

Hazen *Technical Memorandum*

October 31, 2023

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Re: City of Hollywood Emergency Bypass Bar Screen Project
City Project No. 2023-9217; Hazen Project No. 4321-100

Emergency Bypass Bar Screen Basis of Design Memorandum

DRAFT

Introduction

The bar screens at the City of Hollywood's Southern Regional Wastewater Treatment Plant (SRWWTP) provide the primary means of protection for the downstream treatment works and accompanying equipment from debris inherent in raw wastewater. Recent storm events carried excessive debris to the SRWWTP, clogging and severely damaging the existing screens, threatening the collection system with an overflow of sewage. To reduce risk of a system overflow and to protect public health, the installation of an emergency bar screen bypass is desired. The purpose of this technical memorandum is to develop a basis of design for implementation of an emergency bar screen bypass.

The following basis of design technical memorandum includes the study of a single, coarse bar screen to be installed as an emergency bypass for the existing screening building, and comparison of three screen manufacturers. Based on recent practices of bypassing all screening, a "no-screen" alternative (pipeline only) is also included. Additionally, this memorandum includes a recommendation on pipe material and discussion on the proposed construction approach.

For report organizational purposes, all relevant photographs are provided in **Appendix A**, and referenced in the report text by figure numbers.

Job no 04321-100

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1. Existing Conditions

1.1 Existing Bar Screens

Mechanical bar screens are currently utilized at the Southern Regional Wastewater Treatment Plant (SRWWTP) to remove large solid objects in the influent flow stream and protect downstream mechanical equipment. The existing screening system includes two (one duty, one standby) mechanically cleaned climber-type bar screens. In 2013, the Infilco-Degremont bar screens with 3/8-inch bar spacing were replaced with finer HUBER RakeMax bar screens with 1/4-inch bar spacing for improved screening. Each HUBER RakeMax bar screen is rated for a peak hour flow capacity of 140 million gallons per day (mgd). The existing screen chambers are 8 feet wide and 19 feet deep. Screened materials are deposited in dumpsters and trucked off-site by a private contractor for disposal.

There have been three recent failure events with the current bar screens based on staff accounts:

- November 2020: One of the screen's level sensors failed, causing excessive debris build-up and subsequent screen failure.
- May 2022: Due to level sensor failure, a procedure was implemented in which the screens were manually checked by Operations staff. The screens were not checked at regular intervals, causing excessive debris build-up and eventual screen failure.
- June 2022: A large piece of lumber (2"x4") in the influent wastewater hit and damaged the east screen.

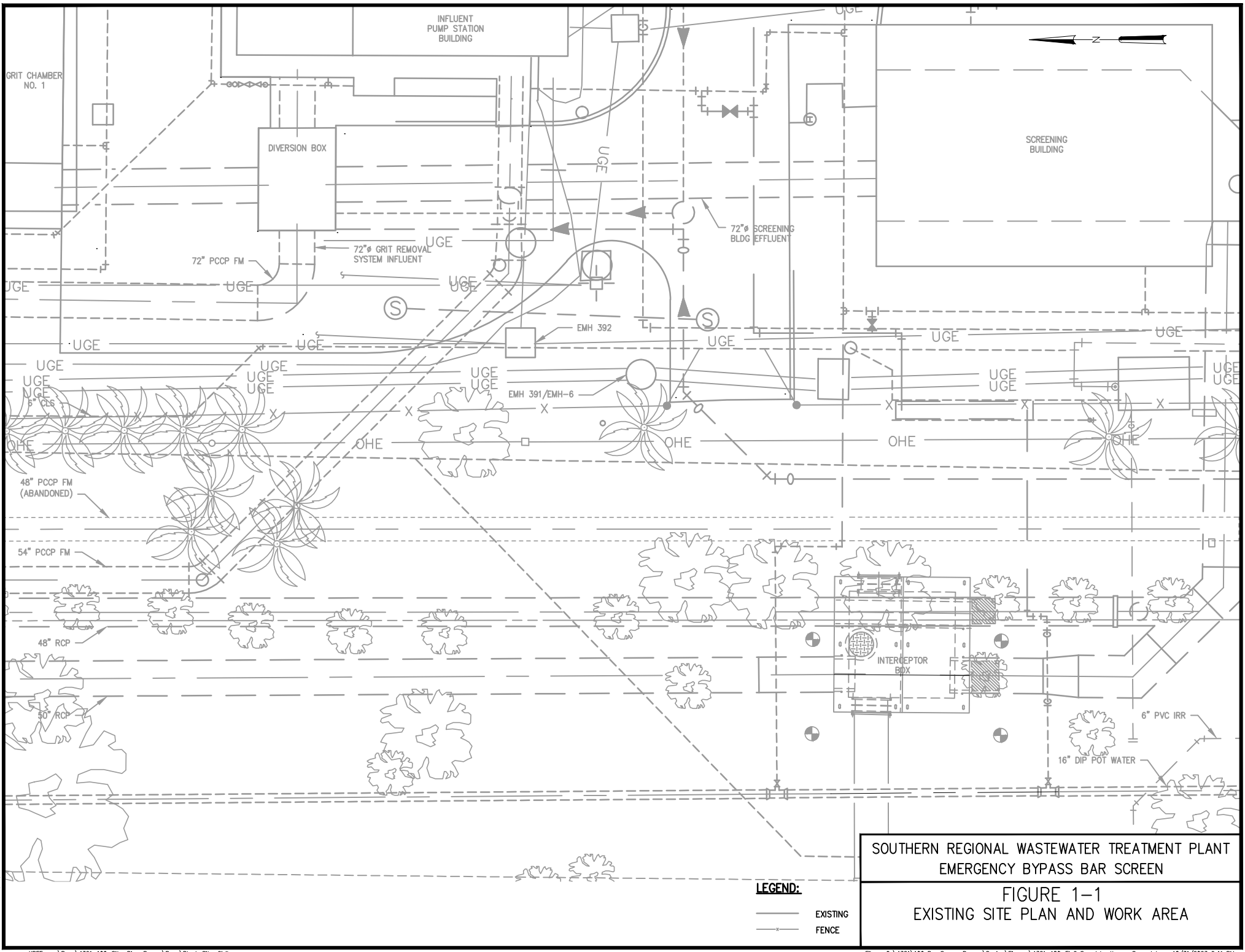
Appendix A Figure A-1 was taken inside the bar screen building in May 2023. Both bar screens have been damaged by incoming debris. The east bar screen is currently removed, awaiting repair parts, and has not been placed back into service. The housing of the east bar screen is shown in **Appendix A Figure A-2** and the chain is shown in **Appendix A Figure A-3**. Currently, all of the influent wastewater flow is being sent through the repaired west screen.

Treatment following the bar screens includes the grit removal system prior to the influent pump station (IPS). The passing of unscreened effluent allows large incoming debris and rags to clog the grit removal mechanisms and grit pumps and can damage the IPS pumps. Rags and debris passing further downstream has led to excessive maintenance and operational difficulties, particularly with the oxygenation mixers and clarifiers. The emergency bypass will allow the City to completely take the bar screen building out of service to perform any needed repairs to the screen influent chamber, effluent chamber and discharge pipeline as well as any repairs and maintenance in future. Incorporation of a screen in the bypass will allow debris removal while in use to protect downstream processes and the flexibility to provide supplementary screening during strong or prolonged storm events if needed.

1.2 Utilities in Vicinity of Project

Hazen subcontracted with Craven Thompson and Associates (CTA) to perform a survey and subsurface utility locates in the vicinity of the project area (**Figure 1-1**).

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SOUTHERN REGIONAL WASTEWATER TREATMENT PLANT
EMERGENCY BYPASS BAR SCREEN

FIGURE 1-1
EXISTING SITE PLAN AND WORK AREA

Based on survey data, available record drawings, and site investigations on 5/1/23 and 7/11/23, the following utilities were found to be in the proposed project area:

- Florida Power and Light (FPL) overhead electric lines and power equipment. There is an existing transformer in the project area which was installed as part of the IPS upgrades under the 1999 WWTP Upgrades project and was abandoned (refer to photo of transformer in **Appendix A Figure A-4**). Additional coordination will be needed with FPL to confirm which equipment is currently active in the project area and which equipment can be removed. Coordination will also be needed with FPL to confirm if the overhead electric may be isolated and shut down for the work.
- Underground electric (UGE). Various underground duct banks and associated electrical manholes are present in the project area. Four underground electrical manholes and vaults in the project area were opened on 7/11/23 for further investigation. The location of these electrical manholes and vaults are shown in **Appendix A Figure A-5**.
 - 5.3'x7.0' Electrical Vault: Located west of the Screening Building. Vault is completely full of sediment and does not appear to be in use. Refer to photograph in **Appendix A Figure A-6**.
 - Electrical MH 391 / EMH-6: Located south of the abandoned FPL transformer. A number of unlabeled conduits believed to be the emergency tie between the North Electric Service Center (NESC) and the South Electric Service Center (SESC). Some standing water present. Refer to photograph in **Appendix A Figure A-7**.
 - Electrical MH 392: Located east of abandoned FPL transformer and existing light pole. A small number of unlabeled wires and some standing water present. Refer to photograph in **Appendix A Figure A-8**.
 - Electrical Vault adjacent to IPS (not surveyed): Vault is not in the project area but was opened for indications of UGE originating from the project area. Many unlabeled conduits, entangled wires, and some standing water present. Refer to photograph in **Appendix A Figure A-9**.
- Existing light pole will need to be relocated. Refer to photograph in **Appendix A Figure A-10**.
- Existing 54-inch PCCP IPS effluent force main (centerline at EL -1.18 ft, to be confirmed). This pipe will require support while the proposed bypass pip crossing is installed underneath.
- Existing 72-inch pre-stressed concrete cylinder pipe (PCCP) Screening Building effluent main. This is the proposed connection point of the emergency bypass line.
- Abandoned 48-inch PCCP historic plant outfall pipe leading to North Lake. Sections of this force main have been removed during various plant upgrades, but the limits of removal were not available.
- Multiple sanitary sewer manholes and piping is in the vicinity of the project.
- Water service piping is in the vicinity of the project.

- A chlorine solution line (CLS) is in the vicinity of the project.
- Concentrate force main which brings concentrate (brine) from the water treatment plant to the SRWWTP for treatment and disposal. A portion of this main has been abandoned.

It is recommended that the City performs additional investigations to determine which UGE is active and what, if anything, it may be serving. Some of the UGE may have once fed the abandoned FPL equipment noted above and may now be abandoned.

2. Proposed General Layout

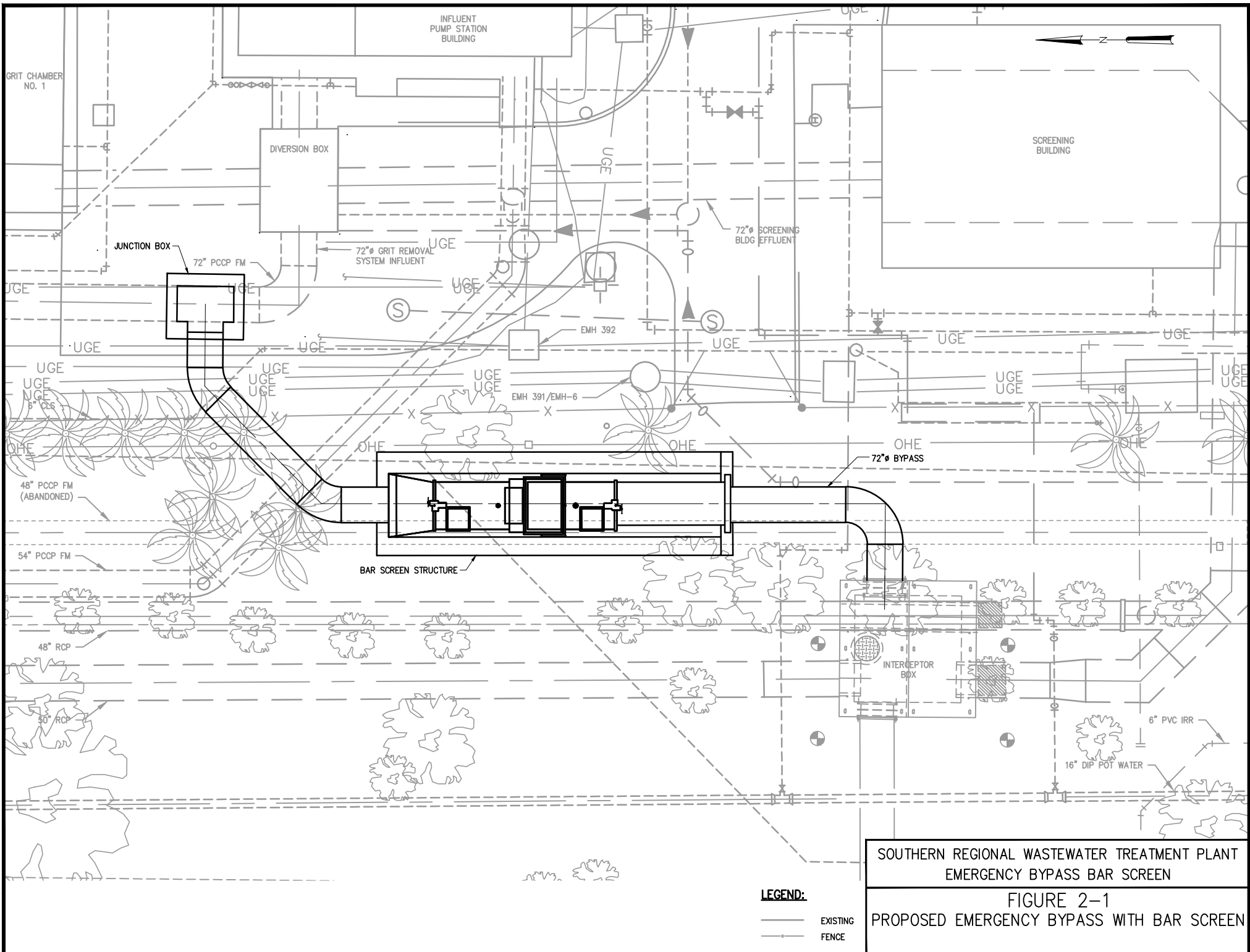
A preliminary layout of the proposed emergency bypass pipe, including screened and unscreened alternatives are provided in **Figure 2-1** and **Figure 2-2**, respectively. The upstream end of the bypass is proposed to connect to the interceptor box located on the Eco Grande Golf Course as shown in **Appendix A Figure A-11**. Due to the existing overhead electric lines along and just outside the SRWWTP perimeter fence and the numerous duct banks located inside the perimeter fence, the bar screen structure is proposed to be located at the edge of the golf course near the northeast corner of the interceptor box. The screened effluent pipe will proceed north and east to tie into the Grit Removal System influent 72-inch PCCP located south of Grit Chamber No. 1.

The interceptor box was installed during the McKinley Street Interceptor City Project No. 07-7059 (August 2009) and serves the Taft Street Interceptor, McKinley Street Interceptor, and the 48-inch diameter gravity interceptor from Dania Beach. Its design included a 72-inch flanged wall piece with blind flanges on both the inside and the outside. Removal of the exterior blind flange will allow connection of the bypass piping. Removal of the interior blind flange via divers will allow activation of the bypass upon completion of construction without the need for shutting down or bypassing the influent interceptors.

On the downstream end, the bypass is proposed to tie into the existing 72-inch PCCP via a gated junction box, similar to the diversion box constructed for the addition of Grit Chamber No. 3. Once constructed over the existing grit influent line, the interior pipe segment would be cut and removed to complete connection of the bypass.

The bypass will include gates or valves at both the interceptor box and the junction box for isolation when not in use. The proposed width of the bar screen channel is 10-ft for an approach velocity of approximately 2 ft/s under full bypass conditions (140 mgd). Coarse bar spacing no greater than ½-inch is proposed to accommodate anticipated extreme storm events with minimal headloss under blinding conditions. The intent is for the bypass to be pumped dry and hosed off after each use to eliminate odors and protect against corrosion. Hose bibbs for non-potable or potable water will be provided for cleaning and a dumpster to capture screenings and facilitate disposal of debris. Removable fiberglass covers over the screen channel, similar to those at the grit chambers, will be included to avoid odors, prevent rainwater inflow, and allow for cleaning and maintenance. Due to the location and limited anticipated use of the emergency bypass, the design does not envision a building or odor control beyond the fiberglass covers and a fully enclosed screening mechanism.

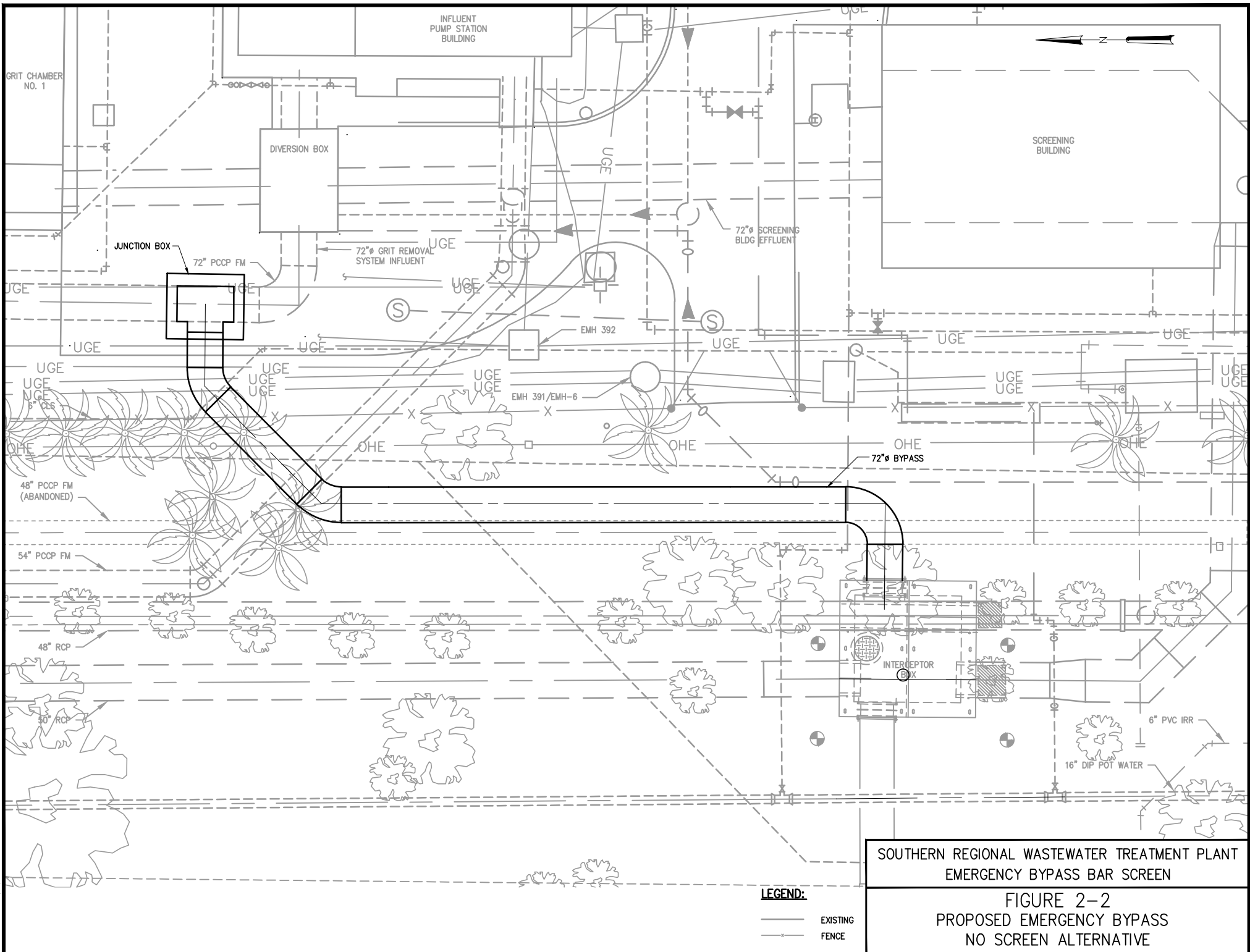
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SOUTHERN REGIONAL WASTEWATER TREATMENT PLANT
EMERGENCY BYPASS BAR SCREEN

FIGURE 2-1
PROPOSED EMERGENCY BYPASS WITH BAR SCREEN

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3. Bar Screen Manufacturer Alternative Analysis

Mechanically cleaned bar screens have been in existence for over 50 years in WWTPs in the United States. These types of screens are manufactured in several configurations, the most efficient of which is the front raked, front return type. Multiple rake bar teeth positively engage with the screenfield bars. The rakes, mounted to chains on each side of the self-contained frame, travel in a continuous circuit from the bottom of the channel, up the bar rack and past the debris plate, where the screenings are scraped off. Mechanically cleaned bar screens offer both fine and coarse screening with spacing typically ranging from 0.25 to 1.5 inches (6 to 36 mm). These screens are suitable for both deep channel and high flow applications.

Manufacturer and models of chain driven mechanically cleaned bar screens that were considered in this analysis include HUBER Technology RakeMax, Duperon FlexRake IQ, and Hydro-Dyne Tiger Shark Multi-Rake. The manufacturers were provided project information shown in **Table 1**. Screens were evaluated with respect to a peak hour flow of 140 mgd. The design concept is predicated on a single, coarse bar screen that is intended for use during emergency conditions only which is comparable to a stormwater application which sees large debris and infrequent use.

Table 3-1: Design Considerations provided to Bar Screen Manufacturers

Parameter	Design Consideration
Flow rate	140 mgd
Clear bar opening	0.5 inch (max)
Grade elevation	6 ft
Channel invert elevation	(-)13 ft
Channel width	10 ft (max)
Channel height	19 ft
Max water level	15 ft

The manufacturers submitted product information including brochures, cut sheets, and a budget cost estimate for the emergency bypass application. A fourth “no-screen” alternative was also evaluated, in which the emergency bypass pipe does not contain any screening. The following sections present descriptions and features of each alternative.

3.1 Alternative 1: HUBER Technology RakeMax Bar Screen

The manufacturer information that was provided for the HUBER Technology Model RakeMax Bar Screen is provided in **Appendix B**. An image of the Huber RakeMax screens is provided in **Figure 3-1**.

Figure 3-1: HUBER Technology RakeMax Bar Screen



RakeMax bar screens are also currently installed at the SRWWTP (two units installed in 2013). Other Huber RakeMax installations in Florida in the last 15 years with wastewater applications are provided in **Table 3-2**. The manufacturer confirmed that there have not been installations of the screen in any stormwater applications; all Florida installations of the Huber RakeMax are wastewater applications.

Table 3-2: Huber RakeMax Installations in Florida

Location	Year of Installation	Quantity	Application
Bradenton, FL	2019	2	Wastewater
Pasco County, FL	2018	2	Wastewater
Naples, FL	2014	2	Wastewater
Fort Lauderdale, FL	2012	4	Wastewater
Key West, FL	2010	1	Wastewater
Milton, FL	2009	1	Wastewater
Seacoast Utilities, FL	2009	2	Wastewater

Maintenance records for the City of Hollywood’s existing Huber RakeMax bar screens were not available; therefore, the manufacturer was requested to provide contact information for other utilities with recent screen installations.

William Waitt, the City of Bradenton Wastewater Treatment Plant Superintendent, was contacted for additional information on the Huber Rake Max bar screen. Mr. Waitt stated that he has worked in multiple treatment plants that use the Rake Max bar screen and he would recommend them. At the City of Bradenton, the only issue experienced since installation in 2019 has been with the motors. They were replaced due to wear and degradation from being outside. His staff does not perform routine maintenance on the units, maintenance is only performed when an issue is identified.

3.2 Alternative 2: Duperon FlexRake IQ Bar Screen

The manufacturer information for the Duperon FlexRake IQ Bar Screen is provided in **Appendix C**. An image of the Duperon FlexRake IQ Bar Screen is shown in **Figure 3-2** and a list of installations in Florida in the last 15 years with wastewater or stormwater applications is presented in **Table 3-3**.

Figure 3-2: Duperon FlexRake IQ Bar Screen



Table 3-3: Duperon FlexRake Installations in Florida

Location	Year of Installation	Quantity	Application
City of Tampa San Carlos PS	2020	2	Wastewater
City of Largo WWTP IPS	2017	1	Wastewater
Manatee Co SEWRF Headworks	2015	3	Wastewater
Indian River County, FL - South Relief Canal Pump Station	2015	1	Stormwater
Indian River County, FL - Egret Marsh	2015	1	Stormwater
SFWMD G251 P.S.	2012	6	Stormwater
City of Bartow, FL - SFWMD Lake Hancock	2012	3	Stormwater
SFWMD Deering Estate Flow-Way	2011	3	Stormwater
Collier County, FL - Picayune Strand - Merritt Pumping Station	2011	1	Stormwater
SFWMD G435 P.S.	2010	3	Stormwater

The manufacturer was requested to provide contact information for other utilities with recent screen installations. Two utilities were contacted for input.

