followed with two coats of Raven 405 liner, SPECTRASHIELD multi-component stress skin panel wetwell liner system or equal epoxy coating system. In addition, the outside wall below grade is to be coated with bituminous waterproofing material. The top and bottom of the chambers shall be precast or may be poured in place concrete if approved by the Engineer and the District.

C. The wet well pump basin and the valve pit chamber shall be enclosed at grade level with a reinforced concrete pad rectangular in shape and extending a minimum 1' - 0" from the chambers outside diameter.

D. The Lift Station shall be provided with an access drive to the nearest public right-of-way conforming to the latest DOT Standards for Design of Driveways. The District will determine final surface materials.

E. The pump supplier shall provide an aluminum two (2) door access hatch frame and door assembly to be installed in the concrete basin top. This door assembly shall provide access for removal of the pumps and shall support the guide rails. The doors shall be provided with lifting handle, safety latch to hold door in the open position and a hasp suitable for padlock. The doors shall have a nonskid finish and be designed for light, medium or heavy duty, depending on the location of the pumping station. Minimum opening for the wet well entry shall be thirty-six (36) inches by thirty-six (36) inches.

F. An aluminum single door access hatch frame and door assembly similar to the one described above shall be provided for use as entry to the valve pit. Minimum opening for the valve box entry shall be thirty-six (36) inch by thirty-six (36) inch.

G. A swing flex check valve and an eccentric plug valve shall be installed in the valve pit in each pump's discharge piping. A minimum clearance of twelve (12) inches shall be allowed from the bottom of the valves to invert of the pit. A drain pipe and check valve or gate valve shall be installed to drain the valve pit back to the wet basin but not allow the wet basin liquid to enter the valve pit. In addition, a tee or cross with bleedable blind flange shall be provided in the valve vault.

H. All padlocks are to be keyed to District specifications.

**10.06 DISCONNECT SWITCH**

A. A single main fusible or breaker disconnect switch of adequate size to provide power for the "control center" and its related components shall be provided by the Contractor.

B. The disconnect switch shall be housed in a NEMA 4X stainless steel enclosure with an external operation handle capable of being locked in the ON and OFF position.

**10.07 CONTROL CENTER**

A. The control center shall be built in a NEMA 4X stainless steel enclosure and shall be suitable for the specified horsepower and voltage for the pumping equipment. The outer door of the panel shall be hinged dead front with provisions for locking with a padlock. Inside shall be a separate hinged panel to protect all electrical components. H-O-A switches, run lights, circuit breakers, etc. shall be mounted such that only the faces protrude through the inside swing panel and no wiring is connected to the back side of the inside swing panel.



B. A circuit breaker and magnetic starter with three (3) leg overload protection and manual reset shall be provided for each pump. Starters shall have auxiliary contacts to operate both pumps on override condition. A separate circuit breaker shall be supplied for power to the control circuit. The control center shall include an extra circuit breaker of adequate size to provide 115 volt, single (1) phase power for the remote monitor panel. The control center shall include a control voltage transformer to reduce supply voltage to 115 volt, single (1) phase to be used for all control functions except the float circuit and associated relays which shall be provided with 24 volt control voltage. An alternating relay shall be provided to alternate pumps on each successive cycle of operation. A green run light and H-O-A switch shall be provided for each pump. A terminal strip shall be provided to make field connections of pump power leads, float switches, seal sensor leads, heat sensor leads, and remote monitor panel interconnections.

C. A time delay relay shall be provided to delay start of second pump should power outage occur.

D. The control center shall incorporate connections for heat sensors which are installed in the pumps. The connection shall disconnect the starter upon high temperature signal and will automatically reconnect when condition has been corrected.

E. The control center shall incorporate connections for seal failure sensors which are installed in the pumps. The panel will have a seal failure alarm light for each pump. This alarm indicates failure of the lower mechanical seal in the pump. This will be an alarm light only and will not shut down the pump.

F. The control center shall include an hour meter for each pump to register the elapsed operating time of each pump.

G. The control center shall have a high water alarm built into the main enclosure. The high water alarm shall consist of a flashing alarm light with red Lexan plastic cover or red glass globe with metal guard mounted on top of the enclosure. A push to test horn and light button as well as a push to silence horn button shall be provided and mounted on the side of the enclosure.

H. The control center shall include a condensate heater to protect against condensation inside the enclosure. The heater shall be placed so as not to damage any other component or wiring in the control center.

I. The control center shall include lightning protection and a phase monitor relay to shut down the control circuit and protect the equipment due to loss of phase or phase reversal. The three phase sequence voltage relay shall be of the 8-pin connector type.

