# 6.3 BOLTS

All field-installed bolts, nuts, and washers used inside either the pump or valve chamber shall be made of 316 stainless steel.

# 6.4 FASTENERS

All concrete fasteners used for installation of braces, brackets or boxes shall be stainless steel wedge type stud anchors. Anchor holes shall be drilled to the manufacturer's recommended depth. Pump base anchor studs shall be sized as follows:

- Four-inch (4") pumps and smaller  $=\frac{5}{8}$ " minimum. • Six-inch (6") and eight-inch (8") = 1" minimum.
- Pumps larger than eight-inches (8") shall be installed with stainless steel anchors sized per the pump manufacturer instructions.
- 6.5 FLOATS AND SETTINGS

# A. General

Floats shall be located near the flow of incoming sanitary lines. All floats shall be located away from the turbulence of the incoming flow. Sewage shall not rise to the level of the incoming gravity lines or the detention pipes during normal pump operation.

#### B. Float Levels

The following levels shall guide the setting of float levels.

Off Float	The entire pump shall be covered at the Off Level
First Pump	No less than $1-1/2$ feet above the top of pump motor
Second Pump	No less than 2 feet above the top of pump motor
High Level Alarm	No less than 2-1/2 feet above top of pump and no more than 1-inch below detention tank pipe

#### C. Float Leads

Float leads shall be hung with stainless steel Kellums (or District-approved equal) wire mesh grips from a stainless-steel bracket supplied by Halliday (or District-approved equal). The bracket shall be attached to the wet well hatch cover or firmly bolted to the concrete immediately below the hatch cover.

#### D. Float Wires

Float wires shall be neatly routed from the wet well to the valve through the access sleeve, without excessive wire strain or pull. Wire length on all float wires shall be such that each float may be adjusted to the bottom of the station wet well.

Acceptable Manufacturer: Pump level floats are to be either Flygt model EH-10 or Anchor Scientific type S-Roto floats.

#### 6.6 ACCESS HATCHES

The pump and valve chambers access hatches shall be aluminum, rated for a 300 lb load. Door size and orientation shall be as indicated on the drawings. The access frame and cover shall be flush with the top of the concrete, complete with hinges and locking mechanism, upper guide holder and level sensor cable holder. Frame shall be securely placed, mounted above the pumps. Hatches shall be equipped with form skirts, sized for the slab top thickness. Doors shall be provided with padlock lugs.

All access hatches shall be an integrated District-approved orange safety grate for open hatch fall protection.

Acceptable Manufacturer: Hatches shall be Halliday Model S1S or S2S (or District-approved equal) with protective grating option.

#### 6.7 SAFETY POST

On the top two ladder rungs under the access provide stainless steel or aluminum safety extension post manufactured by Halliday (or District-approved equal). All bolts and hardware shall be stainless steel. The safety post shall be manufactured so that the safety post can be attached to top two rungs. Contractor shall verify required spacing.

#### 6.8 INTRINSIC BARRIERS

The wet well area of the pump station is considered by the NFPA to be a hazardous area. Therefore, intrinsic barriers shall be installed where the level floats terminate in the control panel to prevent any explosions form occurring due to electrical arcing in the wet well area.

Acceptable Manufacturer: Sym Com Model ISS-105 or approved equal.

#### **SECTION 7 - ELECTRICAL**

#### 7.1 ELECTRICAL

The selected pump supplier shall be directly responsible for all panel fabrication and component installation. The pump control panel shall meet the following specifications:

#### A. Panel Configuration

The pump controls shall be housed within a NEMA-3R, enclosure, constructed from 12-gauge grade 304 stainless steel, with a #4 finish. The enclosure shall consist of three sections in an "H" shape cabinet, with a total overall dimension of 64" high by 70" wide by 24" deep. Each section shall be joined together at the exterior seams with a continuous weld, so that a weather-tight seal exists between the three sections. With the exception of inside corner seams, all exterior seams shall be "MIG" welded, ground smooth, and brush finished. The cabinet's exterior inside corner seams, shall be "TIG" welded.

Section #1 and Section #3 shall form the two outer legs of the cabinet, with Section #2 forming the bridge between each leg. Section #2 shall be flush with the sides of Sections #1 and #3 closest to the wet well and valve chamber, to allow Section #2 outer panel door to open wider than 90 degrees. The interior of Section #1 shall be sub-divided into two smaller compartments, #1a and #1b. The bottom of sub-compartment #1b and the bottom of Section #3 shall be of open base construction, with an angle iron support frame welded to the inside bottom of the two sections. The base angle iron shall be 2" x 2" x 1/4" grade 304 stainless steel. Two removable solid ring 5/8" - 11 tpi. lifting eyes shall be mounted over the top of Sections #1 and #3. Gasketed stainless steel 5/8" bolts shall be provided for eye replacement following cabinet installation.

All compartment exterior doors shall be mounted to the enclosure with stainless steel full-length continuous hinges. Hinges shall be welded to the enclosure. All compartment exterior doors shall be protected with stainless steel drip shields. Self-gripping flange mounted EDPM gasket material with a wire-reinforced base, shall be used to form the seal between the outer doors and the surrounding enclosure flanges. Gasket material shall be EMKA #1011-05. All outer compartment doors shall be secured with three-point interior stainless steel latching mechanism attached to stainless steel exterior mounted handles. The handles shall be capable of accepting padlocks. Latching mechanisms shall be Austin #48-5655XSS.

Full sub-panels shall be mounted within each compartment interior. The sub-panels shall be formed from mild steel. Panel edges shall be turned down to form a <sup>3</sup>/<sub>4</sub>" lip. All panels shall be painted white and mounted on 3/8"-16 standoff studs per NEC and UL 508.

All hardware on the panel exterior shall be stainless steel with the exception of the temporary lifting eyes.

#### B. Section #1 Panels

Section #1 shall be a one door NEMA 3R enclosure with a full inner barrier between Sections #1a and #1b. An opening shall be cut from the back of the Section #1 compartment to provide access into Section #2 when the Section #1 sub-panels are removed. The cut-out opening shall be 38" x 10", to provide a 1" stiffening perimeter around the sides of Section #1a and #1b.

Section #1a shall be accessed through the Section #1 exterior door. This compartment shall be used for installation of the Mission MyDro Cellular Dialer.

Section #1b shall be accessed through the Section #1 exterior door. This section shall have an open bottom with a 2" x 2" x <sup>1</sup>/<sub>4</sub>", grade 304 stainless steel angle iron support frame surrounding the bottom interior opening. This compartment shall be used as an entrance point for the following conduits stubbed through the panel's concrete mounting pad:

• Conduit from the valve chamber control junction box shall be minimum two-inch (2").

#### C. Section #2 Panel

Section #2 shall be accessed through an exterior door, which shall be hinged from the left-hand side. The compartment interior shall include a 12-gauge mild steel continuous hinged inner door painted white unless using converter option (Section 7.5). The inner door shall be set back 2" from the outer door, hinged from the left side and

secured with a single point latch knob. Door screws shall not be used. All control switches, hour and event meters, GFI receptacles, indicator lights and circuit breaker toggles, shall be mounted on the hinged inner door. There shall be a one hundred ten volt (110 V) power receptacle inside the control panel located outdoors to facilitate maintenance. An opening shall be cut from each side of Section #2 to provide access into Sections #1a, #1b and #3 when the adjacent corresponding sub-panels are removed. The size of the cut outs shall be 38"x10", to provide a 1" stiffening perimeter around the sides of Section #2. This compartment shall be performed per NFPDA, NEC and UL-508A specifications. N.E.C. gutter spacing shall be observed. A minimum of 6" additional D.I.N. rail shall be provided for future mounting expansion. All component mounting and wiring shall be completed per the given specifications.

- D. Section #3 Panel
- Power service conduit shall be two-inch (2") diameter as approved by electric service provider.
- E. Thermal Magnetic Breakers allowed.
- F. Mercury Level Sensors (Float Switches) in the pump control panel.
- G. Fluorescent Work Light and Panel Heaters accumulation of condensation.
- H. Wiring noted on drawing.
- I. Lightning Arrestor service entrance disconnect switch enclosure.
- J. Phase Sequence and Loss Monitor control fuse.
- K. Relays
- pin octal base D.I.N. rail mounted.

IDEC

Diversified

#### **Acceptable Manufacturer:** Control Relays Time Delay Relays

- L. Main Terminal Strip bottom of the Section #2 enclosure.
- M. Control Power transforme
- N. Control Panel Name Plate nameplate shall include the following:
- Manufacturer's job number
- Manufacturer's name, location, phone number Site name

# • Pump model, pump serial numbers, horsepower, voltage, amperage

# 7.2 THREE PHASE MOTORS

• All pumps shall operate using 480, 240 or 208 VAC three-phase power. preferred power source.

# 7.3 ELECTRICAL POWER SUPPLY

# 7.4 THREE-PHASE SUPPLY CONTROL OPTION

- A. Magnetic Motor Starters
- Pumps 30 horsepower and larger shall be supplied with soft starters with bypass contactors.

# District-approved equal).

B. Soft Starters board and paralleling bypass contactor.

The SCR based power section shall consist of six (6) back-to-back SCR's and shall be rated for a minimum peak inverse voltage rating of 1,500 PIV. Units using TRIACs or SCR/diode combinations shall not be accepted. Resistor/capacitor snubber networks shall be used to prevent false firing of SCRs due to dv/dt characteristics of the electrical system.

Section #3 shall be accessed through it's own exterior door, which shall be hinged from the right hand side. Both the electric meter and the service disconnect shall be mounted inside this compartment. The exterior door shall have a Lexon (or District-approved equal) plastic window to allow the electric meter to be read from outside the cabinet. The window shall be a Hoffman #A-PNK95NFSS. An opening shall be cut from the back of the Section #3 compartment to provide access into Section #2 when the Section #3 sub-panels are removed. The cut-out opening shall be 38"x10" to provide a 1" stiffening perimeter around the sides of section #3. This section shall have an open bottom with a 2" x 2" x <sup>1</sup>/<sub>4</sub>" (304) stainless steel angle iron frame surrounding the bottom inside opening. This compartment shall be used as an entrance point for the following conduits stubbed through the panel's concrete mounting pad:

• Pump motor conduit from power junction box in valve chamber shall be two-inch (2") diameter.