Dave Winkler, the Plant Superintendent of Operations at the City of Largo, was contacted for additional information on the Duperon FlexRake bar screen. Mr. Winkler stated that the FlexRake bar screen has really helped operations and it is recommended. The screen is fitted with a washer/compacter. The only issues experienced are when excessively large items like cinder blocks and 2x4's enter the system, the auger can't always crush excessively large debris effectively. His staff performs monthly maintenance to keep the screens operational.

Cassidy Barrett, the Project Manager at the City of Tampa, was also contacted for additional information on the Duperon FlexRake bar screen. Ms. Barrett stated that the FlexRake bar screen is highly recommended. The screen is fitted with a washer/compacter. The only issue experienced has been corrosion on the compactor equipment, since it is located within the pump station wet well and has exposure to hydrogen sulfide gas. Ms. Barrett was not aware how often routine maintenance is performed.

3.3 Alternative 3: Hydro-Dyne Tiger Shark Multi-Rake Screen

The manufacturer information for the Hydro-Dyne Tiger Shark Multi-Rake Bar Screen is included in **Appendix D**. An image of the Hydro-Dyne Tiger Shark Multi-Rake Screen is shown in **Figure 3-3** and a list of Hydro-Dyne Tiger Shark Multi-Rake wastewater installations in Florida over the last 15 years is provided in **Table 3-4**. The manufacturer confirmed that there have not been installations of the screen in any stormwater applications; all Florida installations of the Hydro-Dyne Tiger Shark are wastewater applications.

Figure 3-3: Hydro-Dyne Tiger Shark Multi-Rake Screen



Table 3-4: Hydro-Dyne Tiger Shark Multi-Rake Installations in Florida

Location	Year of Installation	Quantity	Application
Tampa, FL	2019	1	Wastewater
Dunedin WWTP, FL	2014	1	Wastewater

The manufacturer was requested to provide contact information for other utilities with recent screen installations. Brian Antonian, the Dunedin Wastewater Treatment Plant Superintendent was contacted for additional information on the Hydro-Dyne Tiger Shark Multi-Rake screen. The Dunedin WWTP services 46,000 residents. Mr. Antonian highly recommends the Hydro-Dyne screens and has not had any notable issues since installation in 2014. His staff performs weekly maintenance to keep the screens operational. Hydro-Dyne was able to customize the screens so that ladders are not needed for maintenance and it can be more easily performed. Prior to 2014, the Dunedin WWTP had Infilco climber screens installed, which had significant maintenance requirements and were not recommended by Mr. Antonian.

3.4 Bar Screen Manufacturer Comparison

In addition to obtaining information on previous installations in Florida, each manufacturer was evaluated based on the following criteria, as presented in **Table 3-4**:

- Budget cost estimate
- Equipment/material lead time
- Cleaning mechanism
- Level monitoring mechanism
- “Storm mode” raking capability
- Electrical requirements
- Control features
- Unique features (i.e. pivot capability for bypass, hydraulic lift)
- Successful installations in Florida

All of the bar screens discussed above are available in 316 stainless steel (SS) material.

Table 3-4: Bar Screen Manufacturer Comparison

Metric	HUBER RakeMax Bar Screen	Duperon FlexRake IQ Bar Screen	Hydro-Dyne Tiger Shark Multi-Rake Screen
Nominal Screen Width (ft)	10	10	10
Screen Overall Height (ft)	28.32	31	28.53
Screen Angle (°)	75 from horizontal	30 from vertical	80 from horizontal
Headloss	4-in (@ 30% blinding)	4-in (@ 25% blinding)	7-in (@ 50% blinding)
Budgetary Cost Estimate	\$286,900	\$579,000	\$700,000
Warranty	1-year standard warranty	5-year standard warranty	1-year standard warranty
Equipment and Material Lead Time	24-30 weeks	12-14 weeks	24-30 weeks
Cleaning Mechanism	Dry discharge with UHMW wiper blade	UV Stable UHMW-PE debris blade assembly	Stainless steel rake blades with UHMWPE guide links
Level Monitoring Mechanism	Ultrasonic differential level control (upstream and downstream)	2 mechanical float switches for “run level” and “high level”	Ultrasonic differential level control system is typical. Operation via upstream float or single level transducer is possible.
“Storm mode” raking capability?	VFD operated with increased raking frequency during high flow events	Normal speed at “run level” float trip, continuous operation at high speed with “high level” float trip.	VFD operated with increased raking frequency during high flow events
Electrical Requirements	3 HP, 480VAC, 3 phase, 60Hz	1.5 HP, 480VAC, 3 phase, 60Hz	1.5 HP, 480V motor, 3 phase, 60Hz
Control Features	PLC based control	Relay based control with E-Stop, Forward, and Jog Reverse buttons. Hardwired interface to SCADA available with remote capability.	Relay based control based on upstream level with a timer; Jam removal sequence reverses rake when obstruction sensed; alarm signals upon failure
Unique Features	Vertical hydraulic lift system available.	<ul style="list-style-type: none"> Head sprocket only - no submerged sprockets or bearings Rake link system design allows jam evasion capability by flexing around and collecting large objects such as a 2 X 4s, bowling balls, grease balls All maintenance can be accomplished at the operating floor level or above. 	<ul style="list-style-type: none"> Screen can pivot out of channel for full bypass Direct drive rake system No submerged bearings, sprockets or bushings All screen maintenance is done above channel level “Guide link” drive system articulates through a stainless-steel track system within the screens frame. Longer wear life than metallic chain designs

3.5 Alternative 4: Unscreened Bypass

The unscreened bypass alternative consists of an emergency bypass pipe without a screen. Eliminating the screen presents capital cost savings, eliminates the above-ground presence of a screening facility and associated maintenance requirements and odor concerns. However, an unscreened bypass will allow large debris to travel through the system, impacting and potentially damaging downstream processes such as the grit chambers, influent pump station, oxygenation trains, and clarifiers.

4. Pipe Material

The proposed bar screen bypass presents a challenging installation with respect to the influent and effluent piping. Connections at both the Interceptor Box and Grit Removal System influent piping are 72" in diameter with invert elevations approximately 20-ft below grade. The groundwater elevation is 5-6 feet below grade requiring installation "in the wet" which will require special consideration for backfill and compaction activities to provide adequate pipe support. Additionally, the proposed application will submit the pipe material to prolonged exposure to raw sewage which will remain stagnant while the bypass is out of service for long periods of time, necessitating robust hydrogen sulfide corrosion resistance.

The entire bypass pipe from the existing influent interceptor box to the proposed bypass screen structure and connecting with the 72-inch PCCP will be buried. To keep pipe velocities below 9 ft/s at the peak design flowrate of 140 mgd, a diameter of 72-inches is preferred. Three pipe materials were considered for this application: glass (fiber) reinforced plastic (GRP or FRP), pre-stressed concrete cylinder pipe (PCCP), and ductile iron pipe (DIP). The pipes will convey wastewater via gravity flow, and therefore pressure ratings are not considered for this analysis.

4.1 Alternative 1: Glass-Reinforced Polymer Pipe (FRP or GRP)

Centrifugally cast, fiberglass reinforced, polymer mortar pipe (AWWA C950) is one option for large diameter gravity application. The material is strong yet lightweight and is produced with consistent dimensions, which are manufactured up to nominal diameters of 126-inches. The materials used for this composite pipe are corrosion resistant which inherently makes the pipe material a superior alternative for the wastewater environment or contaminated soils. There is no need for linings or coatings. Products are maintenance-free and designed for 100-year lifespans. Joints are made using filament wound couplings (FWC) with watertight gaskets. Due to the pipe material being lightweight, the pipe is susceptible to flotation during construction. FRP pipe is a flexible pipe requiring a dry trench and highly compacted backfill. Pipe embedment using sand, geo-fabric wrapped stone, or flowable fill is often needed in areas of poor soils. In order to avoid using flotation restraints, the pipe requires soil cover of approximately one-half to one diameter of pipe above it to resist flotation.

The principal manufacturers of laminate and centrifugally cast FRP are:

- US Composite Pipe South (laminate), Zachary, Louisiana
- HOBAS Pipe USA (centrifugally cast), Houston, Texas

- Ameron International, Rancho Cucamonga, California

4.2 Alternative 2: Pre-stressed Concrete Cylinder Pipe (PCCP)

PCCP (AWWA C301) is a composite pipe material consisting of a thin cylinder steel wall and concrete mortar applied over wrapped prestressing wires as well as applied internally to cover the steel. The concrete protects the steel from corrosion, and the steel provides the pipe with high strength to withstand internal and external loads. PCCP is a rigid pipe with forgiving backfill requirements and can be installed in a wet trench. The exterior concrete is susceptible to cracks thus making the pre-stressing wires vulnerable to corrosion and catastrophic damage. Thicker mortar or additional epoxy coatings offer increased protection. PCCP is more economical and easier to install compared with other pipe materials, however field modifications are more difficult.

The concrete industry is moving in a direction where Type IL cement is more commonly used for the benefits of reduced carbon production. Traditional Portland Cement (PC) is classified as Type I/II, and Type IL cement is a mixture of Type I cement with up to 15% of finely ground limestone. This type of cement for concrete was introduced into ASTM specifications in 2012, but there are apprehensions among specifiers if Type IL will deliver the same level of durability, scaling resistance, wear, and extended service-life properties that are expected when using Type I/II. Other concerns may also include workability, pumpability, finishing, surface wearability and overall constructability. Limestone particle size is classified as more fine than PC, and is attributed to an increase in water demand and may lead to possible failures including plastic shrinkage cracks, thermal cracks, and a weak and dusty surface if the concrete is not kept moist and properly cured.

The principal manufacturers of PCCP are:

- Hanson Pipe & Products Inc., Texas
- Ameron Water Transmission Group, Rancho Cucamonga, California
- Thompson Pipe Group, Rialto, California

4.3 Alternative 3: Ductile Iron Pipe (DIP)

DIP (AWWA C151) has been widely used because of its strength, durability and reliability in wastewater systems. Pipes are manufactured with an internal lining, usually cement mortar, and external coatings can be applied when necessary. DIP is a semi-rigid pipe requiring a dry trench and moderate backfill constraints. In corrosive soils, polyethylene encasement of DIP has proven to be an economical means for providing additional corrosion protection. More sophisticated protective coatings, such as plastic tape wrap or epoxy coating may be provided for greater protection in highly corrosive environments, or when a very high degree of confidence in the protection system is warranted.

There are size limitations when selecting DIP. The largest diameter of DIP produced is 64-inch. At 140 mgd, the velocity in a 64-inch pipe is approximately 9.7 feet per second (fps) as opposed to 7.7 fps in 72-inch pipe. Accounting for the proposed bends and approximate 100 LF in pipe, and no screen, the difference in headloss would be approximately two feet.

The principal manufacturers supplying large diameter DIP to Florida are:

- American Cast Iron Pipe Company, Birmingham, Alabama
- United States Pipe and Foundry Company, Birmingham, Alabama

4.4 Pipe Material Comparison

Key advantages and disadvantages of each pipe material is presented in **Table 4-1**.

Table 4-1: Pipe Material Comparison

	GRP or FRP	PCCP	DIP
Advantages	<ul style="list-style-type: none"> • Shorter lead times (approx. 3 months) • Corrosion resistant interior and exterior – 100-yr lifespan for sewage applications • Installation flexibility - field cutting • Median cost versus other pipe materials (approx. \$1,400/LF) 	<ul style="list-style-type: none"> • Rigid pipe - installation in wet or dry trench possible (1000 psi min. compaction) • >50-yr lifespan (360 PVC lined) • Lower costs versus other pipe materials (approx. \$600/LF) • Flotation not a concern during installation 	<ul style="list-style-type: none"> • Ease of installation • ~50-yr lifespan (epoxy lined) • Flotation not a concern during installation
Disadvantages	<ul style="list-style-type: none"> • Flexible pipe - dry trench needed for installation to attain compaction requirements (3000 psi min. compaction) • Material requires careful handling • Fittings are more difficult to install than other pipe materials • Flotation resistance measures are required during installation 	<ul style="list-style-type: none"> • Susceptible to corrosion – liner subject to failure • Joints must be packed and liner must be welded at each joint • Subject to corrosive soils – external coating needed • Material requires careful handling • Limitations on field cutting and modifications 	<ul style="list-style-type: none"> • Semi-rigid pipe –dry trench (2000-3000 psi compaction) • Size limitation - largest pipe diameter is 64-inch • Susceptible to corrosion • Fittings are expensive, but easier to install • Higher costs versus other pipe materials (approx. \$2,400/LF) • Longer lead times in large sizes (approx. 9 months)

5. Construction Approach

A number of factors will guide the construction approach, including the number of existing structures and utilities in the area, the significant depth and diameter of the bypass line, installation depth below the groundwater table, and connection to the existing 72-inch Grit Removal System influent line. A qualified and experienced contractor will be necessary to perform the work.

Because of the depth of the installation, temporary sheet piling will be required to limit the trench width, retain soil during the excavation phase and to facilitate dewatering. Sheet piling will also be needed for construction of a reinforced concrete structure to be built on auger-cast piles to prevent flotation. The project will require extensive dewatering during construction.

The bypass is proposed to connect to the existing influent Interceptor Box, via a double flanged wall piece on the east side of the box. A new junction box, similar to the existing diversion box at the influent pump station, will be needed around the 72-inch PCCP Grit Removal System influent line before connecting the bypass line at the downstream end. Upon construction, removal of the interior pipe segment will complete the connection. As-builts of the existing diversion box installed as part of the 1985 Plant Improvements Project are provided in **Appendix E**.

Additional investigation is recommended for the several UGE duct banks in the project area. Plant staff were unable to confirm which are active. For construction, all duct banks in the area will have to be cut and crossed for the open trench construction. Therefore, active UGE will need to be temporarily relocated for construction. Upon completion, necessary duct banks will need to be re-built and the active UGE re-installed. One duct bank between EMH-6 and EMH-7 is known to contain the emergency electrical tie between the NESC and the SESC.

A new generator at the SESC is planned and is proposed outside of the project boundaries. It is not anticipated that installation will interfere with the proposed bar screen bypass work. If timely constructed, this genset may allow temporary suspension of the emergency tie-in, mentioned above, during the work, otherwise a temporary electrical bypass will be needed.

Coordination will also be needed with FPL to confirm the presence of an easement in the project area and if the existing overhead electric may be isolated and shut down, or otherwise bypassed, during construction. To date, information and meeting requests to FPL regarding these issues have not been forthcoming. If overhead electric cannot be isolated, installing sheet piling in the vicinity may require splicing shorter length piles with installation in phases adding significant time and cost to construction of the cofferdam. Additionally, depending on the need for overhead electric and the existing duct banks in the vicinity of the project, it may be possible to locate the bar screen structure closer to or within the SRWWTP perimeter fence.

6. Opinion of Probable Cost

An order of magnitude construction cost estimate for the project was based upon preliminary design level information and has an expected accuracy range of +50% to -30%. The final costs project will depend on the final project scope, actual labor and material cost, competitive market conditions, implementation schedule, and other variable conditions. The preliminary budget cost estimate for the overall project is presented in **Table 6-1**. A construction duration of 20 months is anticipated.

Table 6-1: Bar Screen Bypass Preliminary Budget Cost Estimate

Description	Value
Screen Structure	\$1,256,000
Junction Box	\$375,000
72 FRP/GRP Pipe	\$602,000
Dewatering	\$210,000
Bar Screen	\$1,050,000
Isolation Gates	\$180,000
Existing Electrical	\$550,000
Instrumentation & Controls	\$150,000
Restoration	\$85,000
Startup and Testing	\$10,000
Subtotal Construction Cost	\$4,468,000
Bonds and Insurance (3%)	\$135,000
Mobilization / Demobilization (5%)	\$224,000
Overhead and Profit (15%)	\$671,000
General Conditions (5%)	\$224,000
Permit Fee Allowance (5%)	\$224,000
Contingency (30%)	\$1,341,000
Opinion of Probable Construction Cost	\$7,287,000

7. Permitting Requirements

Typical regulatory permitting is anticipated for project implementation. These include the following:

- **Florida Department of Environmental Protection (FDEP)** – Requires treatment plant modification permitting and notification of completion of construction.
- **Broward County Resilient Environment Department (BCRED)** – Requires a treatment plant modification permit, dewatering permit and/or stormwater and drainage permit.
- **City of Hollywood** – Requires full project review and issuance of a Building Permit

It is also noted that the SRWWTP is on Broward County’s list of contaminated sites (#0766A). Should hydrocarbon contamination be found during dewatering, treatment may be required prior to disposal.

8. Recommendations

On three separate occasions, recent storm events have carried excessive debris to the SRWWTP, clogging and severely damaging the existing bar screens, threatening the collection system with an overflow of sewage. To date the prudent response has been to completely remove a screen from its channel and allow unscreened wastewater to flow to the treatment works for extended periods of time. The influx of debris has contributed to the failure and excessive maintenance of downstream equipment and processes. Additionally, rehabilitation work needed in the screenings system effluent chamber and piping cannot proceed without complete bypassing of influent wastewater flow. The proposed emergency bypass will

allow for bypassing all the influent wastewater flow during severe storm events or for needed maintenance. Inclusion of a bar screen in the bypass piping would require increased operations and maintenance but allow for debris removal during such events, lessening future downstream impacts.

Based on the anticipated infrequent usage of the emergency bypass, wastewater will necessarily remain in the bypass piping for extended periods of time. This will promote the generation of sulfuric acid under anaerobic conditions which is detrimental to concrete and ductile iron pipe materials. While the incorporation of a pipe lining will serve to delay the degradation, use of FRP/GRP pipe, which is inert to the anticipated corrosion mechanisms, would provide a superior pipe material for this application.

All of the screens reviewed can accommodate the deep channel installation required at the SRWWTP and provide adequate screening. As mentioned previously, the application proposed for the emergency bypass resembles a stormwater application due to expectations of large debris and infrequent use. The Duperon bar screen has a history of both wastewater and stormwater installations including for the South Florida Water Management District. Although the intent would be for the screen chamber to be drained and cleaned after each use to prevent odors, 316SS construction is recommended to better withstand both the moderately saline influent wastewater at the SRWWTP and an exterior installation.

Appendix A: Photographs and Figures Referenced in Report



Figure A-1: Bar Screen Building Interior - May 2023



Figure A-2: East Bar Screen Removed from Service



Figure A-3: East Bar Screen Chain - Disassembled



Figure A-4: Abandoned FPL Transformer

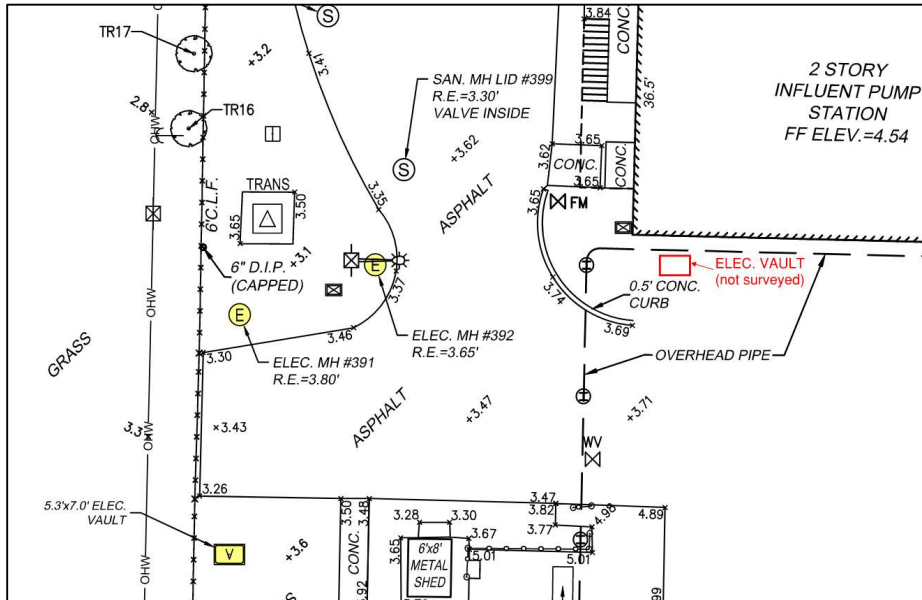


Figure A-5: Location Map of Electrical Manholes Investigated on 7/11/2023



Figure A-6: 5.3'x7.0' Electrical Vault



Figure A-7: Electrical MH 391



Figure A-8: Electrical MH 392



Figure A-9: Electrical Vault adjacent to IPS



Figure A-10: Light pole in conflict with proposed project area



Figure A-11: Interceptor Box on the Eco Grande Golf Course

Appendix B: HUBER RakeMax Bar Screen

Budgetary Proposal

BUDGET PROPOSAL



Hollywood, FL

Equipment:

HUBER Multi-Rake Bar Screen: RakeMax®

Represented by:

Moss Kelley
John Mushinsky
(954) 401-3147
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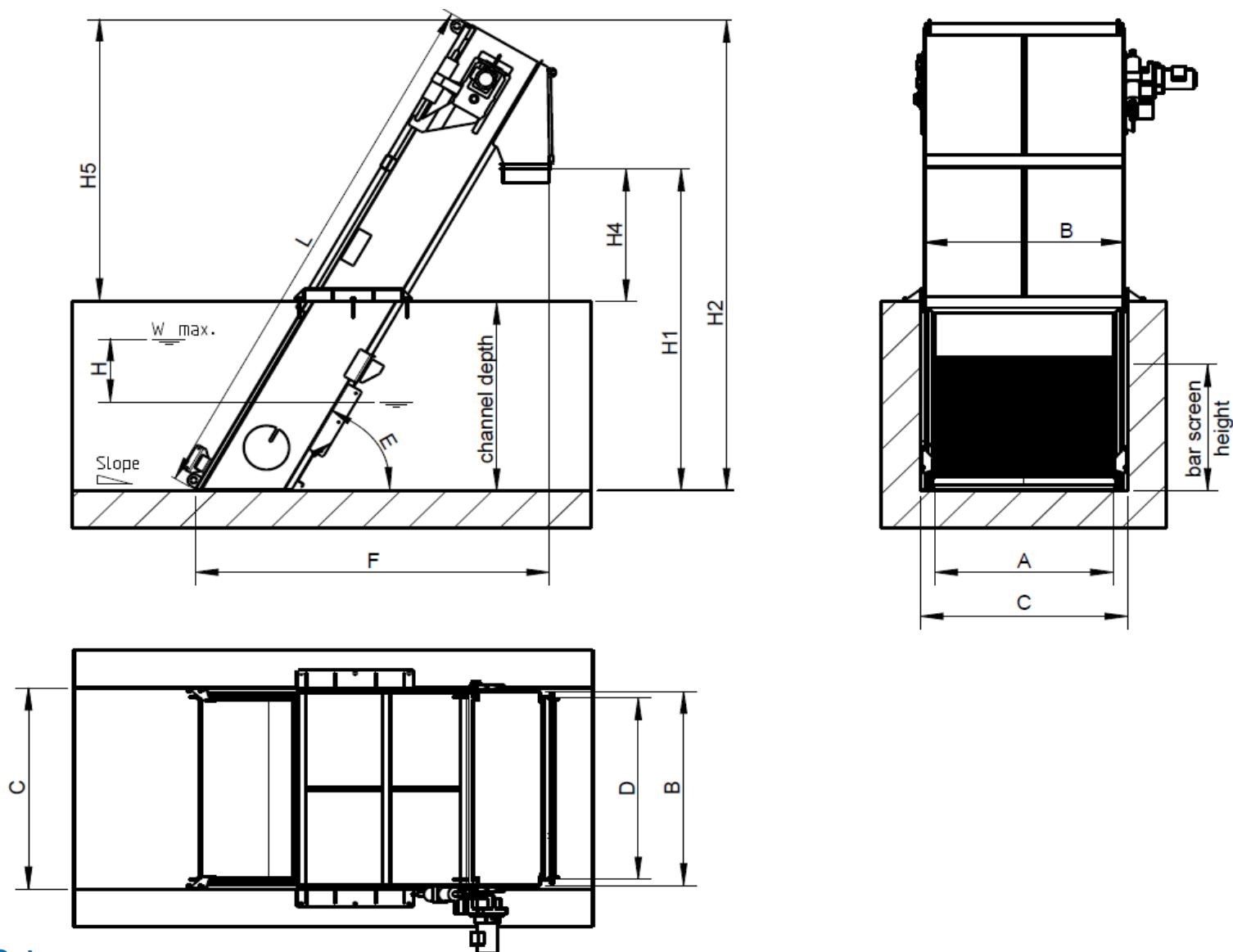
Regional Sales Director:

Steve Frank
(704) 330-9378
Steve.Frank@hhusa.net

Project Number: 499044
Revision: 0
Date: 6/5/2023

HUBER Technology, Inc.
1009 Airlie Pkwy, Denver, NC 28037
704-949-1010 | www.huber-technology.com