J. The control center shall incorporate an alternator selector switch to allow selection of automatic alternation or manual selection of the lead pump.

K. The control center shall include a GFI convenience outlet with 20 amp breaker and suitable transformer or power supply to provide 110 volt single (1) phase power to the convenience outlet.

L. The control center shall be suitable for connection to a remote monitor package as described in the section titled "Remote Monitor Package." The main control must include the following interconnection capability:

1. Circuit breaker to power remote monitor panel as described above.



2. Relay contact to signal high water alarm.
3. Relay contact to signal tripping of the overload of any of the pumps.
4. Relay contact to transmit signal of seal failure or heat sensor trip of any of the pumps.
5. Relay contact for pump run and pump call.
6. Relay contact for power failure.

M. A minimum four (4) inch PVC Schedule 40 wall conduit shall be provided from the wet well basin to the control center which will allow the pump power cables, transducer cable or probe cables to be pulled through without difficulty and allow the use of one (1) piece cables from the pumps and level control switches to the control center. The conduit shall be sealed at the control center to avoid entrance of sewer gases into the control panel.

JUNCTION BOXES SHALL NOT BE USED.

N. The control center and associated components shall be mounted on a non-maintenance type pedestal or mounting stand constructed of aluminum. The control center shall be located so as to provide safe access to the panel while wet well hatch doors are open, and shall be positioned so as not to be between the access drive and the wet well.

O. All components of the control Center shall be American made and available from local sources. In particular, items such as circuit breakers, overload protection, relays, etc. shall be available and in stock by local sources.

P. In order to maintain unit responsibility and warranty on the pumping equipment and control center, the control center must be accepted in writing by the pump manufacturer as suitable for operation with the pumping equipment.

Q. The contractor shall furnish an emergency power disconnect with double throw capabilities.

**10.08 LEVEL CONTROL**

A. ELECTRONIC LEVEL CONTROL SWITCHES

1. Transducers
2. Probe

**10.09 SYSTEM OPERATIONS**

A. On sump level rise, the first level switch shall energize the pump call relay. The second level switch shall start the lead pump, with the lead pump operating thelevel shall drop to the first level switch and shut off the lead pump. The alternating relay in the control center shall index on the stopping of the pump so that the lag pump will start on the next operation. If the level continues to rise with the lead pump operating the override switch shall energize and start the lag pump.



Both lead and lag pump shall operate together until the lower level switch turns off both pumps. If the level continues to rise with both pumps running the alarm level switch shall energize and signal the alarm. If one pump should fail for any reason, the second pump shall operate on the override switch. All level switches shall be adjustable from the surface.

**10.10 REMOTE MONITOR PACKAGE**

A. The station shall be equipped with a remote monitor capable of monitoring the status of the lift station and communicating with the District's existing alarm system house at the Main Office, FCRWD. The monitor shall include an eight (8) channel digital communicator with a gel battery, a terminal strip for connection to lift station control center circuits, a thermostatically controlled heater and connections to AC power and a radio. The monitor package is to be built in a NEMA 4X stainless steel enclosure. The District's central receiver is an Aquatrol 1300 and the remote test central console is a Pro Soft 2000. To assure compatibility with the existing system, the remote monitor shall be an Aquatrol with 1300 remote.

B. The Remote Monitor shall monitor:

1. High water alarm,
2. Power failure,
3. Pump fail,
4. Signal of seal failure or heat sensor trip of any of the pumps,
5. Pump run,
6. Pump call,
7. Station identification, and
8. One open channel.

The Remote Monitor shall provide for phase monitor protection in that it shall continuously check for undervoltage (less than 90% of the normal setting) or loss on one of the three phases or improper phase sequence. Upon detecting one of the above conditions, the unit will generate a code (power failure) alarm.

Each circuit shall use two relays. Each relay shall be wired to an individual pump to remove the shock hazard. Bypass switches shall be installed for each relay so that when a pump is removed for service, the circuit can be bypassed to allow monitoring the status of the remaining pump. Switches will be labeled PUMP 1 ALARM BYPASS and PUMP 2 ALARM BYPASS. A relay and control switch shall be provided to the Pump Running signal to implement pump on/off cycle studies.

Turning the switch on at a station will cause the station to signal the computer as the pumps cycle on and off so that the computer may log the time on and off for later analysis.



C. The Contractor shall install the monitor and coordinate testing with Sewer Maintenance Control Center to assure that the remote monitor reports the proper outputs prior to final acceptance of lift station.