Individual thermal magnetic circuit breakers shall be provided for branch disconnecting service and short circuit protection of all motor and auxiliary circuits. Combination circuit breaker and overload mechanism shall not be

Four (or 2 if using level transducer) mercury level sensors or floats shall be provided with sufficient length cord to extend uninterrupted to the valve chamber control junction box. The four float levels shall be: Pump Off, Lead Pump On, Lag Pump On, and Wet Well High-Water Alarm. All floats shall be connected to an intrinsic safety barrier located

A 12-inch fluorescent work light with a safety lens shall be mounted inside the top of the control panel without penetrating the panel outer skin with screws or fasteners. The light shall be operable with an on/off switch mounted on the inner door. Low wattage strip heaters shall be installed on the inner compartment doors 1a, 2 and 3 to prevent the

Acceptable Manufacturer: Cabinet heaters shall be Watlow #02012096A-40 (or District-Approved equal).

All wires in the pump control panel shall be numbered with either clip sleeve or heat shrink markers. Wrap on or adhesive type wire markers shall not be allowed. Control panel schematic shall show wire and terminal numbers. All rungs shall be numbered with relay contacts referenced by these numbers. Relay contacts shall have socket terminals

A silicon oxide varistor type lightning arrestor shall protect the pump station. The arrestor shall be sized for the incoming power service voltage. This arrestor shall be located in the pump control panel externally mounted to the

A phase sequence and loss monitor shall protect all stations supplied with three-phase power. This monitor/relay shall be a single pole, plug-in-type with automatic reset. The relay shall interrupt the control circuit immediately after the

Acceptable Manufacturer: The relay shall be a Macromatic PMPU series or approved equivalent.

For pump stations supplied with three-phase power, all control and time delays shall be at a minimum DPDT 8 or 11

RR2-ULAC12 RTE-P11-120VAC TBC-120-ABA

The main terminal strip at the lowest portion of the sub panel shall have a minimum clearance of six inches to the

The control power shall be 120 volts. If a 120 volt, single-phase power source is not available, a minimum 3 KVA

shall be supplied with primary and secondary protection. Individual 120-volt circuit breakers shall be provided for each separate power requirement. A 5-ampere fuse shall be provided on the load side of the control circuit breaker. Three (3) spare control fuses shall be provided in a separately mounted three-pole fuse-block. The Mission MyDro Cellular Dialer shall be powered from a separate dedicated 15-amp circuit breaker, fed from the control circuit. A 15-amp ground fault interrupter receptacle shall be mounted on the inner door of the control panel.

All pump control panels shall have a 4"x6" phenolic name plate firmly fastened to the lower right front side of the cabinet inner door or the back panel in the converter option and pursuant to requirements of the electrical supplier. The

• Any station requiring pumps greater than 15 horsepower shall be powered from a three-phase public power system. • Any station requiring pumps 15 horsepower or less may use the single-phase power source option upon District approval and based upon a cost analysis presented by the designer/owner. District approval shall be determined on a case-by-case basis and upon a review of a cost analysis by the design engineer. Three-phase power is the District-

Electrical power for pump stations shall be 3-phase unless special approval is granted by the District.

The three-phase electrical supply installations shall meet the following requirements:

Magnetic across the line horsepower rated motor starters shall be supplied for each pump under 30 horsepower.

Acceptable Manufacturers: Cutler Hammer series CE-15 with series C-316 overloads and 120-volt coils (or

The solid-state reduced voltage starter shall be UL and CSA listed and consist of an SCR based power section, logic

The logic board shall be mounted for ease of testing, service and replacement. It shall have a quick disconnect plug-in connectors for current transformer inputs, line and load voltage inputs and SCR gate firing output circuits. The logic board shall be identical through all ampere ratings and voltage classes and shall be conformally coated to protect from environmental conditions.

The paralleling bypass contactor shall energize when the motor reaches full speed and close/open under 1x motor current. If across the line starting duty is desired the contractor shall be fully rated for such. The contactor shall utilize an energy balanced contact closure to limit contact bounce and an intelligent coil controller which optimizes coil voltage during varying system conditions. The coil shall have a lifetime warranty.

The overload protection shall be electronic and be based on an inverse time/current algorithm. Overload protection shall be adjustable and Class 10/20 shall be selectable. Units using bimetal overload relays are not acceptable. Over temperature protection (on heat sink) shall be standard.

The solid-state logic shall be phase sensitive, and shall inhibit starting on incorrect rotation. Improper phase rotation shall be indicated on the starter.

Starters shall protect against a phase loss/unbalance condition shutting down if a 35% current differential between any two phases is encountered.

A normally open (NO) contact shall annunciate fault conditions, with contact ratings of 60 VA resistive load and 20 VA inductive load. In addition, an LED display shall indicate type of fault (current trip, phase loss, phase rotation).

- The following adjustments are required:
- 1. Ramp time: 1-45 seconds 2. Initial torque: 100-200% current
- 3. Current limit: 100-500% current
- 4. FLA of motor: 4-1 range of starter

Smooth stopping shall be available to provide a linear voltage deceleration. It is to be adjustable from 1-45 seconds. Acceptable Manufacturers: ABB or Square D

C. Pump Control Circuits and Indicator Lights Individual pump control circuits shall be provided with HOA (Hand-Off-Auto) switches, elapsed time meters and re-settable event counters for monitoring pump cycles. Also provide amber pump running lights, green power available light and individual red indicator lights to alarm seal leaks and pump failures. Indicator lights shall be 30 mm full-voltage type ( or District- approved equal). LED type lights or LCD-type counters shall not be accepted.

The above switches, lights, meters and counters shall be mounted on the inner door of Section #2 of the control panel.

#### 7.5 SINGLE PHASE CONTROL OPTION (AS APPROVED)

Because of the higher probability of electrical failure from using a phase converter, this type of system shall only be considered after investigating the feasibility of having three-phase power brought onto the job site. Three-phase power shall be used unless special approval is granted by the District upon review of a cost analysis provided by the design engineer. All phase converter installations shall meet the following requirements:

A. Single Phase 240 Volt Power Source

The supplied single-phase 240-volt source shall be stepped up to single phase 480 volts to operate the pump motors that are above 15 horsepower. The power transformer shall be shielded, isolated, and sized to handle 1.5 times the total pump load requirement.

#### 7.6 STATION INTERIOR WIRING

Wet well level control float leads shall be hung with stainless steel Kellums (or District-approved Equal) wire mesh grips from a series J Halliday (or District-approved equal) stainless-steel cable holder. The holder shall be bolted to the inside of the wet well hatch, immediately below the hatch cover and shall be located to not interfere with the wet well entrance steps. The pump power cables shall be hung with stainless steel Kellums (or District-approved Equal) wire mesh grips from the upper pump guide rail brackets. Power and control wiring shall be routed with adequate separation. All excess wires shall be rolled up inside the valve chamber.

Passage of the pump and float wires from the pump chamber to the valve chamber shall be made through two open ended lengths of 4-inch PVC conduit installed between the valve and pump chamber. A minimum of 12" separation shall be maintained between the control and power wiring.

There shall be no electrical connections made in the pump chamber. All wiring shall run unbroken from the pump chamber to the valve chamber through the 4-inch PVC conduits and terminated inside a 12" x 10" x 6" plastic hinged, watertight junction box. There shall be two junction boxes. One for control wiring and one for power cables. Wire connection shall be DryConn or approved equal waterproof connectors.

Acceptable Manufacturer: Carlon #CS12106 or District-approved equal.

Valve chamber junction box cord connections are to be made with liquid tight nylon cord connectors T&B or approved equal.

All wiring in the valve chamber shall be routed and fastened securely along the chamber walls with non-corrosive wire straps and fasteners.

7.7 FIELD WIRING SPECIFICATIONS

Control panel wiring shall be as follows:

- All wiring installed on the line and load side of the electric meter shall be THHN copper wire. • Electric service to the station shall be sized to provide the maximum total station amperage with all installed pumps
- running under a fully loaded condition. • All pump station control panels shall be provided with a minimum 100-amp service.

# 7.8 CONDUIT SPECIFICATIONS

The following conduit sizes are to be used on any combination of pumps with a total station HP of less that 60 HP. For larger HP stations, contact the District's maintenace supervisor for specific conduit sizes.

- A  $2\frac{1}{2}$  conduit shall be used to run from a public electrical system (as approved by electric service provider) to an electric meter mounted in control panel Section #3. The meter and disconnect switch are to be connected together with a rigid steel conduit nipple within Section #3 of the panel.
- A  $2\frac{1}{2}$ " conduit shall be used to run all power wires from the bottom of Section #3 in the control panel, to the back of the 12" x 10" x 6" power junction box in the valve chamber.
- A  $2\frac{1}{2}$ " conduit shall be used to run all control wires from the bottom of Section #1 in the control panel, to the back of the 12" x 10" x 6" control junction box in the valve chamber.
- If a step-up transformer is required, conduit shall be sized in accordance with current National Electrical Code • All conduits running to or from the control panel shall be run underground at a minimum depth of 18 inches below
- finished grade. • All below ground conduit shall be PVC schedule 80, unless a phase converter is utilized. For that option, PVC
- coated rigid steel conduit shall be used including all fittings and transition points. 7.9 CONTROL PANEL MOUNTING

The station pump control panel shall incorporate the pump controls, alarm system and incoming utility power into one pre-fabricated stainless-steel structure. The panel shall be placed as follows:

- The control structure shall be set on a 4-inch concrete pad (see Section 3.10). The concrete pad shall have a
- well-compacted 4" stone base. • Conduits shall be run into the power supply cabinet from beneath the structure per the detail drawing.
- The panel shall be centered on the concrete pad and set 4-inches in from the rear edge of the pad.
- Prior to setting and securing the panel to the concrete mounting pad, a strip of 2"  $x \frac{1}{4}$ " solid rubber gasket material shall be placed against the bottom angle iron frame to create a seal between the concrete mounting pad and the bottom panel bottom.
- The control panel shall be firmly anchored to the concrete mounting pad with six, 3/8-inch stainless steel Wej-It stud anchors. Anchor holes in the concrete pad shall be drilled to the manufacturer's recommended depth.

Acceptable Manufacturer: Anchors shall be Hilti Quick Bolt Two (or District- approved equal)

# SECTION 8 - ALARM SYSTEM

# 8.1 SYSTEM REQUIREMENTS

Each pump station shall have a Mission MyDro Cellular Remote Alarm System.