Technical Data



Project Data

		Imperial		Metric	
Channel Width	C	8.00	ft	2438	mm
Channel Depth		19.00	ft	5791	mm
Depth to Operation Deck EL (if Applicable)		19.00	ft	5791	mm
Peak Hourly Flow (per Screen)		140.00	MGD	6134	l/s
Clear Bar Spacing		1/2	in	12	mm
Headloss @ 30% Blinding	H	4	in	90	mm
Through-Bar Slot Velocity @ 30% Blinding		5.45	ft/s	1.66	m/s
Channel Approach Velocity @ 30% Blinding		2.12	ft/s	0.64	m/s

Screen Dimensions

		Imperial		Metric	
Overall Discharge Height above Channel Invert	H1	24.80	ft	7558	mm
Discharge Height above Operation Deck EL	H4	5.80	ft	1768	mm
Overall Height	H2	28.32	ft	8632	mm
Height above Operation Deck EL	H5	9.32	ft	2840	mm
Total Screen Length	L	29.31	ft	8932	mm
Length of Screen in Channel	F	10.48	ft	3193	mm
Sieve Width	A	7.14	ft	2175	mm
Total Screen Width	B	7.69	ft	2343	mm
Screen Weight		7326	lbs	3330	kg
Inclination from Horizontal	E	75°			

Screen Details

Screen Model	RakeMax® 8000x2175/12
Quantity	1
Material	316L stainless steel construction; pickled and passivated in acid bath
Screening Bars	Teardrop 8/5/60; 316L stainless steel construction
Chains	316L links with ANSI-431 pins & polyamide rollers
Upper Sprocket & Bearing	316L stainless steel, split; greasable flange bearings
Lower Sprocket & Bearing	316L stainless steel, solid; silicon carbide slide bearings
Scraper	Polyethylene blade
Motor Data	BK60Z 3.0HP, VFD, C1D1, 480VAC, 3 phase, 60Hz, SF 1.0
Anchor Bolts	M12, 316L stainless steel
Local Control Station	Included, 3-hole NEMA7
Level Control Device(s)	VEGAPULS differential with two (2) sensors (per screen)
Optional Adder(s)	No optional adders included

Screenings Treatment Details

Washer/Compactor Data	Imperial		Metric	
Maximum Screenings Capacity	210	ft ³ /hr	6	m ³ /hr
Wash Water Demand	24	gpm	1.5	l/s
Wash Water Pressure	30-60	psi	2-4	bar
Weight (Empty)	1450	lbs	659	kg

Wash/Compactor Model	WAP® 6
Quantity	1
Body Material	316L stainless steel construction; pickled and passivated in acid bath
Screw Auger	Shafted; 316L stainless steel construction with stainless-backed nylon brush in wash & compaction zones
Drain	5mm perforations; latched and sealed with 3.5in NPT drain connection
Inlet Hopper	316L stainless steel construction; inspection hatch included
Discharge Pipe	Tapered, conical pipe flanged connection, endless bagger attachment
Motor Data	7.5HP, C1D1, 480VAC, 3 phase, 60Hz, SF 1.15 (auger)
Water Manifold	Mounted to body; 316L stainless steel construction with two (2) solenoid valves, brass-bodied, C1D1, 120VAC
Anchor Bolts	M12, 316L stainless steel
Local Control Station	Included, 4-hole NEMA7
Dewatering Piece	Not included
Hopper Level Device	Not included
Optional Adder(s)	No optional adders included

Control Details

One (1) HUBER Standard Control Panel	
Enclosure	NEMA 4X, 304 stainless steel
PLC	Allen Bradley MicroLogix
HMI	Allen Bradley PanelView 4"
Motor Starters	VFD (screen), NEMA reversing (WAP, Ro8t), as required
Components	HUBER standard
Climate control components available upon request and are not included in this proposal	
Pre-programmed and factory tested	

Pricing

Equipment	Model	Quantity	Pricing
HUBER Multi-Rake Bar Screen	RakeMax® 8000x2175/12	1	Included
HUBER Wash Press	WAP® 6	1	Adder: \$78,000
HUBER Control Panel	HUBER Standard	1	Included
Freight and Startup Services	Standard HUBER Start-up Services	1 trip(s), 2 day(s)	Included
TOTAL:			\$286,900.00

Standard delivery is 24-30 weeks from approval of submittals.

Thank you for your interest in HUBER Technology, Inc. If you have any questions, please do not hesitate to contact our Regional Sales Director or our local sales representative.

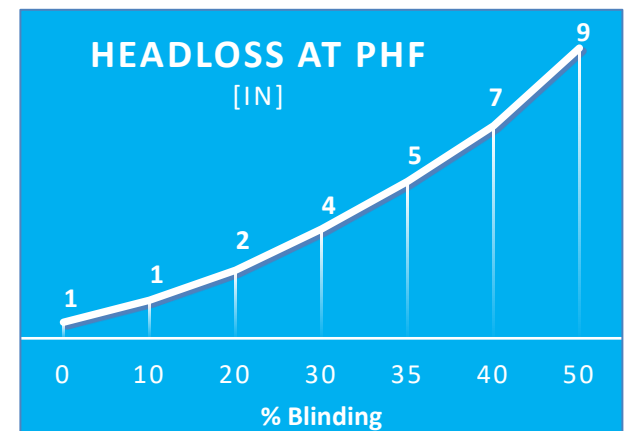
This proposal has been reviewed for accuracy and approved for issue by: BG

Notes and Technical Clarifications

- Equipment specification and drawings are available upon request.
- If there are site-specific hydraulic constraints that must be applied, please consult the manufacturer's representative to ensure compatibility with the proposed system.
- Electrical disconnects required per local NEC code are not included in this proposal.
- All electrical interconnections, wirings, junction boxes, and terminations between the equipment and electrical components are to be provided by installing contractor.
- Huber Technology warrants all components of the system against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, whichever occurs first.
- Budget estimate is based on Huber Technology's standard Terms & Conditions and is quoted in US dollars unless otherwise stated.
- Equipment recommendations are based on information provided to Huber Technology. Subsequent information which differs from what has been provided may alter the equipment recommendation.
- Any item not specifically listed is not considered part of this scope of supply. Please contact the HUBER Technology representative listed for further clarification.
- Equipment pricing that has been broken out from the Total in the table above are only valid when packaged together.

Screen Blinding Calculation Table

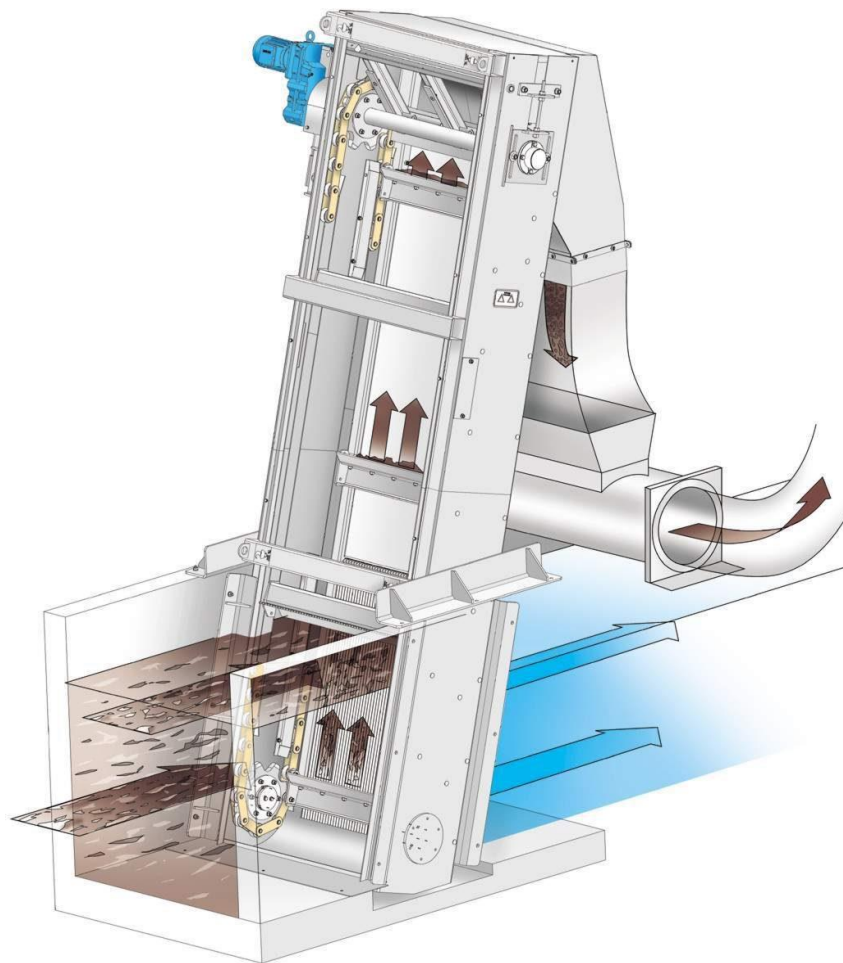
Blinding	Headloss		Upstream Head		Flow Velocity Between Slots		Channel Approach Velocity	
	[in]	[mm]	[in]	[mm]	[ft/s]	[m/s]	[ft/s]	[m/s]
0	1	151	151	3823	3.90	1.19	2.16	0.66
10	1	151	151	3841	4.31	1.31	2.15	0.65
20	2	152	152	3866	4.81	1.47	2.13	0.65
30	4	154	154	3900	5.45	1.66	2.12	0.64
35	5	155	155	3939	5.82	1.77	2.09	0.64
40	7	157	157	3985	6.23	1.90	2.07	0.63
50	9	159	159	4049	7.36	2.24	2.04	0.62



Control Philosophy

Control Philosophy

HUBER Multi-Rake Bar Screen RakeMax®



HUBER SE
Industriepark Erasbach A1
92334 Berching

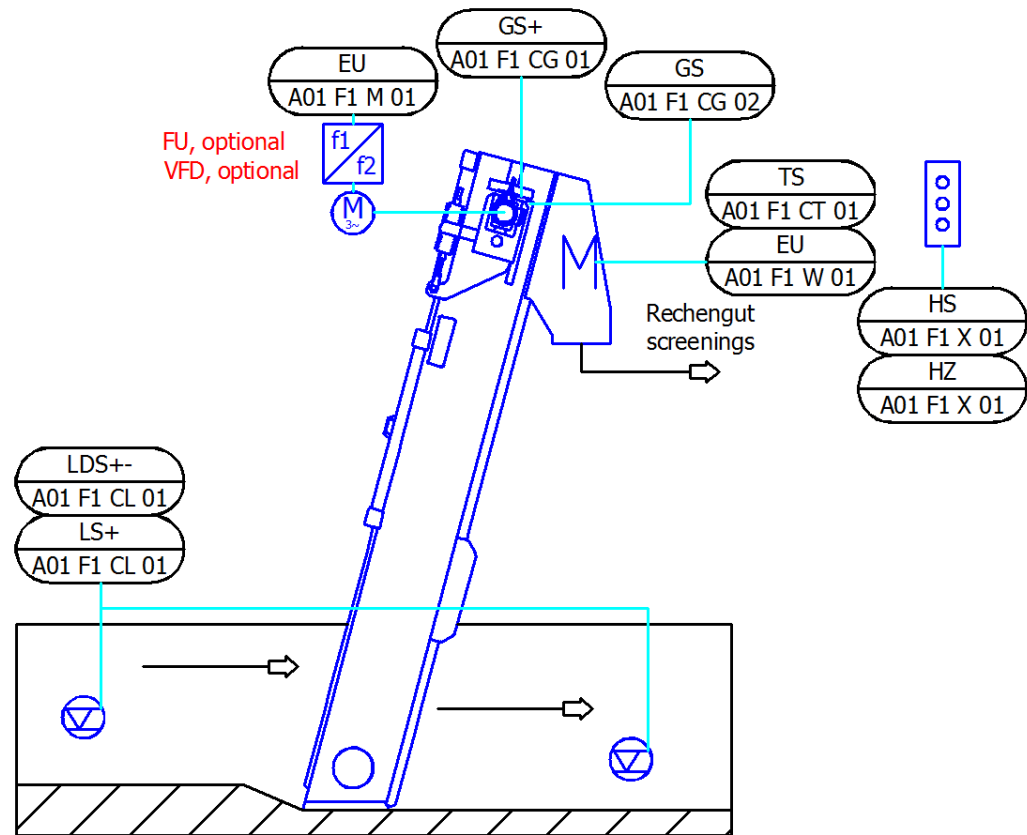
Revision No.	Description	Date	Person in charge

Original Control Philosophy
Version 05.05.2022

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1. Control and instrumentation diagram



Built-in components, see control- & instrumentation diagram and consumer- & measuring points list.

2. Electric measuring and automatic control devices**2.1. Consumer**

Screen drive motor	A01 F1 M 01
Heating	A01 F1 W 01 (option)

2.2. Measuring points

Limit switch for screen drive overload protection	A01 F1 CG 01
Screen level control	A01 F1 CL 01
Limit switch for screen rake position detection	A01 F1 CG 02 (option)
Temperature sensor	A01 F1 CT 01 (option)

2.3. Control points

Local control station	A01 F1 X 01 (option)
-----------------------	----------------------

3. Requirements

3.1. General

- Plant-related safety and emergency stop concepts must be taken into account.
- The machine must be equipped with a mains isolator (or suitable net isolator) to allow for switching off any energy supply (electricity, compressed air, water). The isolator must be lockable.
- The machine must be equipped with one or several emergency stop command devices. Theoretical performance level PLr=„c“ according to DIN EN ISO 13849-1:2016-06 is required.
- Stop category '0' according to DIN EN 60204-1 VDE 0113-1 (2014-10-00) must be realized.
- If there has been a power failure, the plant must start again automatically. In case of a fault or emergency stop, however, appropriate measures must be taken to protect the plant against unintended start up.
- The plant is to be equipped with at least operation mode 1 (automatic operation) and operation mode 2 (manual operation).
- In manual operation mode, the drives can be controlled individually and separately for carrying out start-up and service work.
- Input parameters, such as process values or running times, to be changed via programmable parameters.
- Input parameters, such as limit values, to be changed via adjustable parameters in a protected level (password-protected for HUBER service personnel).
- All aggregates to be equipped with operation and fault indication.
- Operating hours counter to be provided for all drives.
- Machine-specific protection devices (e.g. overcurrent release, thermal motor control, dry run protection, overpressure protection, tightness monitoring system) to immediately switch off the respective associated equipment.
- Applicable standards must be observed when designing the electrical control system, in particular the following:

Directive / standards	Title	CE conformity	Notes
DIN EN 82079 VDE 0039	Preparation of instructions for use - Structuring, content and presentation (IEC 82079-1:2012)	05-2019	Harmonised standards
2006/42/EC	EC directive: machinery	2006	
DIN EN ISO 14118	Safety of machines – Prevention of unexpected start-up	07-2018	Harmonised standards
DIN EN ISO 13849-1	Safety of machines – safety-related parts of electrical control systems – Part 1	06-2016	Harmonised Standards
DIN EN ISO 13849-2	Safety of machines – safety-related parts of electrical control systems –Part 2	02-2013	Harmonised Standards
DIN EN ISO 13850:2016-05	Safety of machines – emergency stop, design guidelines	05-2016	Harmonised standards
2014/35/EU	EC directive: Low voltage directive	2014	
DIN EN 60204-1 VDE 0113-1	Safety of machines; Electrical equipment of machines, Part 1: General requirements	06-2019	Draft Harmonised standards
2014/30/EU	EC directive: EMC	2014	
DIN EN 61000-6-2 VDE 0839-6-2	Electromagnetic compatibility Basic standards for interference resistance for industries	03-2006	Harmonised standards
DIN EN 61000-6-4 VDE 0839-6-4	Electromagnetic compatibility Basic standards for emitted interference for industries	09-2011	Harmonised standards
2014/34/EU	EC directive: Atex	2014	
DIN EN 1127-1	Potentially explosive atmospheres – explosion protection, Part 1: Basic concepts and methodology	10-2019	Harmonised standards
DIN EN 60079-7 VDE 0170-6 2016-08	Potentially explosive areas - Part 7: Equipment protection by increased safety "e" Incl. supplement 10/2017	08-2016	Harmonised Standards Supplement 10/2017
DIN EN 60079-11 VDE 0170-7 (2012-06-00)	Potentially explosive areas - Part 11: Equipment protection by intrinsic safety "i"	06-2012	Harmonised standards
DIN EN 60079-14 VDE 0165-1: 2016-06	Potentially explosive areas - Part 14: Design, selection and installation of electrical systems	10-2014 06-2016	Harmonised Standards Corrigendum 06/2016
2009/125/EU	EC directive: Ecodesign	2009	
DIN EN 60034-30-1 VDE 0530-30-1 :2014-12	Rotating electrical machines - Part 30-1: Efficiency classes of line operated AC motors (IE code)	12-2014	Harmonised standards
DIN EN 60034-30-2 VDE 0530-30-2 :2014-06	Rotating electrical machines - Part 30-2: Efficiency classes of variable speed AC motors (IE-code)	06-2014	Draft

3.2. Machine specific

- The “screen drive motor” (**A01 F1 M 01**) to be controlled by means of a smooth start system. (start-up ramp time $t = 2$ seconds; starting voltage $U = 70\%$)
- As an overload protection the drive unit is equipped with a torque control (laminated disc spring), which trips in the event of rough machine running. A “limit switch for screen drive overload protection” (**A01 F1 CG 01**) detects the triggering.
- As an option, the “screen drive motor” (**A01 F1 M 01**) can be equipped with a frequency converter.

When designing the frequency converter, make sure that a sufficient maximum output current is available at the frequency converter. Reference values:

- 3,0 times the nominal motor current for up to 1,5kW
- 2,4 times the nominal motor current for up to 3kW
- 2,2 times the nominal motor current in excess of 3kW

Further setting values can be found in the separate e-document. The setting values must be adapted to plant specific requirements during commissioning.

- The reversal of the rotation direction requires a programmable standstill time (**t 7***).
- The “limit switch for screen drive overload protection” (**A01 F1 CG 01**) and “limit switch for screen rake position detection” (**A01 F1 CG 02**) must be monitored by a Namur evaluation device (Ex cut-off relay) to detect wire breaks.
- Take appropriate measures to ensure the maximum admissible water levels are not exceeded. The maximum admissible levels and pressure losses can be found in the data sheet or installation drawing.

If pumps are installed downstream, pump control must be integrated into the screen control system. This ensures that the capacity is reduced when the maximum admissible water level difference is reached or the pump is switched off completely.

4. Intended use / working principle

The operation principle of the RakeMax® screen operation principle is based upon the principle of a travelling chain screen. While the wastewater flows through the screen, the solids contained are retained at the screening elements. The water level in front of the screen rises. Travelling rakes remove the solids from the channel.

5. Functional description

5.1. Functional sequence without screen rake position detection

A differential measurement (absolute and differential measuring point) must be used for the “*screen level control*” (**A01 F1 CL 01**). An absolute measurement is only sufficient for applications in the tank.

The screen starts when the level of the “*screen level control*” (**A01 F1 CL 01**) (or any other start signal) is reached. The “*screen drive motor*” (**A01 F1 M 01**) operates as long as the signal of the “*screen level control*” (**A01 F1 CL 01**) is responding plus for a settable follow-up time (**t 1**), and transports thus the solids out of the channel. The water level in front of the screen falls again. The screen follow-up time (**t 1**) must be individually adjusted to each plant. It is recommended to preferably choose a running time that ensures that the blinded screen rack is completely cleaned, i.e. at least 2 of the rakes pass the screen rake area. The running time is set via a time relay or the PLC operating device.

If the inflow is low, screenings may accumulate in front of the screen if screen starting is not effected via “*screen level control*” (**A01 F1 CL 01**). To prevent accumulation of screenings, a time can be programmed after which the “*screen drive motor*” (**A01 F1 M 01**) is necessarily switched on after a selectable standstill time (**t 3**). The “*screen drive motor*” (**A01 F1 M 01**) will then operate according to the set follow-up time (**t 1**).

Individual setting options (for screens with wedge wire screens with critical screenings):

After an adjustable number of cleaning cycles (**n 3***), a reverse run (**t 9***) is carried out at the end of the cleaning cycle after a delay time (**t 8***). The counter for the cleaning cycles (**n 3***) is reset. During the delay time (**t 8***), the screen continues to operate normally. A cleaning cycle corresponds to the time from the response to the subsequent dropping of the “*screen level control*” (**A01 F1 CL 01**) (or on-site start signal). If a new start request for the screen occurs during the reverse run, this has priority.

See notes on setting parameters – index (6).

The following chapter “Functional sequence with screen rake position detection” can be ignored.

5.2. Functional sequence with screen rake position detection (option)

The screen can optionally be equipped with a screen rake position detection system. The previous chapter “Functional sequence without screen rake position detection” can be ignored.

A differential measurement (absolute and differential measuring point) must be used for the “*screen level control*” (**A01 F1 CL 01**). An absolute measurement is only sufficient for applications in the tank.

When a rake passes through the comb, the “*limit switch for screen rake position detection*” (**A01 F1 CG 02**) is activated and a signal sent to the control unit.

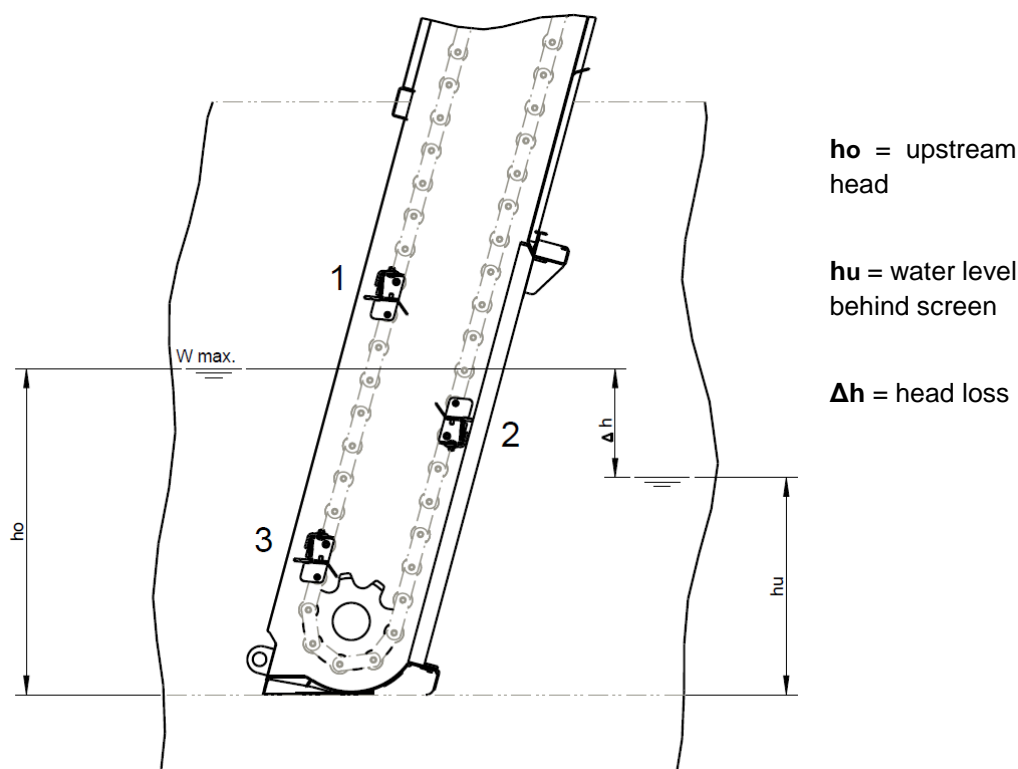
The screen starts when the level of the “*screen level control*” (**A01 F1 CL 01**) (or any other start signal) is reached. The “*screen drive motor*” (**A01 F1 M 01**) operates as long

as the signal of the “screen level control” (**A01 F1 CL 01**) is responding plus for a follow-up time, which is defined as follows:

When the signal of the “screen level control” (**A01 F1 CL 01**) disappears the screen runs until a programmable number of rakes (**n 1**) have passed the “limit switch for screen rake position detection” (**A01 F1 CG 02**) plus a programmable correction time (**t 2**) during which the screen rake position is corrected. This time is to be individually adjusted to the specific requirements.

The position of the rake can have an effect on tressings. Depending on the type and mixture of the waste water as well as on the type of feeding, tressings may form on the rake. The preferred rake position while off-time can be found in the following drawing.

It should be noted that, depending on the type of the rake, the water level, the rake number, etc., the preferred rake position can't be fully converted.



e.g.: rake position while off-time

<u>Rake position 1:</u>	preferred
<u>Rake position 2:</u>	compromise
<u>Rake position 3:</u>	unfavourable

In principle, the rake position detection system can be used for control of downstream equipment (e.g. a wash press), i.e. the downstream unit will start after XXX discharge events (which are identified by means of the “limit switch for screen rake position detection” (**A01 F1 CG 02**)). For this purpose, an impulse of 2 s is generated when the “limit switch for screen rake position detection” (**A01 F1 CG 02**) is passed.

To avoid erroneous repeated detection by the limit switch it is recommended to debounce the limit switch via the software (debounce-time max. 2 s).