**10.11 ~~ON-SITE EMERGENCY POWER GENERATOR~~**

A. ~~Provisions for emergency standby power shall be provided at each lift station site unless otherwise indicated by the District. The station shall be equipped with an onsite permanent generator that meets the following requirements:~~

~~1. Emergency Generator shall be totally automatic and shall include all automatic transfer switches and other components necessary for automatic operation.~~

~~2. Housing for the emergency generator shall be a heated and insulated weatherproof enclosure.~~

~~3. Automatic transfer switch must be enclosed in a NEMA 4x rated enclosure.~~

~~4. A residential type silencer must be provided to minimize noise from the emergency generator. Noise levels shall not exceed 80 decibels.~~

~~5. Emergency generator shall be diesel fueled and be equipped with a 24 hour fuel tank.~~

~~6. Generator shall be sized to run all pumps at the pump station simultaneously.~~

~~7. Acceptable emergency generator manufacturers: Cummins, Caterpillar, Kohler, or approved equal.~~

~~8. Supplier must have a complete service and parts facility within a 60 mile radius and provide 24 hour service.~~

~~9. A two (2) year warranty must be provided to guarantee against defective parts or workmanship. The warranty shall cover 100% of all part and labor.~~

~~10. The generator, diesel engine, and radiator shall be painted the engine manufacturer's standard color.~~

**10.12 OPERATION AND MAINTENANCE MANUALS**

A. Four (4) operation and maintenance manuals shall be submitted to the District.

B. Manuals shall include at a minimum:

1. Operation instructions;
2. Maintenance instructions;
3. Recommended spare parts list;
4. Lubrication schedules;



5. Structural diagrams;
6. As-built wiring diagrams; and
7. Bill of materials.

**10.13 SPARE PARTS**

A. The Contractor shall supply one set of spare parts for each station, including at a minimum the following:

1. Impeller;
2. Upper seal assembly;
3. Lower seal assembly;
4. Upper bearing assembly;
5. Lower bearing assembly;
6. Wear rings; and
7. O-Rings and gaskets (two (2) sets).

**10.14 NOTES TO DESIGN ENGINEER**

A. SIZING OF WET BASIN

1. The wet well storage below the lowest inlet shall be a minimum of 5'0"and shall also meet the following criteria:

a. Pump Level to be set at the pump manufacturer's recommended level but no less than 1'0" from the bottom of the wet well.

b. The distance between the pump off level and the lead pump on level shall be set to provide storage capacity equal to:

$$\frac{15 \text{ X RATED PUMP GPM}}{4 \text{ (I.E. 15 MINUTE CYCLE MINIMUM}}$$

c. The lag pump on level shall be set a minimum of 6" above the lead pump on level and a minimum of 6" below the lowest inlet invert.

d. The high water alarm level shall be set a minimum of 6" above the lag pump on level and a minimum of 6" below the lowest inlet invert.

e. All levels shall be set below the lowest inlet invert.

B. STATION WARRANTY



Station warranty shall be three (3) years from the date of acceptance per District maintenance bond requirements.

**10.15 SMALL DIAMETER PRESSURE SEWER SYSTEMS**

A. GENERAL

1. Small diameter pressure sewer systems incorporating the use of individual home grinder pump units will be allowed on a case-by-case basis subject to the written approval of the District and the Indiana Department of Environmental Management. In general, these systems shall only be considered in areas where the surrounding areas are currently served by sanitary sewers and the site can not be sewered by gravity.

2. The maintenance of the grinder pump station and building force main to the point of connection with the collector force main shall be the responsibility of the homeowner. The District shall only be responsible for the maintenance of the collector force main.

3. The redundant check valves for use as a curb stop shall be a brass McDonald swing check valve model 3101. The curb stop shall be located in the right-of-way. The vault for the curb stop (See Figure 10.2) shall be a 30-inch diameter Sono-Loc, Hi Corr or approved equal corrugated pipe section with an East Jordan Inc. Type 2800, Neenah R-5900-G, or approved equal cover and frame that reads "SEWER"

4. All of the mechanical and electrical equipment shall be an integral package supplied by the grinder pump manufacturer with local representation so as to provide undivided responsibility. The package shall be equal in construction and performance to F.E. Myers WG20 Grinder Pump Model and other specific requirements set forth herein and in the approved plans.

5. The Contractor shall submit to the District for review and approval three (3) sets of shop drawings, detailed specifications, pump warranty performance characteristics, and design calculations for all of the equipment and fixtures to be furnished and installed.

6. The Shop Drawings and equipment data shall be submitted with a cover letter or Contractor's stamp of approval, indicating that he has reviewed, checked and approved the data submitted. The District will review the submittal and render a decision in writing as to the acceptability of the equipment.