# **SECTION 9 - SITE REQUIREMENTS**

## 9.1 SITE AND ACCESS ROAD PAVEMENT

Pavement is required around all pumping stations unless otherwise approved by the District. All pavement materials and construction shall be in accordance with the current edition of the St. Charles County Standard Specifications for Subdivision Street Construction and the following:

#### A. Station Area

All pump and valve chambers shall have a minimum 6 feet of paved apron placed around the pumping structures. The pavement shall be sloped to cause surface water to drain away from the station.

When fencing is installed around the pump station, the pavement shall be extended an additional 1 foot beyond the fencing perimeter.

# B. Station Access Road

- The access road shall be:
- Minimum of 12 feet wide • Be designed to limit the access road grade to a 10% maximum.
- Have a turn around area at the station end of the access road large enough to accommodate the turning radius of a 16-foot service van
- The centerline of the entrance road shall bisect the station gate entrance, security fence, and the valve and wet well structures. If this type entry is not feasible for a particular site, the closest structure to the gate and road shall be the wet well.

### C. Pavement Specifications for Access Road and Other Pump Station Pavement Areas

1. Asphaltic Cement Concrete: Asphaltic cement concrete shall be paved with 2" of Type C (BP-1) asphaltic cement concrete wearing surface with a 6" of Type X asphaltic cement concrete base course and 6" of well-compacted Type 1 or Type 5 aggregate base (3/4" minus).

2. Poured Portland Cement Concrete:

Portland cement concrete pavement shall be Class B or Pavement Concrete, 6" thick, air-entained (5% minimum) 0.50 water/cement ratio, with a 4" slump. Pavement shall be reinforced with 8 gauge, 6x6 welded wire mesh. All subgrade shall consist of 6" of well-compacted Type 1 or Type 5 aggregate base (3/4" minus).

Concrete Delivery Tickets. The Developer shall furnish to the District for each truck load of concrete delivered to the site, a delivery ticket, stamped by a bonded weighmaster on which is shown information concerning the concrete as follows:

- (a) Name of concrete plant
- (b) Serial number of ticket. (c) Date and truck number.
- (d) Name of contractor.
- (e) Specific project name.
- (f) Specific class of concrete. (g) Quantity of concrete in cubic meter (cubic yards).
- (h) Time when batch was loaded or of first mixing of cement and aggregates.
- (i) Arrival time on project. (j) Time when truck has finished discharging load.
- (k) Any additional water added at jobsite to attain pouring consistency.

Failure to provide concrete material tickets may result in the District requiring the removal and reconstruction of completed work.

#### D. Entrance Road Barriers

Stations requiring entrance roads shall have 6-inch high barrier posts installed at the road entrance. Post shall be constructed of 6" concrete filled steel or iron pipe, or 6"x6" cedar posts. Posts shall be set 30" below ground in an 18"x36" poured concrete base. A 5/16" diameter galvanized chain locked on one end and firmly fastened to the other, shall be run between the poles. For safety purposes, a 4"x12" reflective plate shall be attached to the chain at the span center.

#### 9.2 FENCING

Fencing shall be required around all pump station sites unless otherwise approved by the District. Fencing shall be included on the pump station site plan. Elimination or alterations to the approved fencing plans shall only be considered for compliance with municipal requirements.

#### A. Fencing Specifications

Wire fabric for the fence shall be brown or green vinyl clad 6' high chain link fabric. Wire shall be No. 11 gauge woven in a 2" mesh. Top and bottom salvages shall be barbed.

All posts and other appurtenances used in the construction of the fence shall be brown or green vinyl clad schedule 40 pipe. All posts shall be equipped with tops. Fiberglass or other material fencing components shall not be accepted.

An entrance gate that is at least 12 feet wide is required at the entrance of the pump station grounds.

Posts shall be sized and set as follows:

ТҮРЕ	SIZE	PULL
Top Rails & Brace	1-1/4" Nominal (1.66" O.D.)	2.27 lbs./ft.
Line Post & Gate Frame	1-1/2" Nominal (1.9" O.D.)	2.72 lbs./ft.
End Corner or Pull Post	2" Nominal (2.375" O.D.)	5.79 lbs./ft.
Gate Post	3-1/2" Nominal (4" O.D.)	9.11 lbs./ft.

Posts shall be set in the concrete bases so that the pole bottom rests 6" higher than the concrete base bottom.

Horizontal support bars shall be installed half way between the top rail and the ground.

A #7 tension wire shall be installed at the bottom of the fencing fabric and stretched taught enough so as to not allow the bottom of the fencing fabric to be lifted away from the fencing poles and/or ground.

# B. Fencing Placement

- Fencing shall be located so that:
- There is a 4' space between all auxiliary pump station equipment, panels, generators, etc. and the fence perimeter • The access gate shall be located so that hoisting or cleaning equipment can easily access the valve and wet well chambers.

# 9.3 MAINTENANCE

Temporary erosion control shall be provided in accordance with state and local requirements. Surface water shall be directed away from the pump station paved area to prevent debris from washing over the paved area.

# 9.4 **RESTORATION**

Restoration shall be in accordance with the District's Standard Specification. Final acceptance of the public dedication of the pump station shall be withheld until the site is restored to the District's satisfaction.

Duckett Creek	Duckett Cre	ek Sar	nitary (	District
	PUMP STATION DESIGN	Dwn By: MSM	App By: LRK	Detail No.
	REQUIREMENTS	Ckd By:	Date: MAY 2023	P2-2

### **SECTION 3 - STRUCTURE REQUIREMENTS**

#### **3.1 DESIGN CRITERIA**

All reinforced concrete structures shall be designed using the Working Stress method. At a minimum this includes the wet well, valve chamber and control pad. The strctures may be either pre-cast or cast-in place as approved by the District.

#### **3.2 JOINING CHAMBERS**

The valve chamber shall rest on a haunch poured integral with the wet well walls. Both chambers shall be tied together with a minimum of two (2) threaded tie bolts. The design engineer shall specify the bolt diameter and material strength. Bolts are to be eighteen inches (18") down from the top of the structure. For top slab thickness greater than 12 inches (12"), place the bolts down six inches (6") from the bottom of the top slab.

One-half inch  $\binom{1}{2}$  thick 6" x 6" backing plates shall be used as washers on each end of the tie bolts. Both structure tops shall be at the same elevation separated by a one-inch (1") square flexible rubber mastic sealant placed along the perimeter of the valve chamber where it meets the wet well. The tie bolts and the 6" x 6" backing plates shall be stainless steel.

#### 3.3 ACCESS HATCHES

Access hatches shall be cast in the top sections of each chamber. The hinged side of the valve and pump chamber hatches shall be located on the walls opposite from each of their respective common tie walls. For valve chambers requiring double hatch doors, the hinges shall be placed on the common wall and the wall opposite the common wall. Hatch specifications are provided in Section 6.6.

All access hatches shall include an intergrated District-approved orange safety grate for open hatch fall protection.

#### **3.4 ACCESS OPENINGS**

In addition to the openings for the incoming gravity lines and pump discharge lines, the following accesses are required:

- A six-inch (6") hole shall be centered in the valve chamber tie wall, 20 inches (20") from the structure top. A four-inch (4") SCH40 DWV PVC coupler shall be cast in the center of the wet well tie wall and centered on the valve chamber six-inch (6") hole. After the two chambers have been tied together, a four-inch (4") PVC stub shall be glued in the coupler on the valve chamber side through the six-inch (6") hole. The space between the pipe and the chamber walls shall then be filled and sealed with grout. This opening will be used for power and control wire passage between chambers.
- A six-inch (6") hole shall be centered at the bottom of the valve chamber floor in the tie wall. A four-inch (4") PVC coupler shall be cast in the wet well tie wall and centered with the valve chamber six-inch (6") hole. After the two chambers have been tied together, two (2) four-inch (4") PVC stubs shall be glued into the coupler on each side of the tie wall. These stubs will be used for the valve chamber drain piping.
- Two two and one half-inch  $(2\frac{1}{2}")$  holes shall be placed on each side of the valve chamber sidewalls, eighteen-inches (18") from the tie wall and eighteen-inches (18") from the top of the structure. For a top slab thickness greater than ten-inches (10"), place the two and one half-inch  $(2\frac{1}{2})$  holes down eight-inches (8") from the bottom of the top slab. A two and one half-inch  $(2\frac{1}{2})$  PVC coupler shall be cast in each hole. One of the openings is to be used for the power and control wires from the control panel. Two openings are provided for flexibility. The opening not used shall be stubbed and capped with a piece of two and one half-inch  $(2\frac{1}{2})$  PVC.

### **3.5 VALVE CHAMBER FLOOR**

The valve chamber floor shall be sloped with a three-sided invert towards the four-inch (4") drainpipe using a two-inch (2") fillet. Gravity pipes, detention pipes and electrical conduits may not be run beneath the valve chamber.

#### **3.6 VALVE SUPPORTS**

Valve chamber piping shall be supported as follows:

- After discharge piping and valves have been installed in the valve chamber and adjustable pipe cradle jack shall be under the valves and tee, so that they have a ten-inch (10") clearance between the floor and valve flanges. The supports shall be firmly bolted to the valve chamber floor.
- A second adjustable pipe cradle jack shall be placed against the back of the discharge tee and then bolted to the common chamber tie wall to prevent piping thrust movement. The thrust jack shall be shown on the valve chamber plan drawing.

#### **3.7 ENTRANCE LADDER**

Wet well entrance ladder shall be per the District's Standard Construction Specifications. The entrance ladder shall be located as follows:

- Entrance ladder shall not be placed in front of incoming gravity lines.
- Entrance ladder shall not be located under or next to any obstructions.
- Entrance ladder shall provide a clear-in-line visible unobstructed access from the top of the chamber to the bottom of the chamber.
- Entrance ladder shall be placed on the station sidewalls closet to the control panel, approximately in the center of the hatch cover.

#### 3.8 DETENTION CHAMBER

Detention shall be installed below ground with an access manhole(s) located at the upstream end. The connection between the detention chamber(s) and the wet well shall be made with a minimum eight-inch (8") ductile iron pipe. The detention tank shall be a dedicated system, it may not be used as part of the gravity system. The detention tank and connection line shall be laid at a minimum 1% slope.

#### 3.9 CHAMBER SIZING

The pump station wet well and valve chamber shall sized as noted. Access hatches shall be correspondingly sized to chosen structure size.