The function of the *“limit switch for screen rake position detection”* (**A01 F1 CG 02**) is controlled. If the limit switch does not respond within a programmable period of monitoring time (**t 5***), a fault message is reported and the machine changes into emergency operation mode.

In emergency operation mode, the machine operates without position detection. The machine continues only for the correction time (**t 2**) when the screen level control signal disappears. To ensure the operation downstream units, the limit switch is simulated internally by generating an impulse of 2 sec at certain intervals (monitoring time (**t 5***) of limit switch).

If the inflow is low, screenings may accumulate in front of the screen if screen starting is not effected via *“screen level control”* (**A01 F1 CL 01**). As an option, to prevent accumulation of screenings, a time can be programmed after which the *“screen drive motor”* (**A01 F1 M 01**) is necessarily switched on after a selectable standstill time (**t 3**). The *“screen drive motor”* (**A01 F1 M 01**) runs until a programmable number of rakes (**n 1**) have passed plus a programmable correction time (**t 2**).

Individual setting options (for screens with wedge wire screens with critical screenings):

After an adjustable number of cleaning cycles (**n 3***), a reverse run (**t 9***) is carried out at the end of the cleaning cycle after a delay time (**t 8***). The counter for the cleaning cycles (**n 3***) is reset. During the delay time (**t 8***), the screen continues to operate normally. A cleaning cycle corresponds to the time from the response to the subsequent dropping of the *“screen level control”* (**A01 F1 CL 01**) (or on-site start signal). If a new start request for the screen occurs during the reverse run, this has priority.

See notes on setting parameters – index (6).

5.3. Continuous level measurement (option)

For the *“screen level control”* (**A01 F1 CL 01**), a continuous level measurement (analog signal) is used instead of level switch (e.g. air sparkle system).

The *“screen drive motor”* (**A01 F1 M 01**) starts in continuous operation as soon as an adjustable differential level (**I 1**) or an adjustable absolute level (**I 3**) is applied in front of the machine. The *“screen drive motor”* (**A01 F1 M 01**) is stopped again as soon as an adjustable differential level (**I 2**) or an adjustable absolute level (**I 4**) is reached in front of the machine. The running time of the rake needs to be individually adjusted to the needs of the system. The functional sequence as described in the previous chapter is not changed.

5.4. Heating (Option)

The trace heating must be integrated in the control cabinet so that frost protection of the heated machine parts can be ensured. In the PLC, the trace heating is not integrated.

To control the *“temperature sensor”* (**A01 F1 CT 01**) and the *“heating”* (**A01 F1 W 01**), a suitable evaluation device (e.g. temperature controller) must be provided.

As soon as the temperature, set on the controller, is undershot, the *“heating”* (**A01 F1 W 01**) runs until the set temperature (with hysteresis) is exceeded again.

5.5. HUBER Impurity Detection Safety Vision (Option)

Three additional input signals are required to control the screen using the HUBER Impurity Detection Safety Vision:

- Screen lock forward
- Screen operation backwards
- Screen endurance run

Screen lock forward

If the signal (low) is not present at the screen control, the screen can be operated according to the procedure described above.

If the lock-signal is present, the screen must not start, even if it would be necessary to start by means of the *“screen level control”* (**A01 F1 CL 01**) (or start signal provided by the customer) or after the adjustable standstill time (**t 3**) has elapsed.

Screen operation backwards

When the signal (high) was present at the screen control, potentially critical screenings was identified by the impurity detection. The *“screen drive motor”* (**A01 F1 M 01**) is operated backwards. The Safety Vision controller evaluates the duration of the reverse run. This reversing operation attempts to eliminate the cause of the triggering of the impurity detection.

Screen endurance run

When the signal (high) is present at the screen control, the *“screen drive motor”* (**A01 F1 M 01**) is put into continuous operation, independent of the *“screen level control”* (**A01 F1 CL 01**) until the signal is no longer present.

5.6. Safety control components

5.6.1. Mechanical overload monitoring (laminated disc spring)

As an overload protection the drive unit is equipped with a mechanical torque control (laminated disc spring), which trips in the event of rough machine running. A *“limit switch for screen drive overload protection”* (**A01 F1 CG 01**) detects the mechanical torque controller position. In the event of an overload, the torque control trips. The *“limit switch for screen drive overload protection”* (**A01 F1 CG 01**) is able to detect this and report it to the control unit. When the *“limit switch for screen drive overload protection”* (**A01 F1 CG 01**) responds [normal operation = limit switch in home position, 'high' on PLC via Namur isolation amplifier; overload = limit switch 'low' on PLC via Namur isolation amplifier], the *“screen drive motor”* (**A01 F1 M 01**) is immediately stopped and changes then to reversal (standstill time for changing rotation direction (**t 7***)). At the same time a warning message occurs. This warning message is automatically acknowledged the next time the *“screen drive motor”* (**A01 F1 M 01**) is operated in forward direction. The reversal time (**t 4**) must be adjusted to plant-specific requirements (see chapter “Setting parameters”). After the standstill time for changing rotation direction (**t 7***) the *“screen drive motor”* (**A01 F1 M 01**) restarts in forward direction. The function of screen reversal is provided to have the possibility to eliminate rough running (for example caused by a jammed stone).

If the mechanical torque control trips during reverse operation, the reversal time (**t 4**) is not completed – the *“screen drive motor”* (**A01 F1 M 01**) stops immediately. The *“screen*

drive motor" (**A01 F1 M 01**) restarts in forward direction after the standstill time for changing rotation direction (**t 7***).

If torque control switches off within 5 minutes for an adjustable number (**n 2***) (summed forwards and reverse), the machine is stopped and a fault message reported. Motor restart is only possible after elimination of the cause for rough running and subsequent fault resetting on the control panel.

If the torque control trips during operation in manual mode (forwards or reversal), the machine must immediately be stopped and a fault message reported. Motor restart is only possible after elimination of the cause for rough running and subsequent fault resetting on the control panel.

Individual setting options (for screens with wedge wire screens with critical screenings):

If the mechanical torque control trips during reverse run (**t 9***), the reverse run is not completed – the *"screen drive motor"* (**A01 F1 M 01**) stops immediately and a warning message appears on the user interface. The machine can continue to operate normally and waits for the next start signal.

See notes on setting parameters – index (6).

5.7. Fault consideration for machine combination with subsequent Wash Press (option)

For the machine combination of a screen with a downstream unit, e.g. a Wash Press, a fault consideration is necessary. The decisive factor is the situation on the plant, whether on the screen or the wash press an emergency bypass is present or not.

A fault of the screen does not affect the downstream wash press.

In case of a fault of the downstream wash press, the screen keeps working for a freely adjustable time (**t 6**). If the value 0 is set for this time, the screen stops immediately in case of a fault of the downstream wash press.

6. Control diagram

Status		Screen OFF	Screen ON								Screen OFF
			Start signal (level) is responding.				Freely programmable run-on time, or optionally: limit switch for screen rake position detection + correction time				
Start signal (e.g. level control A01 F1 CL 01)	on										
	off										
Screen drive motor A01 F1 M 01	on										
	off										

Individual setting options (for screens with wedge wire screens with critical screenings):

Process when number of cleaning cycles (**n 3***) is reached.

See notes on setting parameters – index (6).

Status		Screen OFF		Screen ON				Screen OFF	
				Start signal (level) is responding.		Delay	Re-verse		
Start signal (e.g. level control A01 F1 CL 01)	on								
	off								
Screen drive motor A01 F1 M 01	on								
	reverse								
	off								

7. Setting parameters

Parameter	Setting range	Standard setting
Follow-up time t 1	0,0 – 999,9 seconds	60,0 seconds ⁽³⁾
Correction time of screen t 2	0,0 – 99,9 seconds	3,5 seconds ^(2/4)
Screen timer t 3	0,0 – 540,0 minutes	60,0 minutes ⁽⁵⁾
Screen reversal time after overload t 4	0 – 999,9 seconds	3,0 seconds ⁽¹⁾
Monitoring time of limit switch position detector t 5*	0,0 – 999,9 seconds	60,0 s ⁽²⁾
Extension release of the downstream unit t 6	0,0 – 999,9 minutes	10,0 minutes
Standstill time for changing rotation direction t 7*	1,0 – 2,0 seconds	1,0 seconds
Delay reverse screen by cleaning cycles t 8*	0 – 99 seconds	0 seconds ⁽⁶⁾
Reverse time screen by cleaning cycles t 9*	0 – 99 seconds	0 seconds ⁽⁶⁾
Number of rakes passing during follow-up time n 1	1 – 99	2 ^(2/3)

Number of mechanical overload monitoring n 2*	1 – 5	3
Number of cleaning cycles start reversal n 3*	0 – 99	0 ⁽⁶⁾ 0 = reversal by number of cleaning cycles deactivated
Differential level for start screen I 1	0 – 999 cm	Set while start-up
Differential level for stop screen I 2	0 – 999 cm	Set while start-up
Absolute level for start screen I 3	0 – 999 cm	Set while start-up
Absolute level for stop screen I 4	0 – 999 cm	Set while start-up

*** The marked parameters are to be changed in the password-protected service menu.**

(1: To be adjusted to specific plant requirements and situational requirements:

- In normal operation, until the previous screen rake has passed by the bottom turning point.
- In continuous operation, e.g. due to heavy rain, there is the risk of a blockage by a too long reverse running! Therefore, during such an event, the reverse running time (**t 4**) must be reduced manually.

(2: Only relevant with optional screen rake position detection.

(3: For a complete cleaning it is recommended to choose a running time that ensures that at least 2 of the rakes pass the screen rake area.

(4: To be adapted plant specific, see drawing: “rake position while off-time” in chapter functional sequence with screen rake position detection.

(5: To be adapted plant specific. If the machine is mounted outdoors, the machine must be switched on more frequently (for example, every 3 minutes) in case of frost (< 5 ° C).

(6: Only required for screens with wedge wires screens – as an individual adjustment option for critical screenings that tend to compress on the bearing bars. This compressed screenings can be loosened by reversing.

For hints to the setting of the “*screen level control*” (**A01 F1 CL 01**) refer to the separate document “level controls for screens” chapter “setting instructions for different screen types”.

The above settings are standard settings. They are provided as guide values only and need to be adjusted to specific site requirements at the time of plant start-up.

8. List of possible Messages

8.1. Fault messages

- emergency stop --- activated
- RakeMax® --- fault
- RakeMax® --- mechanical torque
- RakeMax® --- limit switch
- RakeMax® --- level in front of screen
- RakeMax® --- level behind screen
- bus system --- fault

8.2. Warning messages

- RakeMax® --- reverse mechanical torque

8.3. Operating messages

- RakeMax® --- downstream unit locked → auto locked

9. Additional information

Company address

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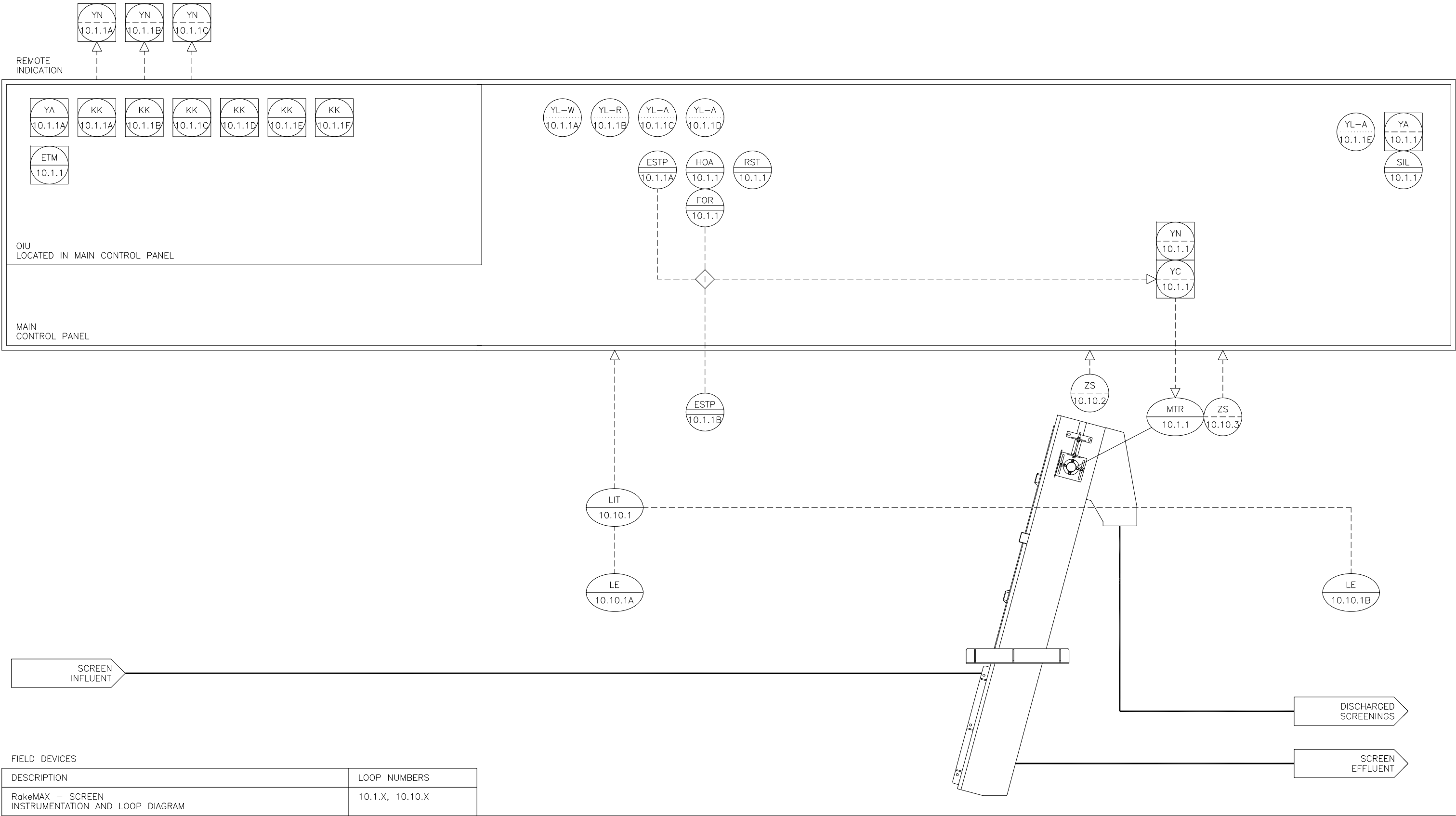
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Piping & Instrumentation Diagram (P&ID)



NOTES:

- SYMBOLS AND DESCRIPTIONS USED ARE THOSE PUBLISHED IN THE INSTRUMENT SOCIETY OF AMERICA, ISA. PLEASE REFER TO THEIR PUBLICATIONS FOR FURTHER DETAIL.
- THESE DETAILS ARE BASED ON TYPICAL INSTALLATIONS, AND ARE SUBJECT TO CHANGE BASED ON SPECIFIC PROJECT REQUIREMENTS.

01/08/18	UPDATED SCREEN RAKE PARKING SEQUENCE	E	CAJ	CCC	DESIGNED	CCC
02/12/11	ADDED CALL FOR NOT RUNNING TO THE SEQUENCE OF OPERATION	B	JAP	CCC	DETAILED	
08/13/12	ADDED MOTOR THERMOSTAT SEQUENCE NOTES	C	BMG	CCC	CHECKED	ALS
01/02/17	SCREEN HOME PROX. INCLUDED IN DESIGN	D	DG	CCC	APPROVED	
DATE	REVISION	NO.	BY	CK	APP	DATE
						05/01/09

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RakeMAX – SCREEN
TYPICAL PID DIAGRAM

OIU DETAIL

SCALE:
NONE

PROJECT NUMBER:

DRAWING NO:
RakeMAX_PIDA1
SHEET 1 OF 3

TAG	DESCRIPTION	FUNCTION
ESTP 10.1.1A	PUSHBUTTON – PANEL MOUNTED EMERGENCY STOP MUSHROOM HEAD, PUSH–PULL TYPE	PROVIDES OPERATOR WITH PROVISION TO STOP ALL MOTORS AND SOLENOIDS IN THE EVENT OF AN EMERGENCY
ESTP 10.1.1B **	PUSHBUTTON – FIELD MOUNTED EMERGENCY STOP MUSHROOM HEAD, PUSH–PULL TYPE	PROVIDES OPERATOR WITH PROVISION TO STOP ALL MOTORS AND SOLENOIDS IN THE EVENT OF AN EMERGENCY
FOR 10.1.1	SELECTOR SWITCH SCREEN FOR–OFF–REV FOR CAN BE LOCATED IN PANEL OR LCS*	PROVIDES OPERATOR WITH PROVISION TO SELECT FORWARD, OFF, OR REVERSE WHILE OPERATING THE SCREEN IN HAND
HOA 10.1.1	SELECTOR SWITCH SCREEN HAND–OFF–AUTO HOA CAN BE LOCATED IN PANEL OR LCS*	PROVIDES OPERATOR WITH PROVISION TO SELECT HAND, OFF, OR AUTO
LE 10.10.1A	CHANNEL ULTRASONIC LEVEL TRANSMITTER	LEVEL ELEMENT PART OF LEVEL CONTROLLER
LE 10.10.1B	CHANNEL ULTRASONIC LEVEL TRANSMITTER	LEVEL ELEMENT PART OF LEVEL CONTROLLER
LIT 10.10.1	CHANNEL ULTRASONIC LEVEL TRANSMITTER	PROVIDES LEVEL INDICATION TO THE MAIN CONTROL PANEL STANDARD SENSOR: HYDRORANGER 200
MTR 10.1.1	SCREEN DRIVE MOTOR	
RST 10.1.1	PUSHBUTTON SYSTEM RESET FLUSH HEAD, MOMENTARY	PROVIDES OPERATOR WITH PROVISION TO RESET SYSTEM FAULTS
SIL 10.1.1 **	PUSHBUTTON ALARM SILENCE	SILENCES AUDIBLE SYSTEM FAULT ALARM
YA 10.1.1 **	HORN COMMON ALARM HORN	PROVIDES AUDIBLE INDICATION OF SYSTEM FAULT
YC 10.1.1	SCREEN CALL TO RUN VARIABLE FREQUENCY DRIVE – STANDARD	PROVIDES SCREEN WITH CALL FORWARD AND CALL REVERSE COMMANDS
YL–A 10.1.1C	INDICATOR LIGHT – AMBER SCREEN OVERLOAD	PROVIDES OPERATOR INDICATION THAT THE SCREEN HAS SHUTDOWN DUE TO AN OVERLOAD
YL–A 10.1.1D **	INDICATOR LIGHT – AMBER HIGH LEVEL	PROVIDES OPERATOR INDICATION THAT THE LEVEL OF MATERIAL IN THE SCREEN IS ABOVE THE HIGH LEVEL SETPOINT
YL–A 10.1.1E **	INDICATION BEACON – AMBER COMMON ALARM	PROVIDES OPERATOR INDICATION OF A SYSTEM FAULT
YL–R 10.1.1B	INDICATOR LIGHT – RED SCREEN RUNNING	PROVIDES OPERATOR INDICATION THAT THE SCREEN IS RUNNING
YL–W 10.1.1A	INDICATOR LIGHT – WHITE CONTROL POWER ON	PROVIDES OPERATOR INDICATION THAT CONTROL POWER IS PRESENT AND ALL SAFETY INTERLOCKS ARE ENABLED
YN 10.1.1	CURRENT MONITOR SCREEN HIGH CURRENT	PROVIDES SCREEN OVERLOAD PROTECTION PROVIDED BY VFD
DESCRIPTION		LOOP NUMBERS
RakeMAX – SCREEN INSTRUMENTATION AND LOOP DIAGRAM		10.1.X, 10.10.X

TAG	DESCRIPTION	FUNCTION
YN 10.1.1A	REMOTE INDICATION SCREEN RUNNING	PROVIDE REMOTE INDICATION THAT SCREEN IS RUNNING TYPICALLY 120VAC, 5AMP DRY CONTACT
YN 10.1.1B	REMOTE INDICATION SCREEN OVERLOAD	PROVIDE REMOTE INDICATION THAT SCREEN IS OVERLOADED TYPICALLY 120VAC, 5AMP DRY CONTACT
YN 10.1.1C	REMOTE INDICATION HIGH LEVEL	PROVIDE REMOTE INDICATION THAT SCREEN HAS HIGH LEVEL TYPICALLY 120VAC, 5AMP DRY CONTACT
ZS 10.10.2	PROXIMITY SWITCH SCREEN HOME SWITCH	DETERMINES THE HOME POSITION OF THE RAKE
ZS 10.10.3	PROXIMITY SWITCH SCREEN OVERTORQUE	PROVIDES INDICATION THAT SCREEN IS OVERTORQUED
DESCRIPTION		LOOP NUMBERS
RakeMAX – SCREEN INSTRUMENTATION AND LOOP DIAGRAM		10.1.X, 10.10.X

TAG	DESCRIPTION	FUNCTION
ETM 10.1.1	ELAPSED TIMER METER SCREEN RUN TIME	PROVIDES OPERATOR TOTALIZED MOTOR RUN TIME ON HMI ACCESSIBLE THROUGH OIU
YA 10.1.1A	ALARM INDICATION SCREEN ALARM	PROVIDES OPERATOR DISCRIPTION OF CURRENT SYSTEM FAULT ACCESSIBLE THROUGH OIU
KK 10.1.1A	SETPOINT SCREEN – OFF–DELAY TIME SETPOINT: 10 SEC. RANGE: 1–60 SEC.	SETPOINT ACCESSIBLE THROUGH OIU
KK 10.1.1B	SETPOINT SCREEN – REPEAT CYCLE OFF TIME SETPOINT: 60 MIN. RANGE: 1–180 MIN.	SETPOINT ACCESSIBLE THROUGH OIU
KK 10.1.1C	SETPOINT SCREEN – FAULT DWELL TIME SETPOINT: 5 SEC. RANGE: 1–10 SEC.	SETPOINT ACCESSIBLE THROUGH OIU
KK 10.1.1D	SETPOINT SCREEN – REVERSE RUN TIME SETPOINT: 10 SEC. RANGE: 1–180 SEC.	SETPOINT ACCESSIBLE THROUGH OIU
KK 10.1.1E	SETPOINT SCREEN – FAULT CYCLE COUNTER SETPOINT: 1 CYCLES. RANGE: 1–5 CYCLES	SETPOINT ACCESSIBLE THROUGH OIU
KK 10.1.1F **	SETPOINT SCREEN – ZERO MOTION ON–DELAY TIMER SETPOINT: 15 SEC. RANGE: 1–999 SEC.	SETPOINT ACCESSIBLE THROUGH OIU
KK 10.1.1G **	SETPOINT SCREEN – SCREEN RAKE POSITION DELAY SETPOINT: 15 SEC. RANGE: 1–999 SEC.	SETPOINT ACCESSIBLE THROUGH OIU
DESCRIPTION		LOOP NUMBERS
RakeMAX – SCREEN INSTRUMENTATION AND LOOP DIAGRAM		10.1.X, 10.10.X

NOTES:

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2. THESE DETAILS ARE BASED ON TYPICAL INSTALLATIONS, AND ARE SUBJECT TO CHANGE BASED ON SPECIFIC PROJECT REQUIREMENTS.
3. * DEVICES THAT MAY BE REMOVED FROM CONTROL PANEL DOOR AND MOUNTED NEAR EQUIPMENT IN A LCS.
4. ** INDICATES OPTIONAL ITEM OR OPTIONAL UPGRADE.

