. End Detail: Flanged
15. Optional Accessories Required:

    a. Position Indicator with Air Release Model X101 AR

16. Pilot Control

    a. Body & Cover: Stainless Steel
    b. Pilot Trim: Brass & Stainless Steel
    c. Rubber: Buna-N
    d. Connections: FNPT
    e. Pressure range: 2-30 psi
    f. Pressure setting: 10 psi
    g. Control Tubing: Stainless Steel
    h. Control Fittings: Stainless Steel

E. Gate Valves

1. Non-buried gate valves shall follow City of Rapid City Standard specifications except for the following:

    a. Connection: ANSI 150# flanges
    b. Coating: Fusion Bonded Epoxy
    c. Gate valves shall have hand wheel operator

2.4 FLANGE COUPLING ADAPTERS

A. Furnish ductile iron flange adapters where shown on the drawings. Coordinate with Engineer in locations where adapters are needed for assembly but are not shown on the drawings,

B. Design adapters to permit flange fittings to be installed on plain end pipe without welding or threading.

C. Use Romac Industries RFCA, or approved equal.

2.5 RETAINER GLANDS

A. Furnish retainer glands for all buried pipe connections to fittings and valves, and where otherwise indicated.

B. Retainer glands shall be Ebaa Iron Series 1100 MegaLugor or approved equal.

2.6 PIPE HANGERS AND SUPPORTS

A. A. Install hangers and supports for piping as shown, or, if not shown, at intervals not to exceed 10 feet for pipes 8 inch and larger, 7 ft for pipes 4 and 6 inches and 5 ft for pipes smaller than 4 inches. Check valves 6 inch and larger will be supported. Hangers and supports shall be installed in accordance with the manufacturer's recommendations, using inserts for anchor bolts, rated for the loads imposed. Pipes will be supported from floor. Professional quality supports and hangers made by Grinnell, Envil International, Gulf State Hangers or Piping Technology and products or approved equal shall be provided.

Pipes above 3 ft from floor will be provided with U-bolt tie downs. The elements may be stainless steel, hot dip galvanized, or carbon steel painted per specifications. The smaller pipes and electrical conduits may be supported on HDG unistruts, clamps and bolts. The unistruts will be anchored with minimum two HDG concrete anchors. The base plate will be anchored to the floor with minimum two (2) HDG concrete wedge anchors. Supports called out here is minimum required. The contractor is responsible for providing adequate support to all pipes and equipment. Pipes will be supported from ceilings using clevis hanger. The contractor will run an 1-1/2"x1-1/2" angle iron between trusses to support hangers if required.

B. Professional looking and painted as process system supports are required. Warped, bent, crooked supports will not be accepted. Ferrous metal supports will be sand blasted cleaned and painted as process piping to match.

C. Supports and hangers shall conform to ASME B31.1.0, except where modified by the requirements of this specification. Design support systems using stock or production parts. Design hangers to support pipe in all conditions of operation. Allow free expansion and contraction and prevent excessive stress resulting from transferred weight being induced into the pipe connected equipment.

D. Pipe attachments for horizontal piping shall be clamps whenever possible. Provide means of vertical adjustment after installation. Hanger rods shall be subject to tensile loading only. Provide linkage at locations of lateral or axial movement is anticipated.

E. Paint hangers and supports prior to installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Determine location of existing pipe, valves or other underground structures associated with or potentially interfering with proposed work. Base determination on existing records and any exploration and excavation necessary.

3.2 INSTALLATION

A. Exposed Piping:

1. Install exposed piping at elevation and location shown on drawings. Engineer must approve any deviations.
2. Fit flange joints so contact faces bear uniformly on gasket. Bolt stress shall be uniform when tightened.
3. Install pipe hangers and supports per manufactures recommendations.

B. Encasement:

1. Wrap all pipe and fittings.
2. Clean all surfaces of pipe and appurtenances prior to wrapping.
3. Provide sufficient slack to prevent damage during backfill.
4. Provide minimum 6-inch overlap at joints.
5. Secure overlap and joints with compatible adhesive tape.
6. Repair damaged wrap with tape or polyethylene patch.

3.3 FIELD QUALITY CONTROL

A. Hydrostatic Leaking Testing:

1. Test new pipe after installed and partially backfilled (if yard pipe).
2. Testing shall be observed by the Engineer.
3. Piping shall be tested at 120 psi. for a minimum of 2 hours.
4. Expel all air from pipe before beginning hydrostatic test. Install taps necessary to accomplish this and plug as approved by engineer. Ensure pressure does not exceed any part within the system.
5. Test shall not take place until 5 days have elapsed for all thrust blocking and concrete encasement, duration can be reduced to 2 days if high early strength concrete is used.
6. For each tested pipe segment, record the following for submittal to the Engineer.

    a. Date and time of test.
    b. Ambient air temperature at beginning and end of test.
    c. Identification of pipe segment by process name and pipe location.
    d. Pressure readings every 30 minutes for the duration of the test.

7. Engineer will review pressure data, and examine exposed piping, fittings, valves, etc. Contractor shall repair any leaks.
8. No leakage will be permitted.

3.4 PROTECTION

A. Where new facilities have been physically connected to existing facilities, Contractor shall, at all times when pipe installation is not in progress, and at times when directed by the Engineer, keep pipeline openings, tightly closed with preformed stoppers, caps, plugs, sealed plywood, sheet metal bulkheads, sandbags, or other means acceptable to the Engineer. Closures shall be suitable to prevent entrance of animals, foreign materials, and extraneous water (storm water, ground water, dewater discharges, and other sources) into the system. Engineer may direct Contractor to secure various openings and to resecure previously closed openings, all at no additional cost to the Owner.

B. Protect underground and overhead utility structures from damage. Provide temporary support, adequate protection and maintenance of all structures, surface and subsurface drains, sewers, and other obstructions encountered. Repair or replace any damage to the above.

END OF SECTION