VALVE CHAMBER		WET WELL		
INSIDE	AREA	ACCESS HATCH SIZE	INSIDE AREA	ACCESS HATCH SIZE
5' x	: 5'	60"X 60"	5' x 5'	48"X 60"
6' X	ί 6 <b>'</b>	72" x 72"	6' X 6'	48"X 72"
7' X	〈 7'	84" x 84"	7'X 7'	60" x 84"
8' X	( 8'	84" x 84"	8' X 8'	60" × 84"

To prevent the possibility of the valve chamber pulling the top section of the wet well off of the joint, a poured counter-weight is required to offset the mechanical level arm tipping force. The counter-weight shall be monolithically poured at the bottom of the upper-most wet well section opposite of the valve chamber tie wall. Size and weight of the counter-weight shall be shown on the plans.

#### 3.10 CONTROL STRUCTURE PAD

The control structure concrete pad shall be a minimum of four-inches (4") thick, reinforced with 8 gauge, 6 x 6 welded wire mesh. The concrete shall have a well-compacted four-inch (4") stone base (minimum).

The pad shall be poured next to the pump station. parallel to the length of the stationstructure and centered between the two chambers. Pad deminsions shall be 6' x 11'-4".

# 3.11 MISCELLANEOUS ITEMS

A. Incoming Manhole Placement

A manhole shall be placed on the gravity line by approximately 20 feet from the pump station structure.

B. Detention Chamber Placement The eight-inch (8") pipe joining the detention chamber(s) and the pump station shall be no less than 20 feet in length.

#### C. Bulk Heading

D. Construction Tolerance of Wet Well

E. Connection of Gravity Pipe to Structures. All incoming gravity lines and discharge piping will have a "Z-LOK" type compression fitting cast-in place where the piping passes through the valve and wet well chamber walls. The maximum angle of deflection allowed for pipe gaskets is as follows:

#### "Z-LOK" = 25 degree

F. Top of Wet Well and Valve Chamber

G. The distance between wastewater pumping stations and all potable water sources shall be at least fifty feet (50') in accordance with 10 CSR23-3.01(1)(B).

I. Water Supply. There shall be no physical connection between any potable water supply and a wastewater pumping station, which under any conditions, might cause contamination of the potable water supply. If a potable water supply is brought to the station, it shall comply with conditions stipulated under 10 CSR 20.841(7)(D).

### **SECTION 4 - PIPING AND VALVES**

The following specifications shall be used for installation of the pump station piping and valves. Flanged piping shall be the acceptable means of connecting piping and valving.

All pipes must enter the structure walls with a one foot minimum clearance from the outside face of the pipe to the face of the adjoining wall to allow for proper pipe gasket alignment.

# 4.1 DISCHARGE PIPE MATERIAL

wall, following materials shall be used: 1. Four Inch (4") Diameter and Above:

red rubber.

# 2. Three inch (3") Diameter • Solvent-Weld Installation: ASTM 1785 Schedule 80 PVC.

3. Two inch (2") and Two and a half inch  $(2\frac{1}{2})$  Diameter: • Solvent-Weld Installation: ASTM 1785 Schedule 80 PVC.

# discharge manhole.

- 1. Four Inch (4") Diameter and Above: • AWWA C-900 PVC Class 150
- Ductile Iron Pipe Class 52 ANSI A-21.51 (AWWA C-151)
- AWWA C-905 PVCO (for pipes 14-inch through 48-inch)
- 2. Three-Inch (3") Diameter:
- Ductile Iron Pipe Class 52 ANSI A-21.51 (AWWA C-151)

AWWA C-600.

# 4.2 FORCE MAIN REQUIREMENTS

The following elements shall be included in the force main system design:

# A. Air Relief/Vacuum Valves (ARV) Refer to the District's Detail FM-2 for additional information. 1. Acceptable Manufacturer: ARI Model D-025 NS (minimum standard).

- by a  $1\frac{1}{4}$ " x  $1\frac{1}{4}$ " x  $\frac{1}{8}$ " stainless steel angle bracket (or as approved by the District).
- foot above the flow line of the receiving manhole.
- C. Existing Gravity Manhole Rehabilitation molded to the exiting structure. See acceptable manufacturers below.
- D. New manhole Construction with the epoxy coating specified below.
- F. Tracer Wire

- H Testing
- Testing of force mains shall include:
- with a maximum of not more than 2 PSI drop in pressure.

- B. Connection to Gravity System

- E. Mechanically Restrained Joints

- G. Utility Marking Tape

# Bulk heading of the detention chamber(s) shall be completed with a pre-cast bulkhead.

The wet well shall be installed so that it is no more than three-inches (3") per 25 vertical feet out of plumb.

All piping outside diameters shall be located a minimum of one foot above or below structure joints.

The top elevation shall be six-inches (6") higher than the surrounding ground elevation. Surrounding ground shall be sloped away from the structure for proper drainage.

H. Covered wet wells shall have provisions for air diplacment to the atmosphere by an inverted and screened "j" tube.

A. From the individual pump discharge bases through the header tee to a minimum of four feet (4') outside the structural

• Flanged: Ductile iron pipe Class 53 ANSI A-21.51 (AWWA C-151). All bolts and nuts for flanged connections shall be 304 stainless steel (minimum). All flange gaskets shall be full-face  $\frac{1}{5}$ " thick

B. The following materials shall be used for the force main from a point four feet (4') outside the chamber wall to the

• AWWA C-909 PVCO (for pipes 4-inch through 12-inch)

• PVC meeting AWWA C-900 PVC Class 150 with integral bell and gasket joint design meeting the requirements of ASTM D3139 and F477. Minimum pressure class shall be PC 150.

All ductile iron pipe and fittings shall have polywrap in accordance with AWWA C-105 and be installed per

Automatic combination vacuum/air relief valves shall be placed at high points in the force main as required.

2. On valves other than ARI Model D-025, the body of the ARV shall be supported to the wall of the structure

Force mains shall discharge to the gravity sewer at a manhole. The point of connection shall be no more than one

The sides and bottom of the force main discharge manhole and a minimum of five (5) downstream manholes from the point of connection shall be lined with a solventless, 100% solids, corrosion resistant epoxy coating or a lining having multiple, structural fiberglass layers with a non-porous diaphragm bonded between the layers of fiberglass and

When a new manhole is to be constructed at the point of connection to the gravity system, the manhole shall be manufactured with a flexible sheet liner with locking expansions. The bottom of the new manhole shall be treated

Acceptable Manufacturer: Raven Lining Systems AquataPoxy A-6, Terre Hill Composites Multiplex Liner THC-610-SL-68, Ameron Protective Lining Division, Amer-Plat T-Lock, (or District-approved equal).

The force main shall be fitted at all angle points with mechanically restrained joints designed to withstand the thrust developed under the test pressure plus 50 psi. The required number of mechanically restrained joints from the angle point shall be determined by the design engineer and shown on the plan and profile (see Section One).

On all force mains there shall be installed a tracer wire which shall be a single insulated No. 12 AWG copper wire. The insulated wire shall be furnished in rolls not less than 500 feet. Where splices are required, splices shall be made with 3M waterproof splice kits or approved equal. The Contractor shall furnish all materials. The No. 12 wire shall placed along the top of the force main and taped in place with duct tape or electrical tape at a maximum of 6 feet intervals. Permanent access points shall be provided through manholes, access vaults, valve vaults or other approved means at the ends of the tracer wire. the wire shall be extended into access points at a minimum of 5 feet from each direction. The wire shall be neatly rolled and placed so that it does not interfere with normal operation. The two wires shall be spliced inside the access point with a standard plastic or rubberized wire connector. After testing for continuity, the splices inside the access point shall be made with a 3M splice kit or approved equal. Where splices become necessary outside of access points, the splices shall be made with a 3M splice kit or approved equal. All tracer wire shall be tested for continuity as called for in Section 4.2 I below.

A detectable underground utility marking tape shall be installed the entire length of the force main as per the District's Detail FM-1. The material to be installed for this purpose shall consist of three (3) inch wide tape made of bonded layer plastic with a metallic foil core. Tape splices shall be knotted to prevent tensile pressure on the splice. The metallic tape shall be colored green and shall bear an imprint identifying the force main blow as, "Caution Buried Sewer Main Below". The Contractor shall furnish all materials. The three (3) inch wide tape shall be installed 12" below finished grade. The tape material shall be installed in accordance with manufacturer's recommendations. The tape shall be placed in a manner such that trench backfill will not cause an excessive stress on the material.

1. Force mains shall be pressure tested at the highest point in the project. The Contractor shall fill and pressure test the force main. The minimum required test pressure shall be the force main test pressure for a period of 2 hours

2. The tracer wire on all force mains shall be tested by the Contractor for continuity in the presence of a District construction inspector. If the test is satisfactory, all splices shall be made permanent by means of a 3M splice kit or approved equal. If test fails in a section, the Contractor shall find and repair any failure in the locator wires.

# 4.3 TRANSITION PIPING

When PVC pipe (See Section 4.1) is used for force main outside the structural walls, a transition pipe shall be used to make the transition between the bypass tee inside the valve chamber and the force main outside the station structure. The following methods sshall be used:

A. Four-inch (4") Diameter and Larger

Both pump discharge lines shall be joined to a flanged ductile iron tee. A flanged DIP stub shall be bolted to the tee then passed through the "A-LOK" or "Z-LOK" gasket installed in the valve chamber discharge wall. The PVC force main shall be attached to the D.I.P. stub outside of the valve chamber by a long pattern sleeve mechamnical joint with Mega-Lug retainer glands.

B. Three-Inch (3") Diameter Both pump discharge lines shall be joined to a schedule 80 PVC flanged tee. From the tee, a Schedule 80 PVC stub shall pass through the "A-LOK" or "Z-LOK" gasket installed in the valve chamber discharge wall. Transition the stub to the C-900 PVC force main with a PVC coupling outside of the valve chamber.

C. A portable pump connection on the discharge line with rapid connection capabilities to be provided in the valve vault of submersible pump station per 10 CSR 20.8130 (5)(B)2.

#### 4.4 DISCHARGE RISERS

When plastic pipe is utililized for the pump discharge riser and the riser exceeds 12 feet in length, a stainless steel support brace must be installed between the riser and wet well wall. The brace shall be placed approximately in the middle of the riser but kept above the normal operating level of the well. A minimum of two (2) braces shall be needed on lengths in excess of 20 feet

#### 4.5 SHUT-OFF AND CHECK VALVES

Approved shut-off and check valves shall be placed on the discharge line of each pump. The check valves shall be located between the shut-off valve and the pump. All valves shall be rated so as to withstand normal working pressure plus allowances for the water hammer. No pump discharge valve shall be vertically mounted or located in wet well area.