01/08/18	UPDATED SCREEN RAKE PARKING SEQUENCE	E	CAJ	CCC	DESIGNED	CCC
02/12/11	ADDED CALL FOR NOT RUNNING TO THE SEQUENCE OF OPERATION	B	JAP	CCC	DETAILED	
08/13/12	ADDED MOTOR THERMOSTAT SEQUENCE NOTES	C	BMG	CCC	CHECKED	ALS
01/02/17	SCREEN HOME PROX. INCLUDED IN DESIGN	D	DG	CCC	APPROVED	
DATE	REVISION	NO.	BY	CK	APP	DATE
						05/01/09

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RakeMAX – SCREEN
TYPICAL PID DIAGRAM

OIU DETAIL

SCALE:
NONE

PROJECT NUMBER:

DRAWING NO:
RakeMAX_PIDA2
SHEET 2 OF 3

SEQUENCE OF OPERATION	
<p>CONTROL POWER ON–DELAY: EACH TIME THE CONTROL PANEL POWER SUPPLY IS CYCLED, THE PLC WILL ALLOW ALL SOLID STATE DEVICES TO BECOME FULLY ENERGIZED BEFORE ENABLING THE CONTROL POWER CIRCUIT.</p> <p>SCREEN MODES OF OPERATION: HAND: WHEN THE SCREEN SELECTOR IS IN THE HAND POSITION THE SCREEN WILL CYCLE ON AN OFF WITH THE SCREEN FOR–OFF–REV SELECTOR. FOR: WHEN THE SCREEN SELECTOR IS IN THE HAND POSITION AND THE FORWARD DIRECTION IS SELECTED, THE SCREEN WILL RUN CONTINUOUSLY IN THE FORWARD DIRECTION. REV: WHEN THE SCREEN SELECTOR IS IN THE HAND POSITION AND THE REVERSE DIRECTION SELECTED, THE SCREEN WILL RUN IN THE REVERSE DIRECTION. THIS SWITCH WILL SPRING RETURN FROM REV TO OFF. AUTO: WHEN THE SCREEN SELECTOR IS IN THE AUTO POSITION THE SCREEN WILL BEGIN TO RUN DUE TO ANY ONE OF THE FOLLOWING CONDITIONS: – LEVEL RAISED AND REMAINED ABOVE THE START LEVEL SETPOINT FOR THE TIME SET IN THE PLC – SCREEN OFF TIME HAS REACHED MAXIMUM TIME SET IN PLC – SYSTEM RESET PUSHBUTTON PRESSED AND HELD FOR TIME SET IN PLC ONCE A CYCLE IS STARTED THE SCREEN WILL RUN CONTINUOUSLY IN THE FORWARD DIRECTION UNTIL THE LEVEL DROPS BELOW THE START LEVEL SETPOINT, PER THE TIME SETTING SET IN THE SCREEN OFF DELAY TIMER.</p> <p>SCREEN HIGH SPEED (OPTIONAL): THE SCREEN WILL OPERATE AT HIGH SPEED ONCE THE LEVEL REACHES THE HIGH LEVEL SETPOINT. THE SCREEN WILL CONTINUE TO OPERATE AT HIGH SPEED UNTIL THE LEVEL DROPS BELOW THE START LEVEL SETPOINT.</p> <p>NOTE: HIGH SPEED OPERATION WILL ONLY TAKE PLACE WHEN OPERATING IN THE FORWARD DIRECTION.</p> <p>SCREEN RAKE PARKING: WHEN THE SCREEN OFF DELAY TIMER IS COMPLETED THE SCREEN WILL CONTINUE TO RUN IN THE FORWARD DIRECTION TO TRIGGER THE SCREEN HOME POSITION PROXIMITY SWITCH. ONCE THE SWITCH IS TRIGGERED, THE SCREEN WILL CONTINUE RUNNING PER THE TIME SETTING IN THE SCREEN RAKE POSITION DELAY TIMER.</p> <p>EMERGENCY STOP: WHEN ANY OF THE E–STOP PUSHBUTTONS ARE PRESSED THE SCREEN WILL STOP IMMEDIATELY, THE CONTROL POWER ON LIGHT WILL DE–ENERGIZE. TO RESET, INSURE ALL E–STOPS ARE ENABLED, AND PRESS THE SYSTEM RESET PUSHBUTTON.</p> <p>NOTE: IF THE POWER TO THE PANEL IS INTERRUPTED, THE EQUIPMENT MAY CYCLE IMMEDIATELY ONCE THE POWER IS RESTORED. PRESSING THE SYSTEM RESET PUSHBUTTON AFTER A POWER OUTAGE WILL NOT BE REQUIRED.</p> <p>OIU – INFORMATION: 1. THE OIU WILL DISPLAY THE ELAPSED MOTOR RUN TIME. 2. ALL ADJUSTABLE SETPOINTS CAN BE ACCESSED AND ADJUSTED THROUGH THE OIU. 3. THE PRESENT FAULT WILL BE DISPLAYED ON THE OIU. 4. THE HISTORY OF ALL PAST FAULTS CAN BE ACCESSED THROUGH THE OIU.</p>	
DESCRIPTION	LOOP NUMBERS
RakeMAX – SCREEN SEQUENCE OF OPERATION	10.1.X, 10.10.X

SEQUENCE OF OPERATION	
<p>FAULTS: SCREEN MOTOR OVERLOAD – WHEN THE SCREEN MOTOR OVERLOAD IS TRIPPED THE SCREEN WILL STOP IMMEDIATELY AND THE SCREEN FAULT LIGHT WILL BE ENERGIZED.</p> <p>SCREEN MOTOR THERMOSTAT – WHEN THE SCREEN MOTOR THERMOSTAT IS TRIPPED THE SCREEN WILL STOP IMMEDIATELY AND THE SCREEN FAULT LIGHT WILL BE ENERGIZED.</p> <p>SCREEN OVERLOAD SHUTDOWN – IF HIGH CURRENT IS MEASURED WHILE THE SCREEN IS OPERATING IN THE FORWARD DIRECTION, THEN THE SCREEN WILL TRY TO CLEAR THE FAULT AS DETAILED BELOW IN THE JAM LOGIC SEQUENCE. IF THE JAM LOGIC SEQUENCE IS UNSUCCESSFUL THEN THE SCREEN WILL SHUTDOWN IMMEDIATELY AND THE SCREEN FAULT PILOT LIGHT WILL BE ENERGIZED.</p> <p>SCREEN HIGH TORQUE – IF HIGH TORQUE IS MEASURED WHILE THE SCREEN IS OPERATING IN THE FORWARD DIRECTION, THEN THE SCREEN WILL TRY TO CLEAR THE FAULT AS DETAILED BELOW IN THE JAM LOGIC SEQUENCE. IF THE JAM LOGIC SEQUENCE IS UNSUCCESSFUL THEN THE SCREEN WILL SHUTDOWN IMMEDIATELY AND THE SCREEN FAULT PILOT LIGHT WILL BE ENERGIZED.</p> <p>SCREEN CALL FOR NOT RUNNING – IF THE SCREEN IS READY AND PLC HAS CALLED THE SCREEN TO RUN BUT DOES NOT RECEIVE RUNNING CONFIRMATION WITHIN 3 SECONDS. SCREEN WILL STOP IMMEDIATELY AND THE SCREEN FAULT LIGHT WILL BE ENERGIZED.</p> <p>SCREEN ZERO MOTION – IF THE SCREEN IS RUNNING AND THE SCREEN HOME POSITION PROXIMITY SWITCH IS NOT TRIGGERED BEFORE THE ZERO SPEED ON–DELAY TIMER EXPIRES, THEN THE SCREEN WILL SHUTDOWN IMMEDIATELY AND THE SCREEN FAULT PILOT LIGHT WILL BE ENERGIZED.</p> <p>JAM LOGIC: WHEN A FAULT CONDITION OCCURS THAT REQUIRES THE JAM LOGIC SEQUENCE, THE SCREEN WILL STOP AND DWELL, RUN IN REVERSE, STOP AND DWELL, THEN CONTINUE ITS CYCLE. IF THE FAULT CONDITION PERSISTS, THE SCREEN WILL CONTINUE TO TRY AND CLEAR THE FAULT. IF THE NUMBER OF ATTEMPTS TO CLEAR THE FAULT EXCEEDS THE NUMBER ALLOWED WITHIN 5 MINUTES, THEN THE SCREEN WILL SHUTDOWN IMMEDIATELY AND THE SCREEN FAULT PILOT LIGHT WILL BE ENERGIZED. NOTE: IF THE FAULT CONDITION OCCURS WHILE THE SCREEN IS OPERATING IN THE REVERSE DIRECTION OR WHILE IN HAND, THE SCREEN WILL SHUTDOWN IMMEDIATELY AND THE SCREEN FAULT PILOT LIGHT WILL BE ENERGIZED.</p> <p>ALL OF THE ABOVE FAULTS CAN BE RESET BY PRESSING THE SYSTEM RESET PUSHBUTTON.</p> <p>HIGH LEVEL LIGHT (OPTIONAL) – IF THE LEVEL RAISES ABOVE THE HIGH LEVEL SETPOINT SET IN THE ULTRASONIC LEVEL CONTROLLER, THE HIGH LEVEL LIGHT WILL BE ENERGIZED. THE LIGHT WILL REMAIN ENERGIZED UNTIL THE LEVEL DROPS BELOW THE HIGH LEVEL SETPOINT.</p> <p>ALARM HORN (OPTIONAL): WHEN ANY OF THE ABOVE FAULTS OCCUR THE ALARM HORN WILL BE ENERGIZED. THE ALARM SILENCE PUSHBUTTON CAN BE PRESSED AT ANY TIME TO SILENCE THE ALARM. NOTE: PRESSING THE ALARM SILENCE PUSHBUTTON WILL NOT RESET THE FAULT.</p> <p>ALARM BEACON (OPTIONAL): WHEN ANY OF THE ABOVE FAULTS OCCUR THE ALARM BEACON WILL BE ENERGIZED. THE BEACON WILL REMAIN ENERGIZED UNTIL THE FAULT HAS BEEN ADDRESSED AND THE SYSTEM RESET HAS BEEN PRESSED.</p>	
DESCRIPTION	LOOP NUMBERS
RakeMAX – SCREEN SEQUENCE OF OPERATION	10.1.X, 10.10.X

01/08/18	UPDATED SCREEN RAKE PARKING SEQUENCE	E	CAJ	CCC	DESIGNED	CCC
02/12/11	ADDED CALL FOR NOT RUNNING TO THE SEQUENCE OF OPERATION	B	JAP	CCC	DETAILED	
08/13/12	ADDED MOTOR THERMOSTAT SEQUENCE NOTES	C	BMG	CCC	CHECKED	ALS
01/02/17	SCREEN HOME PROX. INCLUDED IN DESIGN	D	DG	CCC	APPROVED	
DATE	REVISION	NO.	BY	CK	APP	DATE
						05/01/09

<div>HUBER</div> <div>TECHNOLOGY</div> <div>9735 NorthCross Center Court, Suite A Huntersville, NC 28078 Tel. 704-949-1010 info@hhusa.net</div>	RakeMAX – SCREEN TYPICAL PID DIAGRAM	
	OIU DETAIL	SCALE: NONE
PROJECT NUMBER:	DRAWING NO: RakeMAX_PIDA3 SHEET 3 OF 3	

Sample Specifications

SECTION

MECHANICALLY CLEANED BAR SCREEN (TRAVELLING MULTI-RAKE SCREEN "RAKEMAX")

PART 1: GENERAL

1.01 SCOPE

- A. The contractor shall furnish and install multiple rake bar screen(s) as indicated on the drawings. Each screen shall be manufactured from AISI 304L or 316L stainless steel shapes. Fabrication and assembly shall be in conformance with these specifications and drawings.
- B. Each screen shall be furnished complete with bar rack, dead plate, discharge chute, side frames, covers, rake blades, drive chains, sprockets and bearings, scraper assembly, drive motor, gear reducer, anchor bolts, controls and all accessories and appurtenances specified or otherwise required for a complete and properly operating installation.
- C. The contractor shall coordinate all details of the equipment with other related parts of the work. He shall verify that all structures, piping, wiring, and equipment components are compatible. Contractor shall be responsible for all structural and other alterations required to accommodate equipment differing in dimensions, weight, or other characteristics from these specifications and drawings.
- D. The contractor shall install the equipment according to instructions and recommendations of the equipment manufacturer.
- E. The main power supply is 480 V, 60 Hz, 3-phase.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM) Publications:
- B. ISO 281:2007 Calculation Method for Fatigue Life for Roller Bearings.
- C. American Institute of Steel Construction (AISC) Publications
- D. American Welding Society (AWS), European Welding Federation (EWF), and International Institute of Welding (IIW) Publications
- E. American Structures Painting Council (ASPC) Publications
- F. International Organization for Standardization (ISO) Publications.

1.03 SUBMITTALS

The manufacturer will provide an electronic submittal for review by the engineer in accordance with Section 01300.

- A. Product Data: Include the following:
 - 1. Descriptive literature, brochures, catalogs, cut-sheets and supplementary material to define the equipment.
 - 2. Motor characteristics and performance information.
 - 3. Gear reducer data including service factor, efficiency, torque rating, and materials.
 - 4. Parts list including a list of recommended spare parts.

- B. Shop Drawings: Include the following:
 - 1. Manufacturer's installation drawings.
 - 2. Wiring and schematic diagrams.
- C. Operations and maintenance manual.
- D. Detailed mechanical and electrical installation instructions and procedures.
- E. Equipment weights and lifting points.
- F. Recommendations for short and long-term storage.
- G. A copy of the manufacturer's warranty.
- H. A copy of documents proving certification of the Manufacturer's Quality Management System according to ISO 9001 and Environmental Protection Management System according to ISO 14001.
- I. Failure to include all drawings applicable to the equipment specified in this section will result in rejection of the entire submittal with no further review.

1.04 QUALITY ASSURANCE

- A. To ensure quality, conformance, reliability, and environmental practices with regard to the manufacturing and production of the machinery described in this section, the equipment manufacturer shall meet the requirements listed in this section.
- B. Manufacturer shall have established an ISO 9001 certified quality management system. Manufacturers without an ISO 9001 certified quality management program must provide complete documentation of their existing quality management system with supplemental information clarifying why areas do not meet ISO 9001 standards. Meeting national quality management standards alone shall not be considered an acceptable substitute because ISO standards exceed national quality management standards.
- C. Manufacturer shall have established an ISO 14001 certified environmental protection management system. Manufacturers without an ISO 14001 certified environmental protection management system must provide complete documentation of their existing environmental protection management system with supplemental information clarifying why areas do not meet ISO 14001 standards. Meeting national or local environmental protection management standards alone shall not be considered an acceptable substitute because ISO standards exceed national and local environmental protection management standards.
- D. All stainless steel components and structures shall be submersed in a chemical bath of nitric acid and hydrofluoric acid (pickling bath) to remove any residues that may be present on the material because of forming, manufacture, or handling. After removal from the pickling bath, the equipment must be washed with a high-pressure wash of cold water to remove any remaining surface debris and promote the formation of an oxidized passive layer, which is critical to the long life of the stainless steel.
- E. No stainless steel components may be fabricated or assembled in a factory where carbon steel products are fabricated, in order to prevent contamination by rust.
- F. The manufacturer shall have a minimum of twenty (20) years' experience producing multi-rake screens and upon request will submit to the engineer documentation of fifteen (15) installations similar or larger than specified herein, that have been in operation for at least five (5) years
- G. All welding is performed in accordance with American Welding Society (AWS), European Welding Federation (EWF), International Institute of Welding (IIW), or equivalent.
- H. Manufacturer shall provide screen, motors, gear reducers, controls, control panels, and lifting attachments as a complete integrated package to ensure proper coordination, compatibility, and operation of the system.

- I. Manufacturer shall provide services by a factory-trained service technician, specifically trained on the type of equipment specified. Service technician requirements include, but are not limited to the following:
 - 1. Manufacturer shall have a minimum of ten (10) service technicians based in the United States for field service of the equipment. Manufacturer shall have multiple service locations with a minimum of one dedicated service location for both the eastern and western regions of the US.
 - 2. Service technician shall be present during initial energizing of equipment to determine directional testing.
 - 3. Service technician shall inspect and verify location of anchor bolts, placement, leveling, alignment and field erection of equipment, as well as control panel operation and electrical connections.
 - 4. Service technician shall provide classroom and/or field training on the operation and maintenance of the equipment to operator personnel.
 - 5. Manufacturer shall state field service rates for a service technician to owner and contractor. In the event that the field service time required by this section should not be sufficient to properly place the equipment into operation, additional time shall be purchased by contractor to correct deficiencies in installation, equipment, or material without additional cost to owner.
- J. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or installation, defective workmanship or materials, and breakage or other failure. Materials shall be suitable for service conditions.
- K. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service prior to delivery, except as required by testing.
- L. Each major component of equipment shall have the manufacturer's name, address and product identification on a nameplate securely affixed to the equipment.

1.05 DELIVERY, STORAGE, AND HANDLING OF EQUIPMENT

- A. Equipment shall be shipped and delivered fully assembled, except where partial disassembly is required in order to conform to transportation regulations or for the protection of components.
- B. Contractor shall be responsible for unloading and shall have equipment on-site at the time of delivery permitting proper hoisting of the equipment.

1.06 PRE-SUBMITTAL OF ALTERNATE EQUIPMENT

Manufacturers of alternative equipment shall submit a pre-approval package to the engineer at least two (2) weeks prior to bid date. Alternative manufacturers shall submit the following information and supporting documentation:

- A. A complete set of drawings, specifications, catalog cut-sheets, and detailed descriptive material. Drawings shall show all relevant details of the unit. This information shall identify all technical and performance requirements stipulated on the drawings and in the specification. If the proposed equipment does not meet these specifications, any deviation from the specification must be expressly noted. All deviations shall be listed on a single document.
- B. Detailed installation drawings illustrating how the proposed screen will be installed. The drawings shall include plan, elevation, and sectional views of the installation.

- C. Structural calculations by a Professional Engineer either confirming the existing structural design is sufficient for the alternate equipment or detailing any changes required for the building design to use the alternate equipment.
- D. Motor characteristics and performance information. Vendor data shall be furnished to confirm the torque and thrust rating of the drives.
- E. Complete reference list of all installations of same and similar equipment including contact names and phone numbers, showing at least 20 municipal installations of the same size as the alternate equipment located in the United States.
- F. Complete bill of materials for all equipment, showing dimensions and materials of construction of all components.
- G. Certification by the manufacturer that all stainless steel equipment will be manufactured in a stainless steel only factory.
- H. Certification that the entire equipment will be passivated by submersion in an acid bath as specified in chapter 2.03.
- I. A copy of documents proving certification of the Manufacturer's Quality Management System according to ISO 9001. Manufacturers without an ISO 9001 certified quality management program must provide complete documentation of their existing quality management system with supplemental information clarifying why areas do not meet ISO 9001 standards. Meeting national quality management standards alone shall not be considered an acceptable substitute because ISO standards exceed national quality management standards.
- J. A copy of documents proving certification of the Environmental Protection Management System according to ISO 14001. Manufacturers without an ISO 14001 certified environmental protection management system must provide complete documentation of their existing environmental protection management system with supplemental information clarifying why areas do not meet ISO 14001 standards. Meeting national or local environmental protection management standards alone shall not be considered an acceptable substitute because ISO standards exceed national and local environmental protection management standards.
- K. Details of the control and instrumentation system including wiring diagrams. A Professional Engineer shall note any required changes to the project electrical drawings.
- L. Information on equipment field erection requirements including total weight of assembled components and weight of each sub-assembly.
- M. List of recommended spare parts and current cost of each spare part.
- N. A maintenance schedule showing the required maintenance, frequency of maintenance, lubricants and other items required at each regular preventative maintenance period, including all ancillary equipment provided.

PART 2: PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- 1. RakeMax Model 5120x1275/6 from HUBER Technology, Inc.
- 2. Traveling Multi-Rake Screen from pre-approved alternate manufacturer(s), as per section 1.06 above.

Alternates shall not be acceptable unless pre-approved. Costs for changes in design to accommodate alternative offers shall be borne by the alternate screen provider.

2.02 PERFORMANCE AND DESIGN REQUIREMENTS

Parameter	Value
Location in Facility	
Number of Units	2
Channel Width [ft]	4
Channel Depth [ft]	6
Channel Invert to Operating Deck [ft]	6
Equipment Location [Indoor/Outdoor]	Indoor
Installation Area Classification	Class 1 Division 1
Peak Hourly Flow (per Screen) [MGD]	20
Average Daily Flow (per Screen) [MGD]	5
Downstream Water Level During PHF [in]	51
Downstream Water Level During ADF [in]	15
Maximum Upstream Water Level [in]	57
Maximum Headloss During PHF* [in]	6
Minimum Freeboard [in]	12
Screen Sieve Width [in]	38.4" (975mm)
Clear Spacing Between Screening Bars [in]	0.25 (6mm)
Minimum Bar Dimensions (Teardrop Profile) [in]	0.315 x 0.20 x 2.36
Inclination from Horizontal within Channel [degrees]	70
Discharge Height Above Channel Invert [ft]	4.2
Minimum Motor Rating [HP]	1.5

*Based on 30% blinding of the screen field.

1. The travel speed of the rakes shall be between 26 and 39 feet per minute (8 to 12 m/min).
2. All parts shall be designed and manufactured to handle the forces that may be exerted on the screen during fabrication, shipping, erection, and proper operation according to the O&M manual.
3. All components shall be so designed that jamming at any point will not result in structural failure, but will cause the drive motor to stall. All components, including the gear reducer, shall be designed to withstand, without damage or permanent distortion, the full stalling torque of the drive motor and/or the maximum differential head at any channel water depth.

2.03 BAR SCREEN DESIGN SPECIFICATIONS

A. MATERIALS

Frame, Deadplate, Chain Guides & Discharge Chute	304L Stainless Steel
Screening Bars & Rakes	304L Stainless Steel
Screen Covers	304L Stainless Steel
Drive Chain Links	316L Stainless Steel
Drive Chain Pins & Bushings	AISI-431 Stainless Steel
Drive Chain Rollers	Polyamide
Drive Shaft & Sprockets	304L Stainless Steel
Wiper Blade	Polyethylene
Channel Seals	EPDM

*Unless otherwise noted.

1. Screen shall be manufactured from shapes (rods, angles, and channels), pipes, and sheets from stainless steel material as noted in the table above.

2. Screen shall be manufactured in a stainless steel only factory to prevent contamination of the stainless steel with rusty dust.
3. All stainless steel components and structures shall be submersed in a chemical bath of nitric acid and hydrofluoric acid (pickling bath) to remove any residues that may be present on the material as a result of forming, manufacture, or handling. After removal from the pickling bath, the equipment must be washed with a high-pressure wash of cold water to remove any remaining surface debris and promote the formation of an oxidized passive layer which is critical to the long life of the stainless steel. Sand blasting, bead blasting, spray pickling or hand pickling of stainless steel surfaces shall not be acceptable
4. Upper sprocket bearings shall have a paint coated cast iron casing and include ball bearings with grease nipples that are double-sealed with Nilos rings.

B. CONSTRUCTION

1. The bar screen shall remove debris (screenings) from the incoming wastewater by means of a positively cleaned bar rack that is installed within a concrete channel. The screen shall retain debris at the bar rack. A multitude of rake blades shall remove and lift the debris to a discharge mechanism. The bar rack shall be cleaned by a series of rakes engaging the bar rack and continuously engaging within the screening bars while moving along the entire bar rack length. The debris shall be lifted above the channel and dropped on a discharge chute at the downstream side (back) of the screen. Screens with single rakes shall not be approved. Screens employing brushes and spray water for screenings removal shall not be approved.
2. The bar rack shall consist of equally spaced bars that are inclined from the horizontal with the inclination angle specified above. The lower ends of the bars shall be provided with a minimum 10/64" (4 mm) thick curved base plate such that the rakes positively remove all screenings from the bottom of the bar rack. Bars shall have a teardrop (up to a bar spacing of ½ inch or 12 mm) cross section. Teardrop bars shall have a width of 5/16" (8 mm), a depth of minimum 2.4" (60 mm) and a tail width of 13/64" (5mm). Round, tear-shape, rectangular or trapezoidal bar shapes will not be acceptable. The bar rack shall be made up of equally sized sections securely fastened to the frame of the screen and be readily removable. Screens without the ability to replace bar screen sections will not be acceptable for this project.
3. A frame shall be provided supporting all required loads. Side frames shall be made of 10/64 inch (4 mm) thick stainless steel plates with a minimum of four axial edges. The side frames shall be connected with each other through channels having a minimum thickness of 10/64 inch (4 mm) and a minimum cross section of 4-1/4 inch x 2 inch (108 x 49 mm). The shell frames shall be connected to extended support brackets to reach the side channel walls. The support brackets shall be securely anchored onto the operating floor.
4. The bar screen shall be provided with a dead plate extending from the bar rack to the discharge chute. The dead plate shall be made of 10/64 inch or 4 mm thick stainless steel plate and shall be stiffened by structural members so that it is flat without undulation so that the tips of the rake's teeth ride at a distance between 5/128 and 5/64 inch (1 to 2 mm) over the dead plate. The dead plate shall be securely fastened to the side frames.
5. A discharge chute shall be provided that fully encloses the discharge section of the screen. An access hatch with hinges and a handle shall be provided in the chute permitting easy access. The discharge chute shall be mounted to direct screenings into the appropriate receiving container or conveyor. The chute shall have a slope of minimum 60 degrees. The discharge chute shall be made of a minimum 2.5 mm thick stainless steel plate.
6. The screen shall be provided with easily removable, sufficiently stiffened covers made of 3/64 inch (1.5 mm) thick stainless steel plates with edges on all sides. The covers shall be provided with turn locks and handles.
7. Each side frame shall include separate roller tracks to guide the rakes. The roller tracks shall be bolted to the frame so that they can easily be replaced. The roller tracks shall be made of minimum 10/64 inch (4 mm) thick L-profiles.