7. Any exceptions to this Standard or associated approved Plans shall be submitted in writing and clearly stated. The exceptions must be approved by the Engineer and the District prior to proceeding with the work.

**END OF SECTION 10**



PROTECTO 401™ 2017 EDITION P5

## SUGGESTED SPECIFICATION FOR PROTECTO 401 INTERIOR LINING FOR DUCTILE IRON PIPE AND FITTINGS

### I. Condition of Ductile Iron Prior to Surface Preparation

All Ductile Iron pipe and fittings shall be delivered to the application facility without asphalt, cement lining, or any other lining on the interior surface. Because complete removal of old linings may not be possible, the intent of this specification is that the entire interior of the Ductile Iron pipe and fittings shall not have been lined with any substance prior to the application of the specified lining material and no coating shall have been applied to the first six inches of the exterior of the spigot ends.

### II. Lining Material

The standard of quality is PROTECTO 401 Ceramic Epoxy. The material shall be an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. Any request for substitution must be accompanied by a successful history of lining pipe and fittings for sewer service, a test report verifying the following properties and a certification of the test results.

**A.** A permeability rating of 2.00 when tested according to the procedure described in Method A of ASTME 96, Procedure A with a test duration of 30 days.

**B.** The following tests must be run on coupons from factory-lined Ductile Iron pipe.

**1. ASTM B 117 Salt Spray (scribed panel)**
Results to equal 0.0 undercutting after two years.

**2. ASTM D 95 Cathodic Disbondment (1.5 volts at 77°F)**
Results to equal no more than 0.5 mm undercutting after 30 days.

**3. Immersion Testing**
Rated using ASTM D 714.

**a. 20% Sulfuric Acid**
No effect after two years.

**b. 140°F 25% Sodium Hydroxide**
No effect after two years.

**c. 160°F Distilled Water (scribed panel)**
No effect after two years.

**d. 120°F Tap Water (scribed panel)**
0.0 undercutting after two years with no effect.

**C. Abrasion Resistance**
Less than .075 mm (3 mils) loss after one million cycles on a a22.9° sliding aggregate slurry abrasion tester using a sharp natural silicenous gravel with a particle size between 2 mm and 16 mm (European Standardard SN598).

*TR FLEX® & FIELD LOK 350® are Registered Trademarks of U.S. Pipe and Foundry Company.*



PROTECTO 401™ 2017 EDITION P6

## SUGGESTED SPECIFICATION FOR PROTECTO 401 INTERIOR LINING FOR DUCTILE IRON PIPE AND FITTINGS (CONT.)

### III. Application

**A. Applicator**
The lining shall be applied by a certified firm with a successful history of applying linings to the interior of Ductile Iron pipe and fittings.

**B. Surface Preparation**
Prior to abrasive blasting, the entire area to receive the protective compound shall be inspected for oil, grease, etc. Any areas where oil or grease is present, or any substance which can be removed by solvent, shall be solvent cleaned to remove these substances. After the surface has been made free of grease, oil or other substances, all areas to receive the protective compounds shall be abrasive blasted using compressed air nozzles with sand or grit abrasive material. The entire surface to be lined shall be struck with the blast media so that oil rust, loose oxides, etc., are removed from the surface. Only slight stains and tightly adhering oxide may be left on the surface. Any area where rust reappears before lining must be reblasted.

**C. Lining**
After surface preparation, the interior of the pipe shall receive 40 mils nominal dry film thickness of PROTECTO 401. No lining shall be applied when the substrate or ambient temperature is below 40°F. The surface also must be dry and dust free. If flange pipe or fittings are included in the project, the lining shall not be used on the face of the flange.

**D. Coating of Bell Sockets and Spigot Ends**
Due to the tolerances involved, bell interior and spigot exterior up to 6 inches back from the end of the spigot end must be coated with 6 mils nominal, 10 mils maximum PROTECTO Joint Compound. The Joint Compound shall be applied by brush to ensure coverage. Care should be taken that the Joint Compound is smooth without excess buildup in the gasket seat or on the spigot ends. Coating of the gasket seat and spigot ends shall be done after the application of the linings.

**E. Number of Coats**
The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied above the dry thickness per coat recommended by the lining manufacturer in printed literature. The maximum or minimum time between coats shall be that time recommended by the lining material manufacturer. No material shall be used for lining which is not indefinitely recoatable with itself without roughening of the surface.

**F. Touch-Up & Repair**
PROTECTO Joint Compound shall be used for touch-up or repair in accordance with manufacturer's recommendations.