A. Shut-Off Valves

1. Shut-Off Valves Four-inch (4") and Larger Shut-Off valves shall be plug type valves. The valves shall be located so that each pump may be isolated from the common discharge header. Plug valves shall be of cast iron body, ASTM A126 Class B, or ductile iron ASTM A536. Valve plugs shall be cast iron ASTM A126 Class B, or ductile iron meeting ASTM A536, Grade 65-45-12, covered with Buna-N Rubber compound. The seats are to be a corrosion resistant alloy either 304 stainless steel or nickel.

a. Valves shall be able to pass a sphere not less than 80% of the diameter of the valve size.

- b. Valve Operations
- Six-Inch (6") and smaller valves shall be provided with a two-inch (2") square operating nut
- and wrench head • Valves larger than six-inches (6") shall be provided with a Manual Gear Operator sized so that the maximum rim pull required is not more than 80 pounds.
- Valves three-inches (3") through twelve-inches (12") shall be rated at 175 pounds. • Valves fourteen-inches (14") and larger shall be rated at 150 pounds when pressure is applied
- from the preferred direction. These valves have a preferred direction of shut-off, and is the responsibility of the contractor to see that they are properly installed.

Acceptable Manufacturers: DeZurik, Milliken or GA Industries (or District-approved equal).

2. Shut-Off Valves Two-inch (2") and Two and a half-inch  $(2\frac{1}{2}")$ All thermoplastic ball valves shall be True Union type constructed from PVC Type 1, ASTM D 1784 Cell Classification 12454 or CPVC Type IV, ASTM D 1784 Cell Classification 23447. All O-rings shall be EPDM or FKM. All valves shall have Safe-T-Shear stem and double-stop Polypropylene handle. All valve union nuts shall have Buttress threads. All seal carriers shall be Safe-T-Blocked. All valve components shall be replaceable. All valves shall be certified by NSF International for use in potable water service. All Two-inch (2") valves shall be pressure rated at 235 psi and all Two and a half-inch  $(2\frac{1}{2})$  values and all flanged values shall be rated at 150 psi for water at 73° F.

Acceptable Manufacturer: Spears Manufacturing Company (or District-approved equal).

#### B. Check Valves

I. Check Valves Four-inch and Larger Check valves shall be rubber flapper type with epoxy coated iron body. Check valves shall be flapped end type

Acceptable Manufacturers: Valmatic, APCO, Milliken or GA Industries.

2. Check Valves Two-inch (2") and Two and a half-inch  $(2\frac{1}{2}")$ 

All thermoplastic check valves shall be True Union type constructed from PVC Type 1, ASTM D 1784 Cell Classification 12454 or CPCV Type IV, ASTM D 1784 Cell Classification 23447. All O-rings shall be EPDM or FKM. All valve union nuts shall have Buttress threads. All valve components shall be replaceable. All valves shall be certified by NSF International for use in potable water service. All Two-inch (2") valves shall be pressure rated at 235 psi and all Two and a half-inch  $(2\frac{1}{2})$  valves and all flanged valves shall be rated at 150 psi for water at 73° F.

Acceptable Manufacturer: Spears Manufacturing Company (or District-approved equal).

4.6 VALVE CHAMBER DRAIN VALVE

A backwater check valve shall be installed on the valve chamber drain line. The valve shall be installed as follows:

A four-inch (4") diameter PVC stub shall be glued into the four-inch (4") diameter coupler cast into the wet well wall at the valve chamber floor line. a 90-degree elbow shall be glued to this stub and directed toward the wet well floor. A 4" x 36" PVC stub shall be glued into the other end of the elbow. The check valve shall then be slipped on to the stub and attached with two (2) stainless steel clamps to be supplied by the vendor.

Acceptable Manufacturer: The valve should be a "Tide-Flex" series TF-2, 4-inch (slip on) check valve, by Red Valve Co., EVR Type CPO-4 (or District-approved equal).

# 4.7 GRAVITY LINES ENTERING THE STATION

Ductile iron pipe shall be used on sections of gravity lines running from:

The last manhole proceeding the station up to the station.
The outfall of the detention pipes up to the station. This line shall be a minimum of eight-inches (8") in diameter.

Concrete or PVC gravity lines shall not be used in these areas.

#### 4.8 DETENTION PIPE

Detention pipe(s) shall be ADS Sanitite HP triple wall pipe. Engineer to contact the local ADS representative for the design of the detention pipe system.

A vacuum test of all detention pipe shall be performed. The test shall be for a period of 1 minute and the vacuum shall be 10" of mercury and may not drop below 9" of mercury at the end of the 1-minute test.

# **SECTION 5 - SUBMERSIBLE WASTEWATER PUMPS**

5.1 MINIMUM STANDARDS

Pump selection shall be based on the following minimum standards:

- Single-phase pumps shall not be acceptable.
- Pumps less than three horsepower (3 Hp) hall not be acceptable.
- Non-clog pumps are the preferred type of pumps.
- Grinder pumps shall only be upon both acceptable justification and after receipt of a written variance from the
- All pumps, with the exception of grinder pumps, shall be capable of passing spheres of at least three-inches (7.6 cm) in diameter. Pipe suction and discharge piping shall be at least four-inches (10.2 cm) in diameter.
- Multiple pumps shall be provided except for lift stations with design flows of less than fifteen hundred (1,500) gallons per day.

### 5.2 PUMP SPECIFICATIONS

The pump(s) shall be non-clog solids handling, submersible, capable of handling raw, unscreened sewage. The discharge connection elbow shall be permanently installed in the wet well along with the discharge piping. The pump(s) shall be automatically connected to the discharge elbow when lowered into place, and shall be easily removed for inspection of service. There shall be no need for personnel to enter the pump well. A simple linear downward motion of the pump shall accomplish sealing of the pumping unit to the discharge connection elbow. A sliding guide bracket shall be an integral part of the pump unit. No portion of the pump shall bear directly on the floor of the sump. The pump, with it's appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of sixty five (65) feet.

A. Major Components

Major pump components shall be gray cast iron, Class 30, with smooth surfaces devoid of blowholes and other irregularities. Where watertight sealing is required, O-rings made of nitrile rubber shall be used. All exposed nuts and bolts shall be ASTM A-167 304 stainless steel.

B. Watertight Seals

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

The cable entry water seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall be comprised of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body containing a strain relief function, separate from the function of sealing the cable.

The assembly shall bear against a shoulder in the pump top. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the motor interior from foreign materials gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

The junction chamber, containing the terminal board, shall be sealed from the motor by elastomer compression seal (O-rings). Where a sealed junction chamber is not used, the motor chamber shall be fitted with a moisture detection probe. The probe shall be connected to and activate a warning light in the control panel.

Connection between the cable conductors and stator leads shall be made with threaded compressed type binding post permanently affixed to a terminal board and thus perfectly leak proof.

#### C. Cooling System

Each system shall be provided with an adequately designed cooling system. When thermal radiators (cooling fins) are used, they shall be integral to the stator housing and shall be adequate to provide the cooling required by the motor. When water jackets are used, the water jacket shall encircle the stator housing. The water jacket shall be provided with a seperate, self-contained liquid cooling system. Regardless of the cooling system used, the motor shall be capable of pumping under full loaf continuously with the water level only to the top of the volute. Motors with intermittent full load ratings or motors requiring oil for cooling shall not be allowed.

#### D. Impellers

The impeller shall be of gray cast iron, Class 30, dynamically balanced, single or double shrouded non-clogging design having a long thrulet without acute turns. The impeller shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in normal sewage applications. The pump manufacturer shall, upon request, furnish mass movement of inertia data for the proposed impeller. The impeller shall be capable of passing a minimum 3-inch solid sphere. The fit between the impeller and shaft shall be a sliding fit with one key.

When double shrouded impellers are used, a wear ring system shall be installed to provide efficient sealing between the volute and impeller. The wear ring shall consist of a stationary ring made of nitrile rubber molded with a steel ring insert which is drive fitted to the volute inlet and rotating stainless steel ring which is drive-fitted to the impeller eye.

When single shrouded impellers are used, the volute shall be fitted with an adjustable replaceable front plate. The front plate shall be designed with a wave shaped inlet and an outward spiraling V-shaped groove on the side forcing the impeller to shred and force stringy solids outward from the impeller and through the pump discharge.

The volute shall be of single piece design and shall have smooth fluid passages large enough at all points to pass

## E. Pump Motor

any size solid with can pass through the impeller.

The pump motor shall be squirrel-cage, induction, and shell type design, housed in an air-filled watertight chamber. The stator winding and stator leads shall be insulated with moisture resistant Class F insulation that will resist a temperature of 155 degrees Celsius (F). The stator shall be dipped and baked three times in Class F varnish. The motor shall be designed for continuous duty, capable of sustaining a minimum of ten (10) starts per hour. The rotor bars and short circuit rings shall be made of aluminum.

The pump motor cable, installed, shall be suitable for submersible pump application. Cable sizing shall conform to NEC specifications for pump motors.

F. Thermal Sensors

Thermal sensors shall be used to monitor stator temperatures. The stator shall be quipped with three (3) thermal switches, embedded in the end coils of the stator winding (one switch in each stator phase). These shall be used in conjunction with and supplemental to external motor overload protection and wired to the control panel.

# G. Pump Shaft

Each pump shall be provided with an oil chamber for the shaft sealing system. The drain and inspection plug, with positive anti-leak seal, shall be accessible from the outside.

The pump shaft shall rotate on two (2) permanently lubricated bearings. The upper bearing shall be a single row deep groove ball bearing and the lower bearing a two row angular contact ball bearing. The pump shaft shall be stainless steel or hard chrome plated carbon steel.

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. Seals shall run in an oil reservoir. Lapped seal faces shall be hydro-dynamically lubricated at a constant rate. The lower seal unit, between the pump and oil chamber, shall contain one stationary and one positively driven rotating silicon carbide or tungsten carbide ring. The upper seal unit, between the oil symp and motor housing, shall contain one hard metal ring and one carbon ring, or angled to the shaft lip type seal in grinder pump applications. Each interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The following mechanical seal types shall not be considered acceptable.

- Shaft seal without positively driven rotating members.
- Conventional double mechanical seals containing either a common single or double spring acting between the upper and lower units. This conventional system requires a pressure differential to offset external pressure and to effect sealing.