8. Drive chains for the rakes shall be roller type. Each chain shall be rated for a maximum load of 56,000N (12,589lbs.f). Drive chains, chain guides, sprockets and their bearings shall be replaceable without the need for removing the screen from the channel. Chain pitch shall be no less than 6-5/16 inch (160mm). Screens utilizing drive chains constructed from alternative materials will not be acceptable for this project due to the corrosive nature of wastewater.
9. Chain rollers shall have a diameter of 2-3/8 inch (60 mm) and shall be a minimum of 1-1/4 inch (32 mm) wide.
10. Each screen shall be provided with two upper sprockets with a reference diameter of 17-3/8 inch (442 mm). The sprockets shall be split to facilitate maintenance. The sprockets shall be constructed from solid stainless steel plates. Screen designs that utilize sprockets constructing of differing materials will not be acceptable for this project.
11. Upper bearings shall be flange bearings, and shall be provided with grease nipples for easy lubrication. The bearings shall be designed for use with biodegradable grease. Their diameter shall be a minimum of 2 inch (50mm). The casing shall be made of paint coated cast iron.
12. Lower bearings shall be slide bearings in a stainless steel casing. They shall include white cast iron shafts and silicon carbide slide bushings with a length of 2" (50 mm) and an internal diameter of minimum 2-5/16" (59 mm). Bearings employing slide bushings made of plastic material shall not be accepted. Screen designs that utilize guide tracks or shoes will not be acceptable for this project.
13. Rakes shall include rake bars made of 1/4" (6 mm) thick channel profile having a cross section of 4-1/4" x 2-3/8" (105 x 60 mm). Rake blades with a thickness of 5/8" (15 mm) and a depth of minimum 6-1/2" (170 mm) shall be bolted on the rake bars. The rake blades shall have teeth matching and engaging the bars of the bar rack. The rake blades shall each consist of several pieces with teeth such that only one of the pieces needs to be replaced in case that a tooth should be damaged.
14. A pivoting scraper mechanism shall be positioned at the point of discharge and shall be attached to the shell frames. The scraper shall clean the rake on each pass and return to its rest position with minimal shock. The scraper shall be designed such that screenings do not wrap around the rake or scraper. The scraper shall be provided with a scraper bar made 10/64 inch (4 mm) thick channel profile with a minimum cross section of 1-1/2 inch x 2-11/16 inch (39 x 68 mm) and an adjustable 3/8 inch (10 mm) thick blade. The scraper shall be connected with the frame through a pair of minimum 20 inch (500 mm) long scraper arms that shall be made of 10/64 inch (4 mm) thick channel profile with a minimum cross section of 2-3/4 inch x 2-3/8 inch (68 x 59 mm). A pair of shock absorber elements made of EPDM shall be provided.
15. The drive shaft shall be hollow and have a diameter of minimum 3-1/8 inch (80mm) and a wall thickness of minimum 13/64 inch (5 mm). Solid drive shafts shall not be accepted.
16. The drive-mounted rocker arm assembly shall consist of a drive unit mounted to a stainless steel arm. The stainless steel arm will be held in place by a flanged roller bearing connected to the drive shaft and two heavy duty tension springs. The flange bearing shall be connected to the rocker arm by four bolts. The rocker arm position shall be maintained in the standard operating position by the two tension springs. An intrinsically safe proximity switch shall indicate the position.
17. The drive unit shall be designed for continuous service and intermittent spray water contact.
18. The bevel gear reducer shall be a totally enclosed unit. Gear reducer shall have ball or roller bearings throughout with all moving parts immersed in oil. Gear reducers which require periodic disassembly of the unit and manual re-greasing of bearings are not acceptable. The nominal input power rating of the gear reducer shall be at least equal to the nominal horsepower of the drive motor. Gear reducer shall be designed and manufactured in compliance with applicable AGMA or equivalent standards. During continuous operation the oil temperature shall not exceed 200 degrees F (95 degrees C).

19. The rake assembly shall be driven by an electric motor. The motor shall be UL rated for operation in Class 1 Division 1 environment. The motor shall be inverter duty rated, 460 Volts, 60 Hz, 3-phase. The motor shall be rated for operation in a 104 degree F (40 degree C) environment.

2.04 CONTROLS AND INSTRUMENTATION

A. GENERAL

The control system shall be provided by the screen supplier.

B. LOCAL CONTROLS ON EACH SCREEN

1. One (1) NEMA7, Class 1 Division 1 approved Cast Aluminum local control station per screen.

C. WATER LEVEL SENSORS

1. Bar screen manufacturer shall provide one Miltronics HydroRanger 200 with (2) STH transducers for continuously monitoring of the upstream and downstream water levels for control of screen operation. The transducers shall be rated for Class 1 Division 1 hazardous locations and shall be intrinsically safe without the use of additional barriers. The transmitter shall be mounted next to the main control panel. Contractor shall install the transducers and provide wiring to the control panel.

D. CONTROL PANEL

1. A single main control panel shall be furnished with a lockable NEMA 4X corrosion-resistant stainless steel enclosure together with a single local push button station rated for a NEMA 7, Class 1 Division 1 environment.
2. Controls panel shall be made by a U.L. listed company and shall bear a U.L. label.
3. Control panel wiring shall be color coded, neatly cabled and supported in non-flammable wiring tracks. Wiring shall be minimum 14 gauge MTW stranded wire.
4. Control panel shall contain all power and control devices necessary for the proper function of the screen and shall include the following:
 - A. 600-Volt rated main circuit breaker disconnect with lockable handle
 - B. 480 – 120 Volt control power transformer
 - C. Reversible Screen VFD, Square D Altivar 31 or equal
 - D. HAND-OFF-AUTO selector switch for the operation of the bar screen drive
 - E. FORWARD-OFF-REVERSE selector switch for HAND operation. Switch shall spring return from REVERSE to OFF
 - F. Red pilot light for "Screen Run" indication
 - G. Amber pilot light for "Fault" indication
 - H. Amber pilot light for "High Water Level" indication
 - I. White pilot light for "Control Power" indication
 - J. Alarm silence and reset push buttons
 - K. Push-to-Stop/Pull-to Run emergency stop maintained push button with lockout
 - L. Dry contacts for remote indication of "Fault", "Screen Running", and "High Level"
 - M. Control relays, wiring and circuitry required to implement the control logic
 - N. High Level Float switch
 - O. Programmable controller (PLC) Micrologix 1400 minimum.

P. Operator interface Allen Bradley PanelView C400 to provide following:

1. Display of current fault
2. Alarm History
3. Motor Hour Meter
4. Operator access to user adjustable setpoints

E. SEQUENCE OF OPERATION

1. In AUTO position the screen shall be controlled by the water level sensors. Screen operation shall be started when the water level sensors monitor a certain water level difference, when the ultrasonic level sensor detects high water level, or when a certain time has passed since the last operation of the screen. Screen operation shall be stopped with an adjustable delay time after the water difference is below a certain value and after the ultrasonic level sensor ceases to indicate high water alarm, or after a certain run time has expired (if operation was started by timer).
2. If the rocker arm rotates out of the normal operating position a proximity sensor will send a signal to the PLC causing the motor to enter a self clearing mode. The self clearing mode with attempt to reverse the direction of travel of the rakes for a set period before resuming forward operation. This cycle will be attempted up to three (3) times; if the self clearing mode should prove unsuccessful then the system shall initiate an alarm signal.
3. Reset is manually performed after correction of any cause for a trip-out.
4. In HAND position the operator shall be able to run the rake assembly selecting the respective FORWARD or REVERSE direction from the FORWARD-OFF-REVERSE selector switch.

PART 3: SPARE PARTS

3.01 SPARE PARTS

- A. The following spare parts shall be included and supplied with the equipment:
1. Two (2) wipers for scraper
 2. Two (2) proximity switches
- B. Spare parts shall be packaged with labels including a description of the contents.

PART 4: EXECUTION

4.01 INSTALLATION, START-UP AND OPERATOR TRAINING

- A. Contractor shall verify all dimensions in the field to ensure compliance of equipment dimensions with the drawings. Contractor shall notify engineer of significant deviations.
- B. Installation of the equipment shall be in strict accordance with the contract documents and the manufacturer's instructions and shop drawings. Manufacturer shall supply anchor bolts for the equipment. Contractors shall install the anchor bolts in accordance with the manufacturer's recommendations.
- C. After installation, touch-up paint shall be applied to all scratched, abraded and damaged shop painted surfaces. Coating type and color shall match shop painting. Contractor shall passivate all field welds.

- D. Supplier shall furnish the services of a factory-trained service technician for one (1) trip including a total of two (2) workdays to inspect the installation, observe start up, and provide operator training.
 - 1. Equipment shall not be energized, or “bumped” to check the electrical connection for motor rotation without the service technician present.
 - 2. The service technician shall make all necessary adjustments and settings to the controls.
 - 3. The service technician shall demonstrate proper and sequential operation of the screening system. The screen shall be able to operate fully automatically.

4.02 WARRANTY

- A. The manufacturer will warrant against any defects in material or workmanship to the screen and framework. This warranty will commence upon delivery of the products and will expire on the earlier to occur of one (1) year from initial operation of the product or 18 months from delivery thereof (the “Warranty Period”).

END OF SECTION

Partial Installation List

HUBER Rakemax - Partial Install List

date of order	product	size	project	quantity	bar spacing [mm]	width [mm]
10/06/2005	RakeMax	4300	Heart of the Valley / WI, USA	1.00	6	1252
06/04/2007	RakeMax	5300	Havre, City of, MT; US	1.00	6	352
06/21/2007	RakeMax	4300	MILTON PRISON Lift Stat. FL,US	1.00	1212	352
10/08/2007	RakeMax	10300	Coyote Springs - Moapa, NV, US	1.00	6	652
05/05/2008	RakeMax	8300	Meriden, City of / CT, US	1.00	20	952
05/05/2008	RakeMax	8300	Meriden, City of / CT, US	1.00	20	952
05/05/2008	RakeMax	4300	Meriden, City of / CT, US	1.00	12	952
05/05/2008	RakeMax	4300	Meriden, City of / CT, US	1.00	12	952
05/15/2008	RakeMax	6300	Clearwater - Marshall St.	2.00	6	752
05/20/2008	RakeMax	5300	Maunabo - WAP / P.R., US	1.00	5	452
08/07/2008	RakeMax	4300	Rocky River / OH, US	5.00	19	1852
02/19/2009	RakeMax	6300	Halls Mill / AL, US	1.00	25	1152
02/19/2009	RakeMax	6300	Halls Mill / AL, US	1.00	25	1152
03/16/2009	RakeMax	6300	Lititz / PA, US	1.00	6	652
03/30/2009	RakeMax	8300	Cactus / TX, US	1.00	6	1252
03/30/2009	RakeMax	5300	Cactus / TX, US	1.00	6	452
04/16/2009	RakeMax	6300	Central Weber / UT, US	2.00	10	1552
04/30/2009	RakeMax	5300	Hagerstown / MD, US	2.00	10	2152
07/16/2009	RakeMax	3300	Seacoast Utilities / FL, US	2.00	12	952
08/20/2009	RakeMax	5300	Milton, FL;US	1.00	6	352
11/17/2009	RakeMax	7300	Richmond / KY, US	1.00		
12/11/2009	RakeMax	4300	SJRA No. 2 / TX, US	1.00	6	
01/13/2010	RakeMax	10300	Auburn / IN, US	1.00	6	1552
01/13/2010	RakeMax	9300	Auburn / IN, US	2.00	6	652
02/10/2010	RakeMax	2300	Rattlesnake / OH, US	1.00	6	652
03/11/2010	RakeMax	6300	Reaney Street / PA, US	1.00	25	1552
04/22/2010	RakeMax	9300	Linda / CA, US	1.00	6	952
05/27/2010	RakeMax	22300	Louisville / KY, US	3.00	13	
05/31/2010	RakeMax	5300	York City / PA, US	2.00	6	
06/24/2010	RakeMax	3300	Williamston / SC, US	1.00	6	352
06/28/2010	RakeMax	10300	Great Falls / MT, US	2.00	8	952
09/14/2010	RakeMax	9300	Auburn / IN, US	2.00	6	
09/14/2010	RakeMax	10300	Auburn / IN, US	1.00	6	
09/27/2010	RakeMax	6300	Ina Road / AZ, US	1.00	40	
10/12/2010	RakeMax	3300	Oaklodge / OR, US	2.00	6	752
10/28/2010	RakeMax	11300	Belleville / IL, US	1.00	20	1552
10/28/2010	RakeMax	13300	Belleville / IL, US	1.00	20	1552
11/30/2010	RakeMax	3300	Key West / FL, US	1.00	12	652
01/13/2011	RakeMax	9300	Narrows Rd PS / KY, US	1.00	25	752
04/29/2011	RakeMax	8300	Mooreville / NC, US	1.00	25	352
07/07/2011	RakeMax	4300	Rochester / NH, US	1.00	6	952
07/27/2011	RakeMax	6300	Guadalupe / CA, US	1.00	6	452
09/28/2011	RakeMax	5300	Jones Island-Milwaukee / WI,US	3.00	6	2152
09/28/2011	RakeMax	5300	Jones Island-Milwaukee / WI,US	5.00	6	1852
09/29/2011	RakeMax	5300	Quincy / IL, US	3.00	20	1852
09/29/2011	RakeMax	6300	Beardstown / IL, US	1.00		
10/07/2011	RakeMax	6300	Beardstown / IL, US	1.00	50	752
12/05/2011	RakeMax	2300	Niwot / CO, US	1.00	6	252
01/10/2012	RakeMax	3300	Rapid City / SD, US	2.00	6	1052
01/12/2012	RakeMax	8300	Mayaguez / PR, US	2.00	25	255
01/12/2012	RakeMax	5300	Plattsburg / NY, US	1.00	6	952
01/12/2012	RakeMax	5300	Plattsburg / NY, US	1.00	6	952
01/17/2012	RakeMax	5300	Ft Lauderdale / FL, US	1.00	6	1152
01/17/2012	RakeMax	5300	Ft Lauderdale / FL, US	3.00	6	1152
01/26/2012	RakeMax	9300	Charlotte-Irwin Creek / NC, US	2.00	6	1252
02/16/2012	RakeMax	8300	San Leandro / CA, US	2.00	10	752
02/29/2012	RakeMax	2300	Niwot / CO, US	1.00	6	252
02/29/2012	RakeMax	4300	Stony Brook / NJ, US	2.00	6	952

02/29/2012	RakeMax	12300	Fishing River-Kansas City / MO	2.00	6	652
02/29/2012	RakeMax	2300	Snohomish / WA, US	1.00	6	1352
03/23/2012	RakeMax	3300	Columbiana County / OH, US	1.00	6	352
06/14/2012	RakeMax	10300	Morganton / NC, US	2.00	6	1052
07/31/2012	RakeMax	8300	Cleveland / OH, US	7.00	20	2452
09/24/2012	RakeMax	4300	Springfield / OH, US	1.00	12	652
09/24/2012	RakeMax	4300	Springfield / OH, US	2.00	12	652
10/29/2012	RakeMax	4300	Port Angeles / WA, US	2.00	6	652
10/30/2012	RakeMax	5300	Camp Pendleton / CA, US	2.00	10	452
04/10/2013	RakeMax	4300	Brookings WWTP / SD, US	1.00	10	
04/25/2013	RakeMax	8300	Lewisville / TX, US	1.00	20	
08/13/2013	RakeMax	8300	Chambersburg, PA; US	1.00	6	1852
08/19/2013	RakeMax	2300	Houlton, ME; US	1.00	6	652
08/26/2013	RakeMax	6300	Madison, WI MMSD PS#18; US	2.00	25	1252
09/02/2013	RakeMax	11300	Chester-Ridley Creek / PA, US	1.00	6	652
09/02/2013	RakeMax	11300	Chester-Ridley Creek / PA, US	1.00	6	652
09/12/2013	RakeMax	4300	Davis / CA, US	2.00	6	452
10/25/2013	RakeMax	7300	Pelican Rapids / MN, US	1.00	6	352
11/06/2013	RakeMax	8300	Hollywood / FL, US	2.00	6	2152
12/03/2013	RakeMax	4300	Albuquerque / NM, US	5.00	6	1052
12/05/2013	RakeMax	10300	Stillwater / OK, US	2.00	6	752
01/15/2014	RakeMax	8300	Columbia, SC - Quail Lane PS, US	2.00	12	1352
01/15/2014	RakeMax	3300	Gogebic / MI, US	1.00	6	752
01/28/2014	RakeMax	9300	Cary Avenue, US	1.00	6	652
01/28/2014	RakeMax	10300	Clavey Road, US	1.00	6	1952
01/28/2014	RakeMax	10300	Clavey Road, US	1.00	6	1952
01/29/2014	RakeMax	10300	Waukegan STP, US	1.00	6	1852
01/29/2014	RakeMax	10300	Waukegan STP, US	1.00	6	1852
01/29/2014	RakeMax	10300	Waukegan STP, US	1.00	6	1852
01/29/2014	RakeMax	10300	Waukegan STP, US	1.00	6	1852
03/12/2014	RakeMax	14300	Clarksburg / WV, US	1.00	10	1252
03/12/2014	RakeMax	14300	Clarksburg / WV, US	1.00	10	1252
05/14/2014	RakeMax	3300	Lawrenceville / NJ - ELSA, US	2.00	12	952
06/04/2014	RakeMax	4300	San Luis Obispo, CA; US	2.00	6	652
08/11/2014	RakeMax	4300	San Antonio / TX, US	2.00	10	1252
08/11/2014	RakeMax	4300	San Antonio / TX, US	1.00	10	1952
09/25/2014	RakeMax	4300	Naples / FL, US	2.00	6	952
09/30/2014	RakeMax	2300	Boulder / MT, US	1.00	40	252
10/13/2014	RakeMax	6300	Albermarle / NC, US	1.00	10	952
10/13/2014	RakeMax	7300	Albermarle / NC, US	1.00	10	1552
11/10/2014	RakeMax	4300	Seattle / WA - JBLM, US	2.00	6	952
11/19/2014	RakeMax	6300	Middlesex / NJ, US	1.00	6	1552
01/26/2015	RakeMax	3300	Campbell WWTP / OH, US	1.00	10	352
01/26/2015	RakeMax	4300	Campbell WWTP / OH, US	1.00	10	852
02/24/2015	RakeMax	6300	Marysville / CA, US	1.00	6	652
05/06/2015	RakeMax	2560	Lake Havasu / AZ, US	1.00	6	690
05/13/2015	RakeMax	8300	Rock Creek / OR, US	2.00	6	1552
06/26/2015	RakeMax	9300	Trophy Club MUD / TX, US	2.00	6	952
06/29/2015	RakeMax	3300	Lynnwood / WA, US	1.00	6	1152
07/08/2015	RakeMax	4300	Deer Park / TX, US	1.00	6	1252
08/12/2015	RakeMax	3300	Bolivar / MO, US	1.00	6	652
08/13/2015	RakeMax	7300	Buckeye Lake / OH, US	1.00	6	652
08/20/2015	RakeMax	3200	Rocky Branch / MO, US	1.00	6	690
08/25/2015	RakeMax	8300	Marietta / SC, US	1.00	6	452
09/16/2015	RakeMax	4300	Green Bay, WI; US	2.00	12	452
12/07/2015	RakeMax	9300	Miamisburg / OH, US	2.00	6	652
12/17/2015	RakeMax	3200	Elizabeth City / NC, US	1.00	6	690
01/26/2016	RakeMax	9300	Mount Vernon / WA, US	1.00	12	1052
02/24/2016	RakeMax	8300	Farmington / CT, US	1.00	6	952
02/24/2016	RakeMax	8300	Farmington / CT, US	1.00	6	952
02/29/2016	RakeMax	10300	Greensborough / NC, US	4.00	6	1252
03/16/2016	RakeMax	6080	Lake Lakota / WA, US	2.00	6	675

04/14/2016	RakeMax	10300	Oshkosh / WI, US	1.00	10	352
04/20/2016	RakeMax	5300	Euclide / OH, US	6.00	10	1552
04/20/2016	RakeMax	15300	Clayton Atlanta / GA, US	4.00	12	1552
04/27/2016	RakeMax	7300	Lake Charles / LA, US	2.00	10	952
05/12/2016	RakeMax	4300	Santa Barbara / CA, US	1.00	20	452
05/31/2016	RakeMax	4300	Plum Island / SC, US	2.00	6	1652
06/09/2016	RakeMax	2560	Kingwood-Houston / TX, US	1.00	6	775
06/21/2016	RakeMax	15300	Nashua, NH; US	1.00	10	1652
06/21/2016	RakeMax	15300	Nashua, NH; US	1.00	10	1652
10/10/2016	RakeMax	3520	Portsmouth / MA, US	2.00	6	675
10/14/2016	RakeMax	2880	Oak Ridge/ TN, US	1.00	6	375
10/26/2016	RakeMax	4160	Fontana Mills, CA; US	1.00	6	975
10/28/2016	RakeMax	4300	Edson/AB, US	2.00	6	652
10/28/2016	RakeMax	2300	Bernardsville/NJ, US	1.00	10	275
11/03/2016	RakeMax	5120	Little Patuxent / MD, US	3.00	6	675
11/23/2016	RakeMax	6080	Eaton/OH, US	1.00	6	475
11/29/2016	RakeMax	2880	Radcliff/KY, US	1.00	6	375
11/29/2016	RakeMax	2880	The Dalles/OR, US	2.00	6	975
12/20/2016	RakeMax	9920	Mustang Creek WWTP / TX, US	1.00	12	675
12/21/2016	RakeMax	2880	Oak Ridge 2nd Machine / TN, US	1.00	6	375
12/21/2016	RakeMax	6400	Oak Harbor/ WA, US	1.00	10	975
01/19/2017	RakeMax	7040	Grants Creek-Salisbury, NC-RM	2.00		
01/23/2017	RakeMax	3840	Brownsburg / IN, US	1.00	6	675
02/24/2017	RakeMax	4160	Riverbend / TX, US	2.00	6	975
03/28/2017	RakeMax	2560	East Hampton / CT, US	1.00	6	475
05/16/2017	RakeMax	2240	Martinez / TX, US	1.00	6	375
06/30/2017	RakeMax	4160	Hot Springs / AR, US	2.00	6	1075
08/28/2017	RakeMax	6080	Sand Island / HI, US	1.00	12	1275
08/28/2017	RakeMax	10880	Woodbridge, NJ-RakeMax,WAP	2.00		
08/31/2017	RakeMax	8960	Ajax Terrace-Roxbury / NJ, US	1.00	10	975
10/20/2017	RakeMax	6080	Baton Rouge NWWTP / LA, US	3.00	6	975
11/09/2017	RakeMax	3840	Tafuna,American Samoa-RMs,WAPs	1.00		
11/09/2017	RakeMax	3840	Tafuna,American Samoa-RMs,WAPs	1.00		
11/28/2017	RakeMax	7040	Encina-Carlsbad,CA-RM,HLC,WAPL	4.00		
02/21/2018	RakeMax	5120	Pima County State Prison / AZ, US	1.00	25	375
02/27/2018	RakeMax	11840	Lexington / KY, US	2.00	6	675
03/20/2018	RakeMax	4160	Pasco County / FL, US	1.00	10	775
03/20/2018	RakeMax	4160	Pasco County / FL, US	1.00	10	775
03/28/2018	RakeMax	5120	Lyndon / KS, US	1.00	10	375
03/29/2018	RakeMax	9920	Newport / PA, US	2.00	12	375
04/05/2018	RakeMax	4480	Shreveport, LA-RakeMax,WAP	1.00		
04/05/2018	RakeMax	3520	Shreveport, LA-RakeMax,WAP	1.00		
04/05/2018	RakeMax	4480	Shreveport, LA-RakeMax,WAP	1.00		
04/05/2018	RakeMax	3520	Shreveport, LA-RakeMax,WAP	1.00		
04/06/2018	RakeMax	7040	Prestage Farms-RM, US	1.00	20	375
04/24/2018	RakeMax	8320	Lexington, East Hickman-RM/ KY, US	2.00	6	975
05/02/2018	RakeMax	5120	Mooreville,NC-McCraryCrk-RM	1.00		
05/10/2018	RakeMax	NULL	Midland, TX - RakeMax	1.00		
06/12/2018	RakeMax	5120	Domtar Paper-Rothschild, WI-RM	1.00		
06/19/2018	RakeMax	6080	Flagg Creek, IL- RakeMax,WAP	1.00		
07/16/2018	RakeMax	5120	Modesto, CA-RakeMax, HLC	1.00		
07/16/2018	RakeMax	10880	Modesto, CA-RakeMax, HLC	3.00		
07/16/2018	RakeMax	5120	Modesto, CA-RakeMax, HLC	4.00		
07/19/2018	RakeMax	7040	Clinton, OK-RakeMax,WAP	1.00		
08/02/2018	RakeMax	9600	Rifle Range WWTP / SC, US	1.00	12	675
08/06/2018	RakeMax	5120	Portsmouth, NH-Pease-RM,WAP	1.00		
10/08/2018	RakeMax	2880	Mahoning, OH-Craig Beach-RM	1.00		
10/12/2018	RakeMax	3840	Beaumont, CA-RakeMax	1.00		
11/26/2018	RakeMax	8000	Fayetteville, NC - RakeMax	2.00		
11/30/2018	RakeMax	6720	Plymouth, MA-Water St-Headwork	1.00		
11/30/2018	RakeMax	2240	Clear Lake, WI - RakeMax, WAP	1.00		
12/27/2018	RakeMax	3200	Superstition Mountains, AZ-RM	1.00		