*TR FLEX® & FIELD LOK 350® are Registered Trademarks of U.S. Pipe and Foundry Company.*



PROTECTO 401™ 2017 EDITION P7

## SUGGESTED SPECIFICATION FOR PROTECTO 401 INTERIOR LINING FOR DUCTILE IRON PIPE AND FITTINGS (CONT.)

**G. High Pressure Cleaning**
**Guidelines for Pressure Cleaning the Internal Diameter of Ductile Iron Pipe**

The Ductile Iron Pipe Research Association (and its Member Companies), Federal Signal Corporation (and its subsidiaries Vactor, Elgin, Guzzler, Jetstream & Ravo), and Indurse Coatings Inc. participated in a pressure cleaning research program that was conducted by the Missouri University of Science and Technology – High Pressure Waterjet Laboratory.

The test program included asphaltic seal coated cement-mortar lined and Protecto 401 lined Ductile Iron pipe which resulted in guidelines for the pressure cleaning of the inside diameters of Ductile Iron pipe. Through a collaborative effort with the organizations above and the City of Moline, Illinois, field tests were conducted and the guidelines verified as effective and safe for cement-mortar and Protecto 401 lined ductile iron pipe.

**Guidelines are as follows:**

1. The nozzle shall be configured with four jets only (no round jets).
2. The four jets should be oriented at a maximum angle of 30 degrees to the pipe wall.
3. The nozzle shall be a minimum of 2 inches standoff from the pipe surface.
4. The nozzle assembly shall be self-rotating and incorporate a rotational control mechanism - target speed of 30 rpm.
5. The water pressure at the nozzles shall be no more than 2,500 psi.
6. The nozzle assembly shall have non-abrasive wheels and/or UHMW (ultra-high molecular weight) polyethylene skids positioned so that at no time does the nozzle assembly contact the lining of the pipe.
7. The nozzle assembly shall continually move when pressure washing with no hesitation in the pipe.
8. All hose couplings, hoses, etc. shall be smooth so as to facilitate movement across the pipe joints without creating damage to the lining.

Pipe diameters of 24-inch and larger may require additional passes for effective cleaning.

**Vactor Blue Twister Nozzle (or equal) and appropriate assembly**

Although research shows no significant damage in testing, the decision to pressure wash, if made by the customer, engineer, or installer, may present some risk of damage to the Protecto 401.

Any such risk is dependent on water pressure, speed, jet design and angle to the lining, distance of the jet from the lining, type of lining, and other factors. DIPRA does not warrant or guarantee the result or assume any risk associated with pressure washing.

*TR FLEX® & FIELD LOK 350® are Registered Trademarks of U.S. Pipe and Foundry Company.*



PROTECTO 401™ 2017 EDITION P8

## SUGGESTED SPECIFICATION FOR PROTECTO 401 INTERIOR LINING FOR DUCTILE IRON PIPE AND FITTINGS (CONT.)

### IV. Inspection And Certification

**A. Inspection**

1. All Ductile Iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC PA-2 Film Thickness Rating.
2. The interior lining of all pipe and barrels and fittings shall be tested for pinholes with a nondestructive 2,500 volt test. Any defects found shall be repaired prior to shipment.
3. Each pipe joint and fitting shall be marked with the date of application of the lining system along with its numerical sequence of application on that date and records maintained by the applicator of his work.

**B. Certification**
The pipe or fitting manufacturer must supply a certificate attesting to the fact that the applicator met the requirements of this specification and that the material used was as specified.

**C. Handling**
PROTECTO 401 Lined Pipe and Fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc. shall be placed inside the pipe and fittings for lifting, positioning or laying.



CONTRACTOR SHALL ADHERE AND REFERENCE THE CURRENT FALL CREEK REGIONAL WASTE DISTRICT STANDARDS FOR DESIGN AND CONSTRUCTION OF SANITARY SEWERS.

REVISIONS

| DATE | DESCRIPTION | BY |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

HWC ENGINEERING
INDIANAPOLIS - TERRE HAUTE
LAFAYETTE - MUNCIE - NEW ALBANY
www.hwcengineering.com

SPRINGBROOK SECTION 4

FCRWD SANITARY SEWER SPECIFICATIONS

KRISTOPHER K. FISHBURN REGISTERED No. 11400758 STATE OF INDIANA PROFESSIONAL ENGINEER

Kristopher K. Fishburn

| | |
|---|---|
| DRAWN BY TS/TD/GM | JOB NUMBER 2017-271-D |
| CHECKED BY KE | |
| DATE AUGUST 11, 2020 | |
| SCALE N/A | |
| SHEET C8.11 | |

FCRWD SANITARY SEWER SPECIFICATIONS

© 2020