Acceptable Manufacturers: Sewage pumps are to be manufactured by the Flygt Company, Ebara, Barnes, ABS Company or approved equal.

# **SECTION 6 - PUMP STATION APPURTENANCES**

#### 6.1 SLIDE RAILS

All pump-lifting slide rails shall be made of 316 Schedule 40 stainless steel pipe. Slide rails shall be installed and sized per manufacturer's instructions. The slide rails shall be firmly braced to the wet pit wall with stainless steel support brackets. Maximum spacing between brackets shall be every 15 feet.

#### 6.2 LIFTING CHAINS

Pump lifting chain, clevis and shackles shall be made of 316 stainless steel. The chain shall be sized to accommodate the installed pump weight, but shall not be sized small than 3/16" stainless steel diameter links.

Duckett Creek	Duckett	Creek	Sanit	ary I	District
	PUMP STATION DE REQUIREMENTS	SIGN Ckd By:	MSM App B Date:	<sup>y:</sup> LRK MAY 2023	PS-1

# **SECTION 10 - INSPECTION AND ACCEPTANCE OF PUBLIC DEDICATION**

In addition to the inspection by District construction inspectors, District maintenance personnel shall also make inspections of the pump station construction. Contact the Distict's maintenance supervisor, at 636-441-1244, to schedule inspections. Forty eight (48) hour advance notice is required for scheduling inspections. Failure to have the inspection performed at the proper time during the construction process may result in the District requiring the removal and reconstruction of the completed work. The contractor responsible for construction of the pump station shall notify the District when the facility is ready the following two types of inspections.

### **10.1 INTIAL CONSTRUCTION INSPECTIONS**

Initial construction inspections shall be performed following the completion of the wet well floor, the installation of the pump bases and prior to allowing water or sewage into the pump station. The contractor shall be responsible for ensuring that the floor is clean and dry for these inspections.

### **10.2 FINAL DEDICATION INSPECTIONS**

Final dedication inspections shall be performed when one hundred percent (100%) of the pump station structure, storage tank and force main have been completed and all electrical and mechanical equipment and appurtenances, access road and other pavement have been installed and are in operable condition. Representatives from the pump equipment manufacturer and the installing electrical contractor shall be present at the pump station for these inspections.

#### A. Submittal Requirements

- Prior to requesting inspections the following items shall be electronically mailed the District's engineering supervisor:
- As-built electrical schematics.
- As-Built plans of the pump station and related appurtenances prepared in a NAD83, MO East Zone, US Foot (MO83-EF) state plane coordinate system (SPCS), by a Missouri-licensed engineer or a Missouri-licensed land surveyor, certifying that all structures, sewers, roads and other pavement were built in accordance with the approved plans and located within existing easements.
- A comma-seperated values (CSV) file containing points for all pump station and related appurtenances as-built points in SPCS represented in a "Point Number, Northing, Easting, Elevation, Description" format.
- Manufacturer's pump start-up test procedures; the recorded factory test readings for voltage, current and other significant parameters documented on standard forms; and blank forms for the field test. • Letter of completion from paving contractor, guaranteeing that all pavement and pavement subsurface has been
- installed per the District-approved plans and specifications.
- Control panel schematics, 11"x17" in size, laminated to the inside of the control panel exterior door.
- Operating manuals and specification literature. • Copy of electric, gas and water bills to facilitate the transfer of these accounts to the District at the time of
- dedication. • As-built drawings prepared by a Missouri-licensed engineer or land surveyor shall be in State Plane Coordinates and shall indicate the physical location of the pump station, retention, access road, force main locator markers and other related structures. GPS survey of all force mains is required, and District approval of such shall coordinated by the Developer with the District's engineering supervisor.

### B. Pump Tests

In the presence of the District's maintenance personnel, the contractor shall subject the pump equipment to such operating tests as may be required by the District to demonstrate that the equipment performs in accordance with the design requirements. As a minimum, the following two tests shall be performed:

- The insulation resistance of the pump's windings and cables shall be tested. The installed pumps shall not register
- less than 100 meg-ohms resistance per winding on a meg-ohm meter. • The pumps shall be subjected to start-up tests with the voltage, current and other significant parameters being recorded on the standard forms provided by the manufacturer. The contractor shall arrange for an adequate supply of water for the tests. The minimum quantity of water to be provided shall be equivalent to 1.5 minutes of continuous pumping at the rated pump capacity for each pump operating alone. Each pump shall be tested a minimum of two times.

# **10.3 CONSTRUCTION, OPERATION AND MAINTENANCE**

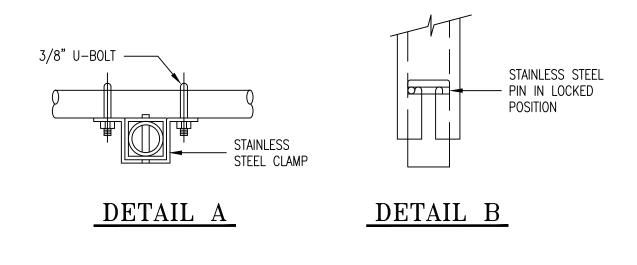
It is the responsibility of the Developer to ensure that the pump station is constructed in accordance with the District-approved construction plans. Public dedication of pump stations and related appurtenances shall only be accepted by the District after all electronic copies of associated as-builts, point coordinate files, operation manuals, specification literature and electrical diagrams have been received by the District and all inspection deficiencies have been addressed to the satisfaction of the District.

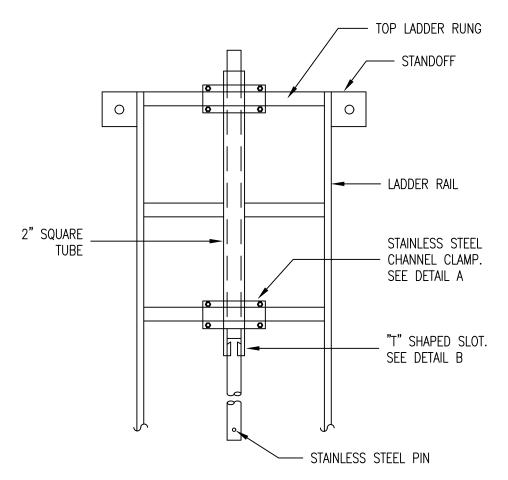
#### 10.4 WARRANTY

In addition to the equipment manufacturer's general warranties, the Developer shall warrant the pump station and related appurtenances to be free from defects in materials and workmanship for a period of not less than one year from the date of the District's final written acceptance of Developer's public dedication of said pump station.

# **10.5 FINAL ACCEPTANCE OF THE PUBLIC DEDICATION**

Final acceptance of the public dedication of the pump station shall be subject to the completion of all items stated above as well as the installation of fencing and satisfactory completion of all site restoration as required.





NOTE: SEE SECTION 3.7 OF DUCKETT CREEK SANITARY DISTRICT SPECIFICATIONS

# STAINLESS STEEL LADDER

NTS

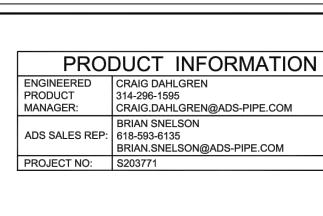
Due to dangerous levels of Hydrogen Sulfide in the District's collection system, a Wet well Aeration System will be required for this project. The District has found the following components to be an effective means of H2s control; however a commercially available system may be installed if it can be proven to be as effective.

Please provide the following components:

### <u>Qty.</u>

- 1 Airtech, Inc. Model 3BA7210-0As7599, 35 CFM Regenerative Blower 0.84HP; 115/230V, 1~phase – 60Hz
- 2 EDI Flexair Tube Diffuser, Model 91762 Part #00262; USA Blue Book Stock #32148
- 1 RDM products Con Pak Model PSE-181D Enclosure
- 1 1" Heavy Wall Threaded Stainless Steel Coupler
- 1 1" 90 Degree Stainless Steel Elbow
- 1 1" Stainless Steel Close Nipple
- 1 1" Stainless Steel Male Thread x Hose Barb Adapter 8 Stainless Steel Hose Clamps for 1" Hose
- 35 Feet of Silicone Rubber Heater Hose
- 1 1" x 1 ¼" Galvanized Bushing
- 1 1 ¼" Galvanized Street Ell
- 1 1" Galvanized Male Thread x Hose Barb Adapter
- 1 1" 90 Degree Elbow
- 1 14 Gauge Outdoor Type 6 foot Extension Cord

District personnel will assemble and install components as needed.



# **ADS HP RETENTION/DETENTION PIPE SYSTEM SPECIFICATION**

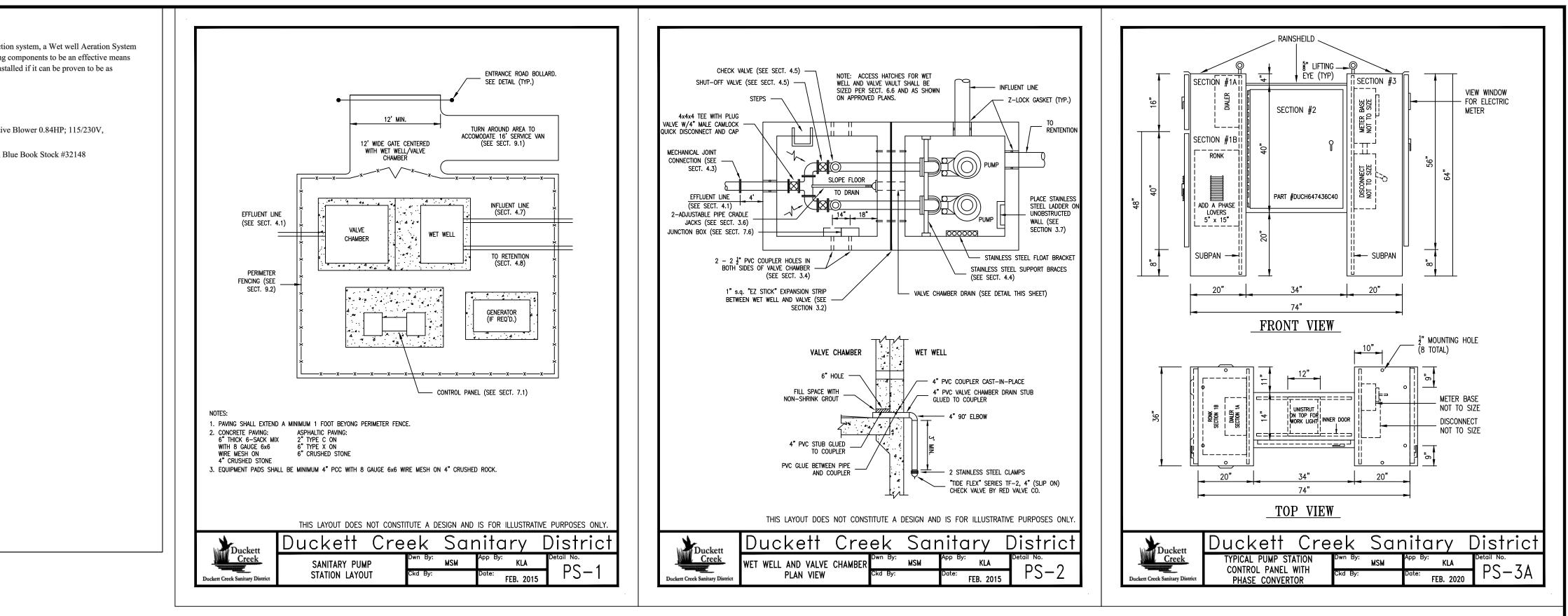
THIS SPECIFICATION DESCRIBES ADS HP RETENTION/DETENTION PIPE SYSTEMS FOR USE IN NON-PRESSURE, GRAVITY-FLOW STORM WATER COLLECTION SYSTEMS UTILIZING ADS HP PIPE PRODUCTS AND A CONTINUOUS OUT FALL STRUCTURE.