02/26/2019	RakeMax	14720	Upper Sandusky, OH_Rakemax_WAP	2.00		
02/27/2019	RakeMax	2560	Winooski, VT_RakeMax WAP	1.00		
04/17/2019	RakeMax	9920	Tomahawk Creek-Leawood / KS, US	3.00	20	1275
04/17/2019	RakeMax	10880	Tomahawk Creek-Peak Flow Pump, US	1.00	20	1275
04/17/2019	RakeMax	10880	Tomahawk Creek-Peak Flow Pump, US	1.00	20	1275
04/18/2019	RakeMax	2560	Mocksville, NC-Dutchmans Creek	1.00		
04/29/2019	RakeMax	6080	Fort Mill / SC, US	2.00	10	675
04/30/2019	RakeMax	9280	Salt Lake City, UT-RM,HLC,WAPL	1.00		
04/30/2019	RakeMax	9280	Salt Lake City, UT-RM,HLC,WAPL	1.00		
05/06/2019	RakeMax	2560	Cedar Park, TX WWTP - RakeMax	1.00		
05/15/2019	RakeMax	10880	College Station, TX - RM, US	1.00	25	675
05/15/2019	RakeMax	10880	College Station, TX - RM, US	1.00	25	675
06/07/2019	RakeMax	14720	Upper Sandusky, OH, US	2.00		
06/28/2019	RakeMax	2560	Bayfield / WI, US	1.00	6	275
07/03/2019	RakeMax	2560	Cedar Park, TX, US	1.00	6	975
07/17/2019	RakeMax	2240	Clear Lake / WI, US	1.00	6	375
09/17/2019	RakeMax	2880	Penn State University, PA, US	2.00	6	475
10/16/2019	RakeMax	3200	Seneca, SC_Oconee_RakeMaxJ,WAP	1.00		
10/18/2019	RakeMax	6720	Encina-Carlsbad / CA, US	4.00	10	975
10/21/2019	RakeMax	6080	Union Sanitation Dist,CA-RakeM	1.00		
10/21/2019	RakeMax	6080	Union Sanitation Dist,CA-RakeM	2.00		
10/28/2019	RakeMax	9920	Stockton,CA - RM,WAPL,HLC,HPTT	1.00		
10/28/2019	RakeMax	9920	Stockton,CA - RM,WAPL,HLC,HPTT	3.00		
11/13/2019	RakeMax	3520	Conroe,TX South WWTP- RMs,WAPs	2.00		
11/19/2019	RakeMax	5120	Holly Springs, Utle Creek, NC, US	2.00	6	975
11/19/2019	RakeMax	2560	Monroeville, AL_RakeMax,WAP	1.00		
11/20/2019	RakeMax	2880	Bradenton, FL_RakeMax	1.00		
11/20/2019	RakeMax	2880	Bradenton, FL_RakeMax	1.00		
11/29/2019	RakeMax	6720	Central Valley, UT, US	4.00	6	1875
12/12/2019	RakeMax	3520	Sterling / CA, US	2.00	6	675
12/12/2019	RakeMax	6080	UT State Correctional Fac.	2.00		
12/18/2019	RakeMax	6080	INTEL Hillsboro - Rake Max, US	1.00	10	1275
12/31/2019	RakeMax	4160	Joliet, IL IDOC - RakeMax	1.00		
01/08/2020	RakeMax	NULL	Nashua / NH, US	2.00	6	2175
01/15/2020	RakeMax	NULL	Peppers Ferry / VA, US	1.00	6	675
01/15/2020	RakeMax	NULL	Peppers Ferry / VA, US	1.00	6	675
02/07/2020	RakeMax	9920	Kyle, TX - RakeMax, WAP	1.00		
02/07/2020	RakeMax	9920	Kyle, TX - RakeMax, WAP	1.00		
03/05/2020	RakeMax	8000	Huntsville, AL, US	1.00	8	1275
03/05/2020	RakeMax	8000	Huntsville, AL, US	1.00	8	1275
04/08/2020	RakeMax	5120	Northampton, MA_RakeMax, WAP	1.00		
04/14/2020	RakeMax	3840	Fostoria, OH_RakeMax-J, WAP	1.00		
04/14/2020	RakeMax	3840	Fostoria, OH_RakeMax-J, WAP	1.00		
04/30/2020	RakeMax	7040	Akron, OH_RakeMax	2.00		
04/30/2020	RakeMax	7040	Akron, OH_RakeMax	2.00		
04/30/2020	RakeMax	2880	Port Wentworth, GA_RakeMax,WAP	1.00		
04/30/2020	RakeMax	16640	Rock Hill, SC Manchester Creek	2.00		
05/22/2020	RakeMax	3200	Daly City, CA - RakeMax-J, WAP	1.00		
05/29/2020	RakeMax	6080	Kaufman, TX WWTP_RakeMax, WAP	1.00		
06/18/2020	RakeMax	7680	Rock Hill, SC_Rakemax_temp	1.00		
06/24/2020	RakeMax	NULL	Lexington, NC	1.00	13	975
07/20/2020	RakeMax	3520	Lower Little Miami WWTP, OH	2.00		
07/30/2020	RakeMax	9920	Lewisville, TX Vista Ridge LS	1.00		
08/20/2020	RakeMax	6080	Mooresville, NC_Northside Pump	1.00		
08/25/2020	RakeMax	7040	Lexington, NC Swearing Creek RM,WAP	1.00		
09/10/2020	RakeMax	4480	Gresham, OR_RakeMax, WAP-SL	2.00		
09/28/2020	RakeMax	3520	Mooresville,NC S.Iredell RakeMaxWAP	1.00		
10/26/2020	RakeMax	4480	Macon, MO WWTP_RakeMax-J, WAP	2.00		
10/30/2020	RakeMax	4160	Quincy, CA_AmerVal_RakeMax,WAP	1.00		
10/30/2020	RakeMax	3840	Tahoe Truckee, CA_RMJ,WAP,HLC	1.00		
10/30/2020	RakeMax	3840	Tahoe Truckee, CA_RMJ,WAP,HLC	1.00		
01/29/2021	RakeMax	3840	Greenville, OH_Rakemax	1.00		

01/29/2021	RakeMax	3840	Bozeman, MT WRF_RakeMax-J,WAP	1.00		
02/18/2021	RakeMax	5120	Geneseo, IL - RakeMax, WAP	1.00		
02/22/2021	RakeMax	9920	Richmond, KY_ Rakemax, WAP	1.00		
03/30/2021	RakeMax	2240	Logan, WV_RakeMaxJ, WAP	1.00		
04/26/2021	RakeMax	9280	Charlotte, NC Irwin Creek_RM	1.00		
04/28/2021	RakeMax	6080	Gastonia, NC_CrowderCr_RakeMax	1.00		
04/30/2021	RakeMax	7040	Atlanta,GA_IntrenchmentCrk_RM	2.00		
05/10/2021	RakeMax	2560	F.B. Purnell Sausage Co., US	1.00	6	
05/14/2021	RakeMax	3520	Angleton, TX Oyster Creek WWTP	1.00		
05/28/2021	RakeMax	2880	SanAntonio,TX_MartinezIV_RMWAP	1.00		
06/17/2021	RakeMax	5120	Marion, RakeMax / KY, US	1.00	6	
07/13/2021	RakeMax	2560	Red Bluff, CA RakeMax, WAP	1.00		
07/19/2021	RakeMax	8000	Ottawa, IL_RakeMax_WAP	1.00		
08/07/2021	RakeMax	2240	Tupper Lake, NY_ RakeMax	1.00		
08/27/2021	RakeMax	7040	Spanish Fork,UT_RakeMax_WAP	2.00		
10/25/2021	RakeMax	3520	Somerton, AZ_RakeMax, WAP	1.00		
11/04/2021	RakeMax	2880	Oakland, TN	1.00	6	575

References

HUBER Multi-Rake Bar Screen RakeMax®



Rocky River (WWTP), OH

22303 Rocky River Road, Rocky River, OH 44116
CarrieAnne Rosemark, Plant Superintendent
O (440) 895-2593 | www.rrcity.com

Five (5) RakeMax® 4300x1852x19
Installation date: 04/2006



Meriden (WWTP), CT

226 Evansville Ave., Meriden, CT 06451
Peter Villa, Supervisor
O (203) 630-4261 | pvilla@meridenct.gov

Two (2) RakeMax® 8300x952x20
Two (2) RakeMax® 4300x952x12
Installation date: 09/2008



Belleville (WWTP), IL

450 Environmental Drive, Belleville, IL 62220
Randy E Smith Sr., Director
O (618) 233-7146 | RSmith@belleville.net

Two (2) RakeMax® 11300x1552x20
Installation date: 08/2013



Bonnybrook (WWTP), Calgary, Alberta, Canada
4330 15th Street South East, Calgary/Alberta CA T2G 3M9
Brad Hodge, Leader of Maintenance
O (403) 268-3843 | brad.hodge@calgary.ca

Six (6) RakeMax® 5300 x 2152 x 6
Installation date: 08/2010



Jones Island, Milwaukee (WWTP), WI
700 East Jones Street, Milwaukee, WI 53207
Samuel M. Lieven, Wastewater and Energy Supervisor
C (414) 236-9414 | samuel.lieven@veolia.com

Five (5) RakeMax® 5300 x 1852 x 6
Three (3) RakeMax® 5300 x 2152 x 6
Installation date: 11/2012



East Hampton (WPCA), CT
20 Gildersleeve Drive, East Hampton, CT 06424
Scott Clayton, Superintendent
C (860) 267-4124 | sclayton@easthamptonct.gov
Operations (860)543-3844

One (1) RakeMax® J 2560 x 75 x 6
Installation date: 12/27/2017



Brownsburg (WWTP), IN

225 Mardale Drive, Brownsburg, IN 46112

Kathy Dillon, Superintendent

C (317) 852-1114 | kdillon@brownsburg.org

One (1) RakeMax® 3840 x 675 x 6

Installation date: 12/11/2017



City of Hot Springs (WWTP), AR

320 Davidson Drive, Hot Springs, AR 71901

Harold Mauldin, WW Operation Manager

O (501) 262-1125 C (501) 912-0314

Monty Ledbetter, Utilities Director

O (501) 651-7730 C (501) 337-2980

One (1) RakeMax® J 3840 x 1075/6

Installation date: 04/2018



ORNL Oak Ridge (PSTP), TN

1 Bethel Valley Rd, Oak Ridge, TN 37831

Dwight Jones, Superintendent

O (615) 394-8216

Two (2) RakeMax® 2800x375/6

Installation date: 08/2017



City of Bradenton (WWTP), FL

1810 1st Street West, Bradenton, FL 34205

William Waitt, Superintendent

O (603) 490-8969 | William.waitt@cityofbradenton.com

Two (2) RakeMax® 2880x775/6

Installation date: 08/2020



Wesley Center (WWTP), Pasco County, FL

7051 Boyette Road, Wesley Chapel, FL 33544

Greg, Lead Operator

O (727) 359-5014

Two (2) RakeMax® 4160x775/10

Installation date: 08/2019

Responses to Questions via Email

Subject:

RE: City of Hollywood SRWWTP - Emergency Bypass Bar Screen | Huber Technology Budget Proposal

From: John Mushinsky <jmm@mosskelley.com>

Sent: Thursday, July 20, 2023 1:05 PM

To: Kelly, Alexandra <akelly@hazenandsawyer.com>

Cc: Cooke, J. Philip <pcooke@hazenandsawyer.com>

Subject: RE: City of Hollywood SRWWTP - Emergency Bypass Bar Screen | Huber Technology Budget Proposal

Alexandra

Information is attached and **responses** to your questions are as follows:

1. Budget cost estimate for a fully enclosed 316SS screen:
Reference : 6/5/23 Budget Proposal \$286,900, 316SS covers are included in proposal (Proposal Attached)
2. Equipment/material lead time :
24-30 weeks
3. Cleaning mechanism:
Dry discharge with UHMW wiper blade
4. Level monitoring mechanism:
VEGAPULS differential with two (2) sensors
5. "Storm mode" raking capability?
VFD operated, the travel speed of the rakes shall be between 26 and 39 feet per minute (8 to 12 m/min).
6. Electrical requirements:
480VAC, 3 phase, 60Hz.
7. Control features:
See attached PID and control philosophy.
8. Unique features (i.e. pivot capability for bypass, hydraulic lift):
Screen size based on channel depth and width prevent pivot design.
9. Proposed dimensions and confirmation that the screen can be installed at required depth:
Confirmed, depth and peak flow are not a concern. See proposal.
10. Examples of successful installations, preferably in Florida, including contact information and year of installation
Attached is a partial install list with FL installs highlighted in yellow. Also attached is a general reference list. Let me know which sites in FL are of interest and I can provide contact information.

Please review and let us know if you have any additional questions.



John M. Mushinsky

O: 954.755.2092

C: 954.401.3147

E: jmm@mosskelley.com

W: www.mosskelley.com

7284 West Palmetto Park Road
Suite 304
Boca Raton, FL 33433

Appendix C: Duperon FlexRake IQ Bar Screen

Budgetary Proposal



DATE: June 7, 2023

Mechanically Cleaned Bar Screen Preliminary
Budget Proposal Number P13014 R1
FlexRake® FR IQ
City of Hollywood WWTP, FL

To:
J. Phillip Cooke, PE
Senior Associate
Hazen and Sawyer
(954) 967-7046
pcooke@hazenandsawyer.com

Sales Representative:
Larry Hickey
Equipment Plus Solutions, Inc.
(352) 895-2656
Larry.hickey@equipmentplusinc.com

From:
Brandon Dayton
Sales Project Manager
Duperon Corporation
(989) 754-8800
bdayton@duperon.com

Mark Hickok
Regional Sales Manager
Duperon Corporation
(989) 412-0289
mhickok@duperon.com



Thank you for considering Duperon® system solutions for your project. We appreciate the opportunity to provide you with a Budgetary Equipment Scope. Please do not hesitate to contact your Duperon® Team with any questions as we work with you through the design process and ensure a successful project.

Form ES-P19-F03-19

Printed: 6/7/2023 10:23 AM

SCOPE OF SUPPLY:

SCREENS:

QTY	UNIT	DESCRIPTION
1	EA	Duperon® FlexRake® - Front Clean Front-Return Model: FR IQ Enclosure (& Material): Fully Enclosed (316) Nom Width x Length: 10.00 x 31 Feet Clear Opening size: 0.5 in Angle of Installation: 30 Deg. from Vertical Material Construction: 316 SSTL

Notes: Based on 19.00 ft channel height.
Includes 316SSTL channel wall supports
and top deck support.

CONTROLS:

QTY	UNIT	Main Control Panel:	(1) FR IQ
1	EA	Power:	480V/3ph/60hz
		Panel Rating:	NEMA 4X
		PLC/Relay Based:	Relay
		Screen Instrumentation:	Dual Mechanical Float
		Local Pushbutton Station(s):	ThreeButton(E-Stop/Run/Jog/Rev)

Includes heater, thermostat, cooling fan,
rain hood, and sunshield.
See attached Controls Selection Guide
for additional options.

TECH/FREIGHT

QTY	UNIT	DESCRIPTION
1	LOT	On-Site Technical Assistance Number of Trips: 1 Trip(s) Days On-Site per Trip: 2 8-hour man-day(s)
1	LOT	Freight: FOB Jobsite, Full Freight Allowed

Clarifications:

- This is not a fully designed project; preliminary pricing may be affected by scope change/project development
- Operational, structural, wind, or seismic calculations are not included
- Scope is based on models and assumptions widely utilized in the industry
- Scope does not convey an offer to sell; installation and taxes are not included
- For reference only: Standard Delivery Schedule: Submittals 6-8 weeks from PO - Shipped 24-26 weeks from approval

PRELIMINARY BUDGET PRICING:

\$579,000.00

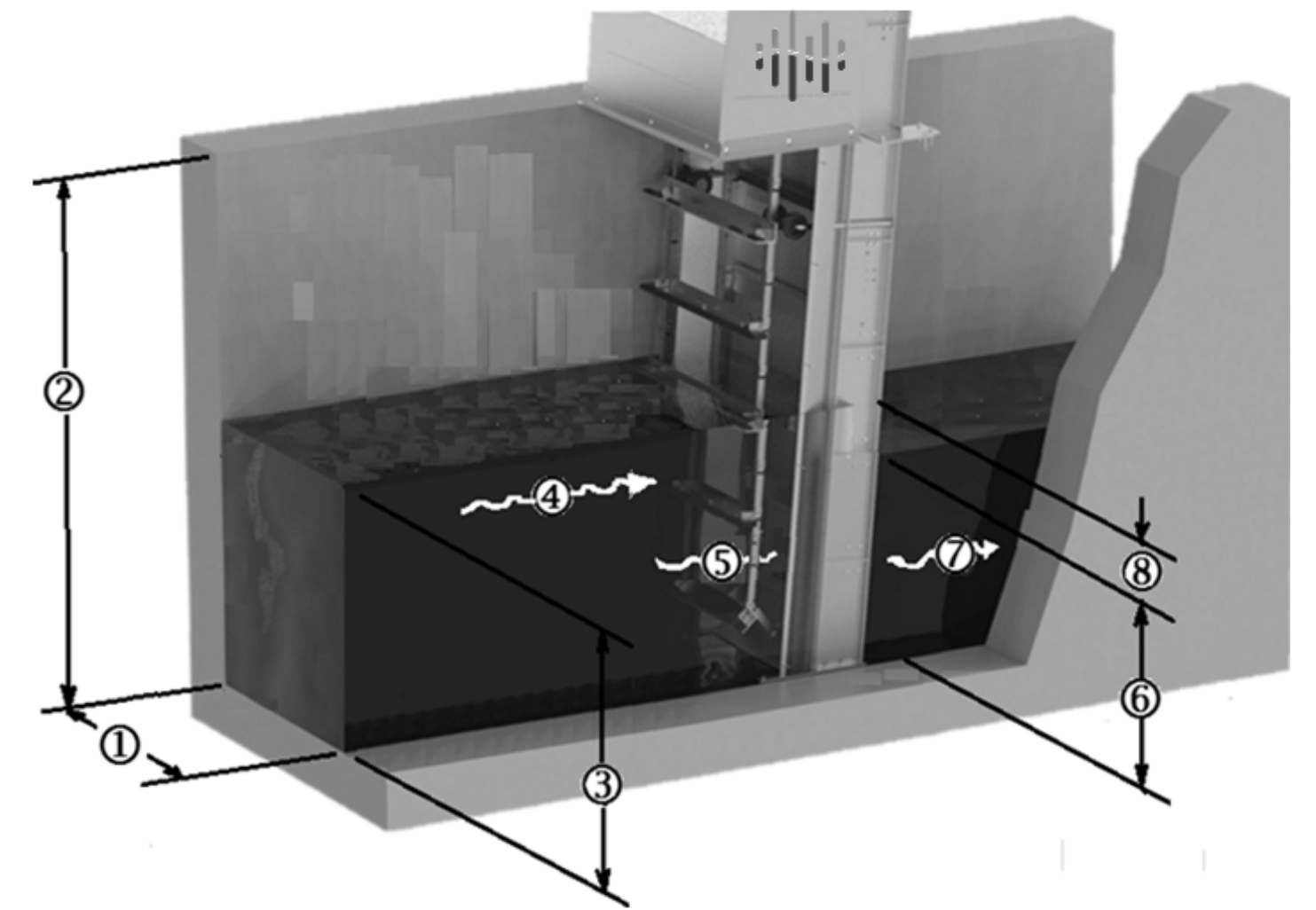




Custom Application Table

Bar Screen Headloss & Channel Hydraulics

IMPERIAL (English) UNITS

[illegible]

Duperon requires a minimum of 1.00 ft water depth when the unit is in operation to keep the SSTL FlexLinks lubricated and ensure an optimal amount of screening area. This does not apply to LowFlow, FR IQ, and GTS units.

Head loss is calculated using Bernoulli equation: $HL = (1/C^2) * (V^2 - v^2) / (2g)$. Flow coefficient $(1/C^2) = 1.43$ should be used for general applications (FP, HD, SCT, FRIQ $\geq .62$). $(1/C^2) = .99$ is used for teardrop bars (LF, FPFS, FPFS-M, FRIQ $\leq .5$, GTS). \neq

At design average flow conditions, approach velocities should be no less than 1.25 fps, to prevent settling. ##

Satisfactory designs have provided for velocities of 2 to 4 fps through the openings of mechanically cleaned screens.###

References: #Hydraulic Similarity of Headloss Predictions (WEF abstract) 2010, L.Botero, M.Woodley. ##Recommended Standards for Wastewater Facilities (10 States), 61.122 (2014). ###WEF MOP 8 5th ed. 2010.

DUPERON®
FLEXRAKE IQ®
RESPONSIVE RESILIENCY™

SMART RAKING™

Duperon created the FlexRake IQ with all the simplicity and reliability of the original FlexRake and added a new level of resilience for today's (and tomorrow's) challenging plant conditions. The FlexRake IQ focuses on Smart Raking™ enhancements and automated response to manage heavy solids loading events. The FlexRake IQ provides a new option for greater flexibility over a broader range of conditions.

**THE DUPERON
DIFFERENCE**

AUTOMATED, REAL-TIME RESPONSE

- *Smart LogIQ™ sequence of operations automatically responds to changing flow and debris conditions*

OPTIMIZED HYDRAULIC PERFORMANCE

- *Ideal during heavy solid loading or first flush events*

INCREASED DEBRIS REMOVAL

- *Up to 4x the debris removal capacity*

ENHANCED DEBRIS MANAGEMENT

- *Improved grit/rock handling*

PROCESS RESILIENCY

- *With reliable continuous cleaning; Jam Evasion™ technology and rapid re-engagement, the FlexRake IQ can remove large debris without disruption and re-enter into the bar screen quickly to avoid blinding, flooding, and bypassing*

LONG PRODUCT LIFE

- *Re-imagined FlexLink™ is designed for long life at higher speeds*



DUPERON® FLEXRAKE IQ® RESPONSIVE RESILIENCY™

The original FlexRake technology transformed preliminary liquid/solids separation. The IQ Platform benchmarks the simple and reliable FlexRake design principles and adds next-generation smart features for a new level of adaptability.

An INTELLIGENT
screening system that
knows what to do
& when to do it

The FlexRake IQ combines
TWO SMART FUNCTIONS:

1 SMART LogIQ™
*Responds to current debris
loading and hydraulic conditions
by adjusting the operating speed
and discharge rate automatically,
without operator intervention.*

2 SMART RAKING™
*Proven FlexLink™ technology made
its mark by eliminating lower
sprockets, becoming its own frame
and operating without shutdowns
from large debris. Redesigned
components enhance screen
cleaning and solids handling.*



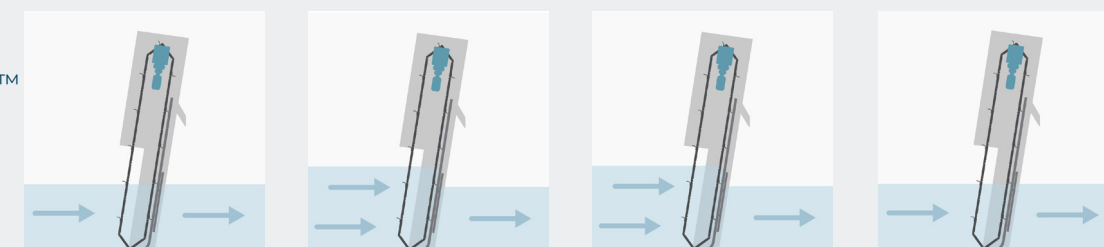
BACKED BY PROVEN PERFORMANCE IN OVER **1800 INSTALLATIONS AND 25+ YEARS** OF APPLICATION EXPERIENCE, THE FLEXRAKE IQ PROVIDES RESPONSIVE RESILIENCE.