PIPE REQUIREMENTS HP STORM PIPE SHALL MEET ASTM F2881 SANITITE HP PIPE SHALL MEET ASTM F2764

JOINT PERFORMANCE HP PIPE PRODUCTS PIPE SHALL BE JOINED USING A BELL AND SPIGOT JOINT. THE JOINT SHALL BE WATERTIGHT ACCORDING TO THE REQUIREMENTS OF ASTM D3212. SPIGOTS SHALL HAVE GASKETS MEETING THE REQUIREMENTS OF ASTM F477. 12-60 INCH (300-1500 mm) DIAMETERS SHALL HAVE A BELL REINFORCED WITH A POLYMER COMPOSITE BAND. THE BELL TOLERANCE DEVICE SHALL BE INSTALLED BY THE MANÚFACTURER. PIPE AND FITTING CONNECTIONS SHALL UTILIZE A SPUN-ON, WELDED OR INTEGRAL BELL AND SPIGOT. DETENTION SYSTEMS ARE SUBJECT TO GREATER LEAKAGE THAN TYPICAL STORM SEWER APPLICATIONS AND THEREFORE ARE NOT APPROPRIATE FOR APPLICATIONS REQUIRING LONG-TERM FLUID

CONTAINMENT OR HYDROSTATIC PRESSURE. FOR ADDITIONAL DETAILS REFER TO TECHNICAL NOTE 7.01 "RAINWATER HARVESTING". FITTINGS

SPECIAL INSTALLATION CRITERION INSTALLATION





- ADS RETENTION/DETENTION SYSTEMS MAY UTILIZE ANY OF THE VARIOUS PIPE PRODUCTS BELOW:
- ALL PRODUCTS SHALL HAVE A SMOOTH INTERIOR AND EITHER ANNULAR EXTERIOR CORRUGATIONS OR SMOOTH EXTERIOR WITH ANNULAR INNER CORRUGATIONS. PRODUCT-SPECIFIC PIPE SPECIFICATIONS ARE AVAILABLE IN THE DRAINAGE HANDBOOK SECTION 1 "SPECIFICATIONS".

FITTINGS SHALL CONFORM TO ASTM F2881 OR F2764 FOR APPLICABLE PIPE TYPE AND DIAMETERS. CUSTOM FITTINGS ARE AVAILABLE AND MAY REQUIRE

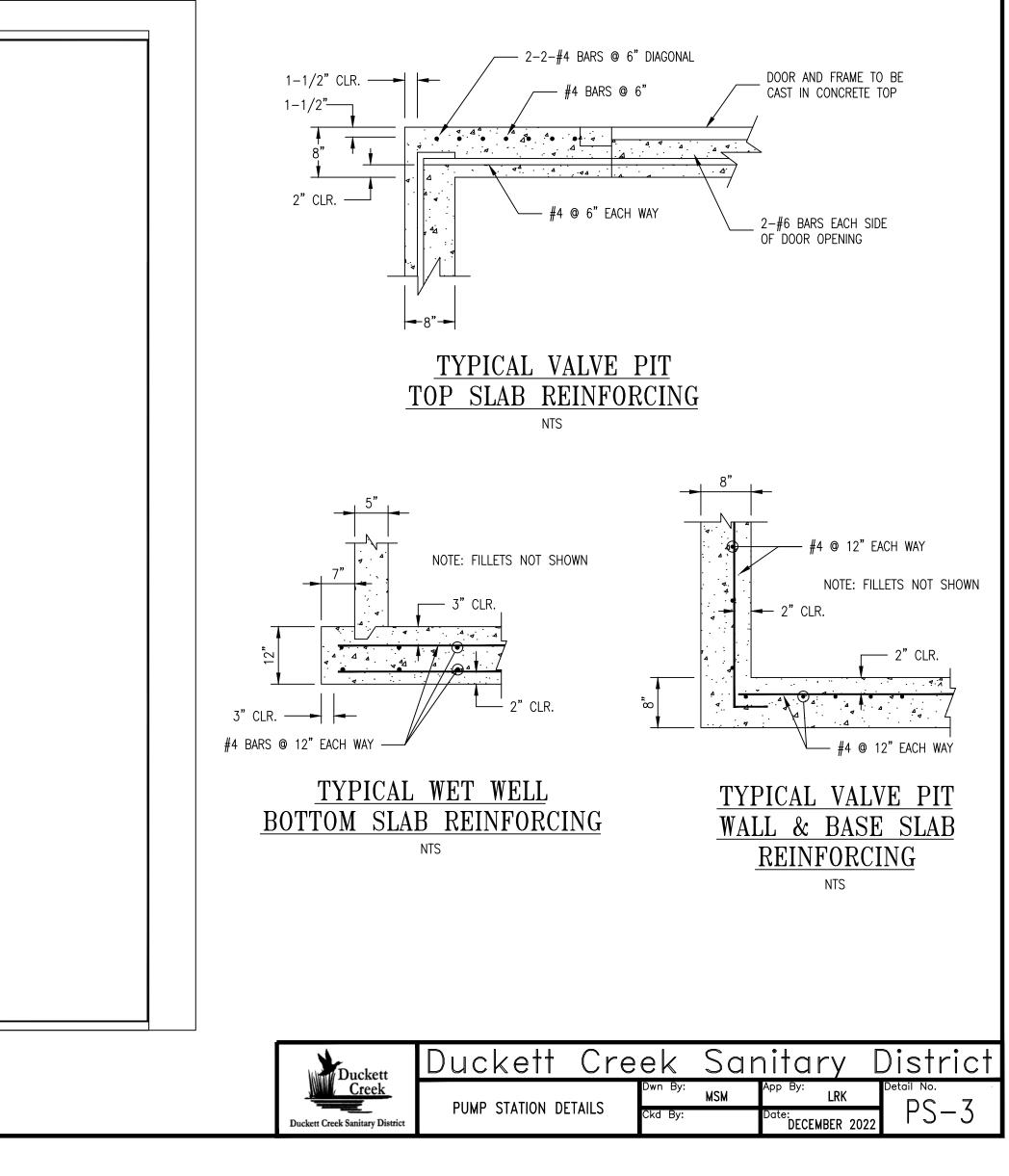
INSTALLATION SHALL BE IN ACCORDANCE WITH ASTM D2321 AND ADS RECOMMENDED INSTALLATION GUIDELINES, WITH THE EXCEPTION THAT MINIMUM COVER IN NON-TRAFFIC AREAS FOR 12-60 INCH (300-1500 mm) DIAMETERS SHALL BE 1 FT (0.3 m). MINIMUM COVER IN TRAFFICKED AREAS FOR 12-36 INCH (300-900 mm) DIAMETERS SHALL BE 1 FT (0.3 m) AND FOR 42-60 INCH (1050-1500 mm) DIAMETERS, THE MINIMUM COVER SHALL BE 2 FT (0.6 m). BACKFILL SHALL CONSIST OF CLASS I (COMPACTED), OR CLASS II (MINIMUM 90% SPD) MATERIAL, WITH THE EXCEPTION THAT 60 INCH (1500 mm) SYSTEMS SHALL USE CLASS I MATERIAL ONLY. MINIMUM COVER HEIGHTS DO NOT ACCOUNT FOR PIPE BUOYANCY. REFER TO ADS TECHNICAL NOTE 5.05 "PIPE FLOTATION" FOR BUOYANCY DESIGN CONSIDERATIONS. MAXIMUM COVER OVER SYSTEM USING STANDARD BACK FILL IS 8 FT (2.4 m); CONTACT A REPRESENTATIVE WHEN MAXIMUM FILL HEIGHT MAY BE EXCEEDED.

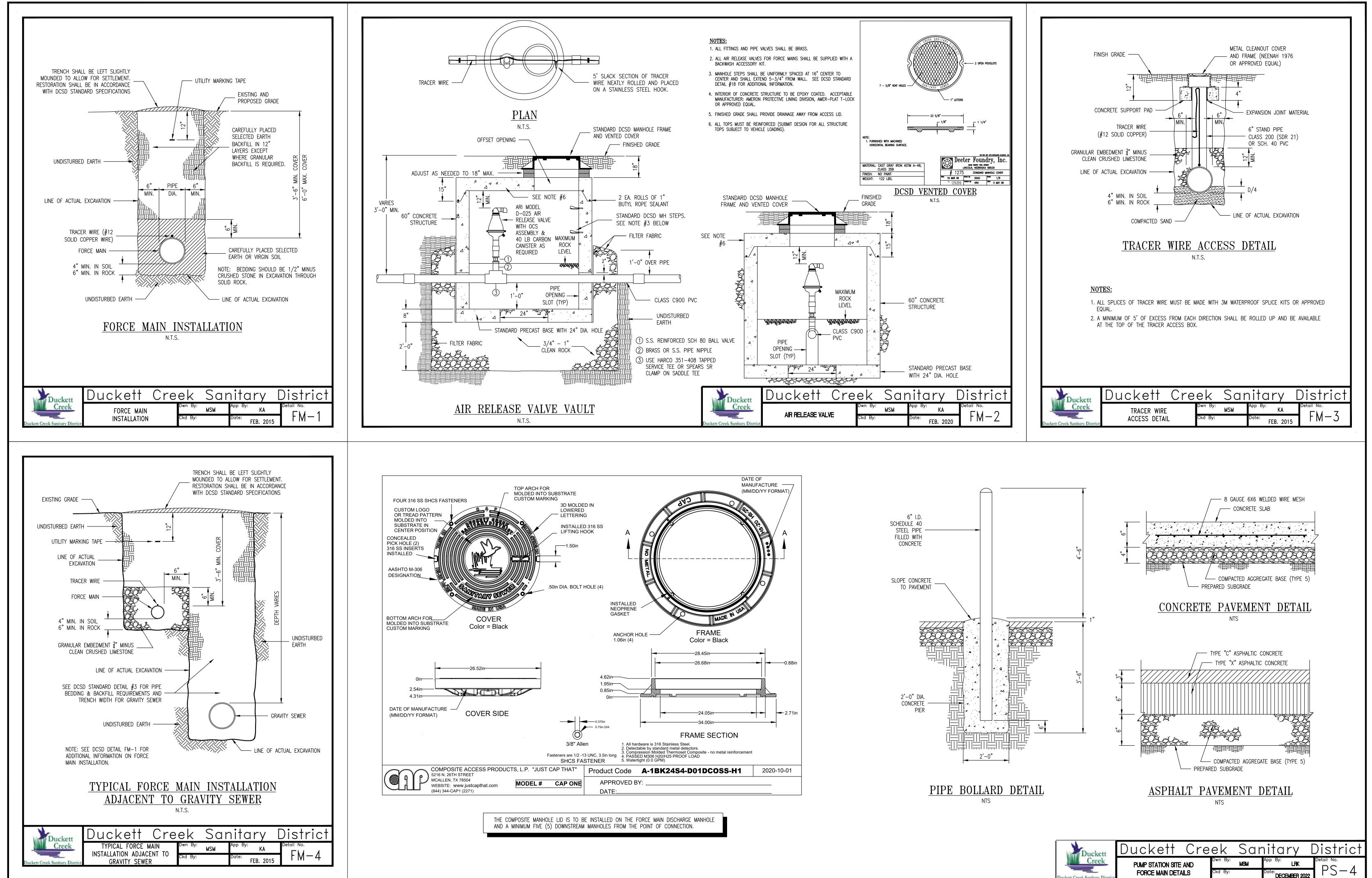
ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

# NOTES:

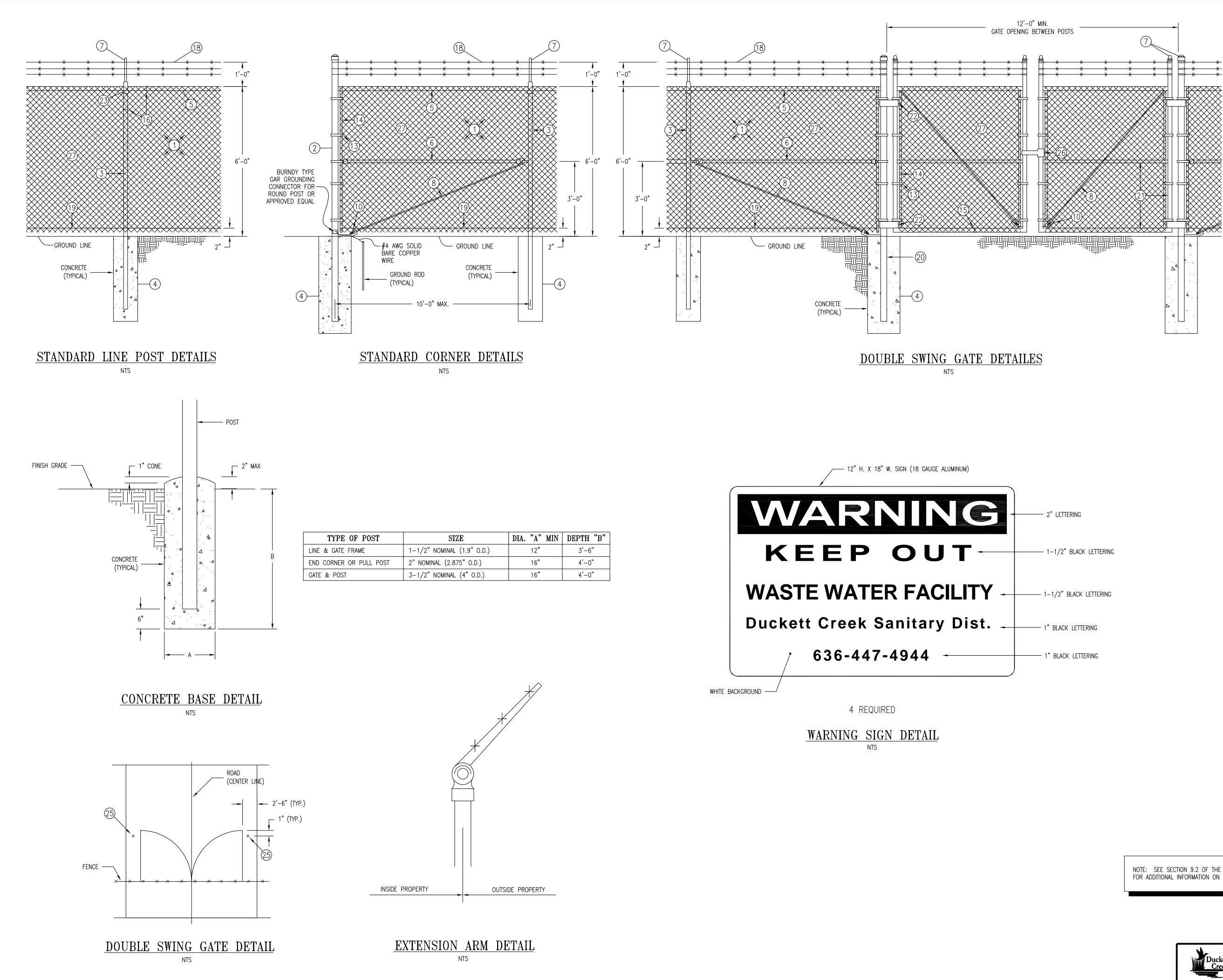
- 1) ALL ELEVATIONS, DIMENSIONS AND LOCATIONS OF RISERS, INLETS AND OUTLETS, SHALL BE VERIFIED BY THE ENGINEER PRIOR TO RELEASING FOR FABRICATION.
- 2) IN SITUATIONS WHERE A FINE-GRAINED BACKFILL MATERIAL IS USED ADJACENT TO THE PIPE SYSTEM, AND ESPECIALLY INVOLVING GROUND WATER CONDITIONS, CONSIDERATION SHOULD BE GIVEN TO THE USE OF GASKETED PIPE JOINTS. AT THE VERY LEAST THE PIPE JOINTS SHOULD BE WRAPPED IN A SUITABLE, NON-WOVEN GEOTEXTILE FABRIC TO PREVENT INFILTRATION OF FINES INTO THE PIPE SYSTEM
- 3) CONSIDERATION FOR CONSTRUCTION EQUIPMENT LOADS MUST BE TAKEN INTO ACCOUNT.
- 4) ALL PIPE DIMENSIONS ARE SUBJECT TO MANUFACTURERS TOLERANCES.
- 5) ALL RISERS TO BE FIELD EXTENDED OR TRIMMED TO FINAL GRADE.

DETENTION PIPE(S) SHALL BE ADS SANITITE HP TRIPLE WALL PIPE. ENGINEER TO CONTACT THE LOCAL ADS REPRESENTATIVE FOR THE DESIGN OF THE DETENTION PIPE SYSTEM.





tt Creek Sanitary



	FENCE NOMENCLATURE AND PARTS LIST					
N0.	. DESCRIPTION REMARK					
1	FABRIC: CHAIN LINK TYPE	- 6' HIGH CHAIN LINK FABRIC, 11 GAUGE				
2	POSTS: PULL, CORNER, P.I.'S	WIRE SHALL BE GALVANIZED STEEL				
3	POST: LINE	WOVEN IN A 2" MESH				
4	BASE, FOR POSTS	SEE DETAIL IN THIS DWG.				
5	RAIL, TOP					
6	RAIL, BRACE					
7	POST TOP OR EXTENSION ARM	EXTENDING 45° OUTWARD				
8	ROD, TRUSS					
9	BAND, TRUSS & BRACE					
10	TRUSS TIGHTENER					
11	RAIL, END	COMPLETE ASSEMBLY				
12	BAND, BRACE	TO FIT SHAPE BEING USED				
13	BAND, STRETCHER BAR	FOR BRACE BOTH SIDES OF POSTS				
14	BAR, STRETCHER	LENGTH TO SUIT FABRIC				
15	TIES, FABRIC TO RAILS	ON GATE ONLY				
16	TIES, FABRIC TO POSTS	(TOP RAILS)				
17	TIES, FABRIC TO WIRES					
18	WIRE, BARBED	3 ROWS ON EXTENSION ARMS				
19	WIRE, TENSION COIL SPRING STEEL	BOTTOM ONLY				
20	POSTS, GATE					
21	FRAMES, GATE					
22	HINGE	180° SWINGING, BOLT TO POST WITH 1/2" BOLT AFTER GATE IS INSTALLED				
23	TOP CAP					
24	BAND END					
25	MALLEABLE IRON GATE KEEPER					
26	FORK LATCH AND HANGER					
27	PRIVACY SLATS	INSTALL "SOLID SLAT" PRIVACY SLATS 1–1/8" x 6', COLOR – BEIGE				

NOTE: SEE SECTION 9.2 OF THE PUMP STATION DESIGN REQUIREMENTS FOR ADDITIONAL INFORMATION ON THE FENCE SPECIFICATIONS.

Duckett Creek	Duckett	Cre	ek	Sar	nitary	Dis	trict
	FENCE DETAILS		Dwn By:	MSM	App By: KLA	Detail N	o. 1 F
Duckett Creek Sanitary District	PENCE DETAILS		Ckd By:		Date: <b>FEB. 2</b>		5-5