USACE DEFINITION OF RESILIENCE

Resilience is the ability to **ANTICIPATE, PREPARE** for and **ADAPT** to changing conditions and **WITHSTAND, RESPOND** to, and **RECOVER** rapidly from disruptions

(Executive Order 13563)

1 SMART LogIQ™ SEQUENCE OF OPERATIONS



SITE CONDITIONS	FLOW	average flow	increasing flow and debris load	decreasing flow/ debris load	average flow
	HEADLOSS	in range	increasing	decreasing	in range
SMART RAKING™	SPEED	normal	increased as needed	reducing	low

2 SMART RAKING™ ENHANCED SCREEN CLEANING



A
*Re-engineered
scraper provides up
to 4x debris removal
capacity and increased
strength*



B
*Patent-pending
re-engineered FlexLink™
is designed for additional
speed capabilities and
long product life*



C
*Rapid re-engagement
removes large debris
without shutdown to
return scraper into
the bar screen faster*



D
*Re-configured geometry
of design allows
for lowest possible
engagement and better
settled solids handling*

		FLEXRAKE®	FLEXRAKE IQ® RESPONSIVE RESILIENCY™
FLEXRAKE® DESIGN PRINCIPLES	Design simplicity	✓	✓
	Multi-rake unit with no in channel sprocket, bearings or tracks	✓	✓
	FlexLink™ Jam Evasion™ technology	✓	✓
	25+ years of application experience	✓	✓
	Low maintenance	✓	✓
	Ease of operation	✓	✓
	Long product life	✓	✓
SMART LogIQ™	Automatically matches speed and discharge rate in real-time for changing channel conditions		✓
SMART RAKING™	Up to 4x increased debris removal capacity		✓
	Increased speed capability		✓
	Improved grit/rock handling		✓
	Rapid re-engagement returns scrapers to the screen faster		✓

PRODUCT DATA

UNIT WIDTH	2 ft to 10 ft
UNIT LENGTH	Up to 100 ft
BAR OPENINGS	1/8 in or greater
ANGLE OF INSTALLATION	Vertical to 45 degrees
MATERIALS OF CONSTRUCTION	Standard 304 SSTL, available in 316 SSTL
TYPICAL MOTOR	1 hp
CLEANING FREQUENCY	Entire screening field cleaned every 7 seconds at max speed
CONTROLS & OPERATIONS	Base packages from float level control to sophisticated automation

Manufacturer Pamphlet



SERVING FLORIDA'S
WATER & WASTEWATER INDUSTRY
SINCE 1987

• Legacy is your opportunity to provide for those who come after you.

Pay it forward!

Inside this Issue:

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Volume 12, Issue 1

May 2023

DUPERON CORPORATION—Screening Systems

The **DUPERON® FlexRake®** is a mechanical barscreen with proven installations in wastewater facilities throughout Florida and the United States.

It is available with typical bar spacing ranging from 1/4"—4". The unique, heavy duty **FlexLink®** construction eliminates the need for lower sprockets and bearings and is capable of lifting up to 1,000 lbs. Multiple barscreen rakes are provided every 21" for high-volume debris applications. Rakes provide full penetration, efficiently cleaning three sides of the barscreen; i.e., the surface as well as the entire depth of the spacing between both sides of the bars.

The **FlexRake®** is available in 304, 316 and 316 L construction with enclosures for odor control. Enclosures are provided with full service hatches for inspection and O&M access.



The **FlexRake®** is standard with two-speed VFD operation which can be run manually or automatically using feedback from level sensors.

DUPERON® Dual Auger compactors are capable of moving debris up to 40 feet away, eliminating the need for conveyors or sluices.

DUPERON® also provides a full complement of equipment including conveyors and sluices.

With **DUPERON®**, you will benefit from over 20 years of industry experience, along with a standard **5-Year-Warranty**.



ROTRON Regenerative Blowers



We are your Florida source for factory direct access to the complete line of **AMETEK DFS (ROTRON)** Regenerative Blowers.

The **ROTRON** brand has been a long standing world leader in regenerative blower technologies providing **chemical process blowers, environmental blowers, industrial blowers, and spa blowers**, as well as a complete line of accessories and replacement motors.

Contact us today with your regenerative blower needs.

EVOQUA WATER TECHNOLOGIES—Odor Control Systems



Evoqua Water Technologies provides a full range of odor control systems—from biofilters, to carbon adsorption systems, as well as chemical scrubbers.

When it comes to total odor treatment, **Evoqua Water Technologies' LO/PRO®** scrubber is proven solution.

LO/PRO®s are available with performance ranges covering air flows up to 30,000 cfm.

They are available in 2- and 3-stage designs. Application of

these models is dependent upon the VOCs present in the air flow and the level of treatment desired.

LO/PRO® scrubbers provide 99.5% H₂S & NH₃ destruction and handle H₂S and organic odors. They are ideal for dewatering and sludge drying odors.

The premier advantage to the operation of a **LO/PRO®** scrubber is the benefit of 50% lower chemical usage.

The **ZABOCs** biofilter is a

2-stage biofilter, providing biological reduction of H₂S in stage one with an internal second stage provided to polish off residual reduced organic sulfides using carbon adsorption.

Standard **ZABOCs** models handle air flows ranging from 50 to 5000 cfm. They provide high efficiency odor removal and are compact and low profile. They are perfect for lift station applications and smaller treatment plant applications

FWEA AIR QUALITY CEU/PDH SEMINAR



THE FWEA AIR QUALITY COMMITTEE recently held their annual seminar in the City of Pompano Beach, continuing the committee's legacy of providing continued education opportunities related to the odor control field.

This year's workshop was well attended by utility personnel and engineers from

throughout the State of Florida.

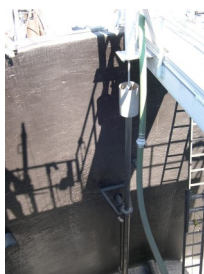
Technical presentations were provided by a nationally acclaimed group of consultants in the odor control field.

Attendees gained an in-depth understanding of odor control system design issues along with sound

engineering practices.

The Annual Seminar is a continued education opportunity, providing CEUs and PDH credits for those in attendance.

The committee annually "pays it forward" by donating proceeds from this event to the **FWEA Norm Casey Scholarship Fund**.



AMWELL® Clarifiers, Skimmers, and Telescoping Valves

AMWELL® (established in 1868) manufactures a full line of circular clarifiers, rectangular clarifiers, sludge thickeners, skimmers and telescoping valves.

If you are looking for a suction style clarifier or a pier-supported solids contact clarifier, **AMWELL®** has your solution.

AMWELL® manufactures single or double-sweep scrapers and standard or spiral flights.

A complete line of rectangular chain and flight clarifiers are also available along with manual or gear operated slotted pipe surface skimmers. if you need decanting capability within your sludge digesters to assist in sludge thickening, **AMWELL®** manufactures rack & pinion or non-rising stem telescoping valves.

AMWELL® offers circular and rectangular clarifiers gear drives, grit removal systems, scum skimmers

and telescoping valves.

With **AMWELL®**, you can count on generations of experience and American-Made products.

Let us assist you with finding the right solution for your particular application.



Located in North Aurora, IL
(Greater Chicago Area)

HALLSTEN CORPORATION —Aluminum Tank Covers

HALLSTEN CORPORATION manufactures custom engineered, flat aluminum cover systems for wastewater treatment plant process tankage.

These tank covers are designed as a walking surface for access by plant personnel.

HALLSTEN covers are substantially air tight and are typically installed in conjunction with a centralized odor control system.

After submittals, and prior to fabrication of the cover

system, **HALLSTEN** survey crews are dispatched from the factory to obtain the actual field dimensions for the covers. These true field dimensions are used when the cover is released to production.

HALLSTEN CORPORATION also provides and installs their covers using experienced plant crews to ensure proper installation. The majority of these covers are installed over live process tanks. Post installation,

the cover systems are certified to be in compliance with local Florida hurricane wind load standards.

Because their crews install the cover system, **HALLSTEN CORPORATION** takes responsibility for the integrity of the installation and fit of the cover system on the tankage.

HALLSTEN CORPORATION offers extensive experience with references throughout the State of Florida.



DUPERON® CORPORATION Addressing Urban Stormwater Screening

Cities and counties throughout the State of Florida are clearly dealing with urban sprawl.

As this growth occurs, the resulting environmental impact has resulted in more complex stormwater treatment systems.

Many regulated stormwater plans now include treatment areas for nutrient reduction and control using various approaches to address nitrogen and phosphorus levels present within the stormwater.

Designers of these systems have quickly learned

that urban litter and stormwater debris can be a hindrance to the performance and ultimate success of these treatment systems.

Urban stormwater debris is physically smaller and is typically represented by small plastic bags, Styrofoam cups, soda cans, cigarette packs, as well as small leaves and twigs, etc. As a result, the screening requirements for these urban applications are more refined if this debris is to be successfully collected and removed.

The **DUPERON®FlexRake®** is a proven solution for

these stormwater screening applications.

This **DUPERON®** screening system, by design, has the capability of removing large and small debris and will successfully discharge it into a dumpster where collected debris can then be transported to a landfill.

DUPERON® offers sound solutions for these unique applications. By providing design assistance, as well as full hydraulic calculations, **DUPERON®** is able to determine your best screening selection.





Visit us on the web at:
www.equipmentplusinc.com

Equipment Plus Solutions, Inc.

P.O. Box 2908
Bellevue, FL 34421-2908

Ph: 352.237.1869
Fax: 877.792.8356

We value your consideration of
EQUIPMENT PLUS SOLUTIONS, INC.
and welcome the opportunity to be of service to you.

Please take a moment and visit our web site.
You'll find direct links to the companies we represent
as well as information and links to our offices.

We stand ready to assist you—we're just a phone call
or an email away.

DUPERON® STORMWATER HARVESTRAKE

The **DUPERON® HarvestRake®** is a highly customized screening system designed for stormwater treatment facilities that use algae to remove nutrients from the water.

The **HarvestRake®** (shown in the photo to the right) is currently operational in a 10-MGD Florida stormwater nutrient reduction facility.

This treatment facility utilizes an algal turf scrubber to filter water being fed from a network of stormwater canals.

A thick layer of algae is grown on the surface of a 5-acre flow way within the treatment system to remove nutrients. As the water flows across the algae rich turf scrubber, surface nitrogen and phosphorus are systematically removed. This particular stormwater treatment system removes 13,000 lbs of nitrogen and 3,000 lbs of phosphorus annually.

The algae on the flow way is periodically removed and the algae is then screened from the treatment system's process water using the **DUPERON® HarvestRake®**.

The separated algae is then dried and safely disposed of in a local landfill.

DUPERON® manufactures other screening systems utilized in various treatment applications.

The **FlexRake®** is used for municipal and industrial wastewater screening applications.

The **TrashRake®** is used for large stormwater debris removal systems.

Duperon Corporation® is a United States based manufacturing company located in Saginaw, MI.



"Do one thing every day that challenges you"

Controls Selection Guide

1. What site power will be fed to the Main Control Panel?

☐ 480V 3PH ☐ 230V 3PH ☐ 208V 3PH ☐ 240V 1PH ☐ 120V 1PH ☐ 575V 3PH ☐ Other:

Additional details: [Click or tap here to enter text.](#)

2. If you are buying multiple machines, do you want:

☐ Separate Main Control Panels for each machine?

☐ One Main Control Panel for all equipment?

☐ Other:

Additional details: [Click or tap here to enter text.](#)

3. Main Control Panel (MCP) location and type (MCP must be located in an NFPA unclassified area):

☐ Located Indoors in a climate-controlled environment ☐ Located Indoors with no climate control

☐ Located Outdoors (requires shelter from direct sunlight, to be provided by others)

☐ NEMA 4X 304SSTL ☐ NEMA 4X 316SSTL ☐ NEMA 12 (must be located indoors)

Any restrictions on MCP dimensions? [Click or tap here to enter text.](#)

What ambient temperature range will the panel be subjected to? [Click or tap here to enter text.](#)

4. What level monitoring instrumentation is required (may pick more than one)?:

☐ No Instrumentation ☐ Single Upstream Float Switch ☐ Dual Upstream Float Switches

☐ Upstream Only Level Transducer ☐ Differential Transducers (Upstream and Downstream)

☐ Ultrasonic Level Transducers ☐ Radar Level Transducers ☐ Submersible Pressure Transducers

5. Preferred Logic Control Option:

☐ Relay ☐ AB CompactLogix 5380 ☐ Unitronics V350 PLC/HMI ☐ Other (provide model below):

Additional details: [Click or tap here to enter text.](#)

6. SCADA / Networking / Remote Access / E-Mail or SMS Notifications:

Please describe any communications and networking needs:

[Click or tap here to enter text.](#)

References - Wastewater Application

Florida – Duperon References - Wastewater

Jeremy Jacobson – Chief Plant Operator
City of Lakeland – Glendale WWTP
1825 Glendale Street
Lakeland, FL 33803

(863)- 834-8207
Jeremy.Jacobson@lakelandgov.net

Two FlexRakes and a single Washer Compactor

Victor Boucher – Plant Supt.
Manatee County SEWRF
3331 Lena Road
Bradenton, FL 34202

(941) 792-8811 Ext 8028
victor.boucher@mymanatee.org

Three FlexRakes with enclosures and screw conveyor on the SEWRF WWTP headworks

Dave Winkler – Plant Supt. Operations
City of Largo (Influent Pump Station)
5100 - 150th Avenue North
Clearwater, FL 33760

727.518-3057
Dwinkler@largo.com

Large FlexRake with enclosure and washer compactor in plant master pump station prior to headworks. Note: best to call Dave Vs. email

Cassidy Barrett – Project Manager
City of Tampa – San Carlos Pump Station
306 East Jackson Street
5th Floor, East Wing
Tampa, FL 33602

813-274-8890
Cassidy.Barrett@tampagov.net

Two FlexRakes with washer compactors in the San Carlos master pump station a

Your Florida Duperon representative:

Larry Hickey
Equipment Plus Solutions, Inc.

352.895.2656 cell
352.237.1869 ofc

Larry.Hickey@equipmentplusinc.com

References - Stormwater Application



Requested 07.2023
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Duperon Corporation Reference List - Florida Flood Control

Job #	Site Name	Site Location	State	Installed	QTY	Unit	Peak MGD	Nominal Width	Nominal Length	Opening	Contact	Phone
1050	SFWMD	G-349B & G-350B	Florida	1998	2	FlexRake®	~	4.00	20.00	4.00	Mike Hodge	863-983-1431
1050	SFWMD	G-349A & G-350A	Florida	1998	4	FlexRake®	~	4.00	20.00	4.00	Mike Hodge	863-983-1431
1068	SFWMD	G-337	Florida	1999	3	FlexRake®	~	10.00	28.00	6.00	Luis Bianchi	561-436-3375
1082	SFWMD	G-409	Florida	1999	3	FlexRake®	~	8.00	28.00	4.00	Mike Hodge	863-983-1431
1114	SFWMD	G-251 Intake 1	Florida	2000	1	FlexRake® FRO	~	8.00	18.00	3.50		
1126	SFWMD	Rotenberger G-410	Florida	2000	2	FlexRake®	~	10.00	26.00	4.00	Robert VanValkenburg	863-452-7515
1141	Indian Trails	M1 Acreage Pump #3	Florida	2000	2	FlexRake®	n/a	12.00	25.75	3.00		
1223	SFWMD	C4- S25B Pump Station	Florida	2001	3	FlexRake®	~	13.00	28.00	2.00	Ken Waugh	305-513-3420
1229	SFWMD	G-251, Bays 2 & 3	Florida	2001	2	FlexRake® FRO	~	8.00	18.00	3.50	Gary Fischer	561-791-4100
1233	SFWMD	Pump Station 361	Florida	2001	3	FlexRake®	~	6.00	20.00	3.00	Gary Fischer	561-791-4100
1244	SFWMD	Manatee Barrier, Struct 380	Florida	2002	1	FlexRake®	~	10.00	18.00	3.00	Ken Waugh	305-513-3420
1252	SFWMD	G-251, Bays 2 & 3	Florida	2001	2	FlexRake® FRO	~	8.00	18.00	3.50	Butch Dias	(561)248-2453
1272	SFWMD	G-251, Intake 2, 327B	Florida	2002	1	DRAG CHAIN COM	n/a	4.00	60.00	n/a	Butch Dias	(561)248-2453
1280	SFWMD	S-26B Pump Station	Florida	2002	3	FlexRake® HD	~	13.00	28.00	2.00	Ken Waugh	305-513-3420
1304	SFWMD	G-337A	Florida	2003	4	FlexRake® HD	n/a	9.00	33.00	4.00		
1315	SFWMD	G420/421	Florida	2003	3	FlexRake® HD	n/a	13.00	34.00	4.00		
1362	Indian Trail Improvement Dist.	40th Street Stn.	Florida	2004	1	FlexRake® HD	~	5.00	18.00	1.75		
1390	SFWMD	L.I.L.A. Pumping Station	Florida	2004	1	FlexRake® HD	~	8.00	18.00	2.00		
1461	City of West Palm Beach	Renaissance Phase II Pump Station	Florida	2006	2	FlexRake®	161.00	9.00	29.00	4.63		
1472	SFWMD	Pump Station 357	Florida	2006	5	FlexRake® HD	n/a	11.83	31.00	3.00		
1472	SFWMD	Pump Station 357	Florida	2006	1	FlexRake® HD	n/a	9.00	31.00	3.00		
1502	Indian Trail Improvement Dist.	M-1 Acreage Area P.S. #3	Florida	2006	1	FlexRake® FROHD	~	12.00	23.00	3.00		
1528	South Florida Water Management District	Packingham Slough	Florida	2007	2	FlexRake® HD		5.00	23.00	3.00		
1535	Indian Trails Improvement District	40th Street Stn.	Florida	2007	1	FlexRake® HD		5.00	18.00	1.75		
1572	Indian River County	Indian River Canal Main	Florida	2007	2	FlexRake® FS	161 MGD	8.00	28.00	0.06	Keith McCully	772-226-1379
1572	Indian River County	Indian River Canal Main	Florida	2007	4	FlexRake® FS	161 MGD	8.00	28.00	0.13	Keith McCully	772-226-1379
2045	SFWMD	G435 P.S.	Florida	2010	3	FlexRake® HD	103.00	12.00	39.00	3.00		
2118	SFWMD	Deering Estate Flow-Way	Florida	2011	3	FlexRake® HD		7.00	31.00	2.00		
2126	Collier County	Picayune Strand - Merritt Pumping Station	Florida	2011	1	FlexRake® HD		12.00	20.00	3.00		
2425	SFWMD	G251 P.S.	Florida	2012	6	FlexRake® HD	242.00	9.00	26.00	3.50		
2435	City of Bartow	SFWMD Lake Hancock FL	Florida	2012	3	FlexRake® HD	19.40	5.00	35.00	3.00		
2672	Indian River County	South Relief Canal Pump Station	Florida	2015	1	FlexRake® HD	12.00	8.00	33.00	1.00		
2883	Indian River County	Egret Marsh	Florida	2015	1	FlexRake® PFPS		6.00	20.00	0.25	Keith McCully	772-226-1379

Responses to Questions via Email

Subject:

RE: P13014 City of Hollywood WWTP FL

From: Larry Hickey <larry.hickey@equipmentplusinc.com>**Sent:** Wednesday, July 19, 2023 11:51 AM**To:** Cooke, J. Philip <pcooke@hazenandsawyer.com>**Cc:** Kelly, Alexandra <akelly@hazenandsawyer.com>**Subject:** P13014 City of Hollywood WWTP FL**Importance:** High

Alexandra and Philip,

Please see the following list of answers to your questions. We are currently getting ready to start up the Bypass structure at the ECR facility in West Palm Beach which is a Hazen & Sawyer project. ECR is comprised of a series of three Duperon screens discharging into a conveyor that routes debris to a dumpster next to the bypass headworks structure.

1. Budget cost estimate for a fully enclosed 316SS screen - **Attached**
2. Equipment/material lead time – **12-14 weeks**
3. Cleaning mechanism - **The equipment shall have multiple scrapers on the bar screen at one time cleaning continuously from bottom to top, the entire width of the bar screen. A 304 stainless steel and UV Stable UHMW-PE debris blade assembly, which does not require a separate drive, shall be installed to assist in removing debris from the scraper on the mechanically cleaned bar screen unit**
4. Level monitoring mechanism – **2 mechanical float switches for “run level” and “high level”**
5. “Storm mode” raking capability? - **When the “run level” float is tipped, the rake will run at normal speed continuously. When the “high level” float is tipped, the rake will run at high speed continuously.**
6. Electrical requirements **Less than 5 full load Amps draw at 480V**
7. Control features **Relay based control, explosion proof motor controlled by a VFD, user adjustable on/off cycle timer to exercise the rake in Auto Mode even when it’s below the “run level”, NEMA 7 local control station (active in Manual Mode) with E-Stop, Forward, and Jog Reverse buttons. Main control panel can be either NEMA 12 or NEMA 4X depending on where it’s located. Hardwired interface to SCADA available, including Remote Run capability.**
8. Unique features (i.e. pivot capability for bypass, hydraulic lift) - **The mechanically cleaned bar screen shall have a head sprocket only, with no sprockets, bearings, idlers, or similar drive components under water to trap the chain. The link system shall have jam evasion capability by flexing around and collecting large objects such as a 2 X 4, bowling ball, grease balls and surges of solids at peak loading times without overloading and shutting down the unit. The link system shall be such that it bends in one direction only, which allows it to become its own lower sprocket and frame. The design shall be such to ensure that all maintenance can be accomplished at the operating floor level or above.**
9. Proposed dimensions and confirmation that the screen can be installed at required depth – **10.00 ft wide x 31 ft nominal length. No concerns with the channel depth.**
10. Examples of successful installations, preferably in Florida, including contact information and year of installation – **See attached**

Here are YouTube links to videos of the Duperon equipment.

<https://youtu.be/xGGaP9yfB8I>

<https://youtu.be/CvTOPynZe6c>

I would welcome the opportunity to do a TEAMS meeting to discuss.

Sincerest regards,

Larry Hickey
Equipment Plus Solutions, Inc.
P.O. Box 2908
Bellevue, FL 34421

Cell: 352.895.2656

Ofc: 352.237.1869

Larry.Hickey@equipmentplusinc.com

Please visit our website:

www.equipmentplusinc.com



Appendix D: Hydro-Dyne Tiger Shark Bar Screen

Budgetary Proposal

City, ST Hollywood, FL
Date June 20th, 2023

Mechanical Screen System

Quantity	Screen Type	Grid Type	Grid Opening	Model Number
1 EA	Multi-Rake Screen	Bar	12mm	MRS 95-342-12B
	Motor Horsepower	Wash water requirements (EA)		
	1.5 HP	0	GPM	0 PSI
				Stainless Steel
				316SS

Screening Handling System

Quantity	Screening Handling Equipment	Auger Size	Model Number:
1 EA	Whitip Shark Washing Compactor	12"	WCP 12H-70-5S
	Motor Horsepower:	Wash water requirements (EA)	
	5.0 HP	0	GPM 0 PSI
	Discharge Chute:	Vertical Distance:	60 Inches
		Horizontal Distance:	90 Inches
			Notes: Washing compactor to sit under screen discharge

Accessories

Valve Type	Classification	Material	QTY
N/A			

Strainer	Material	QTY
N/A		

Controls

Main Control Panel	Classification Type
1 EA	NEMA 4X

Local Control Panels	Classification Type
1 EA	NEMA 7

Screen Control Type	QTY
VFD	1 EA

Screening Handling Control Type	QTY
Reversing motor starter	1 EA

Level Control System	Differential level control
Classification of Motors	C1D2

Start up and Commissioning

Trips	1
Days	1

Warranty	One year
----------	----------

Submittal Lead Time:	6-8 weeks
Fabrication Lead Time:	28-36 weeks

Notes
Assumed control system cost - \$45,000

Budget Price \$700,000

Tiger Shark Multi-Rake Screen Equipment Sizing



Tel: 813-818-0777 Fax: 813-818-0770

Project: Hollywood, FL

Date: 6/7/2023

Rep: TSC-Jacobs

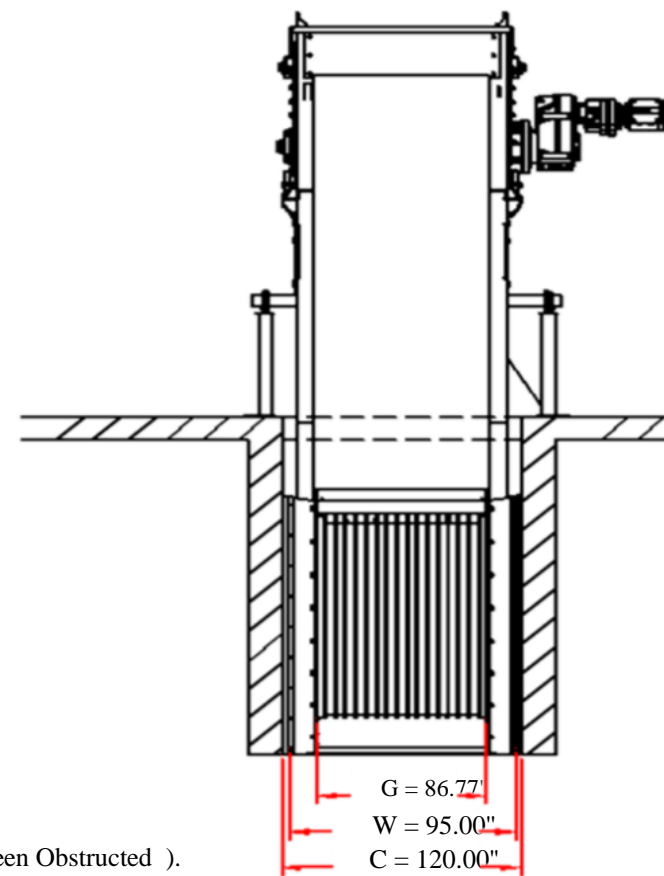
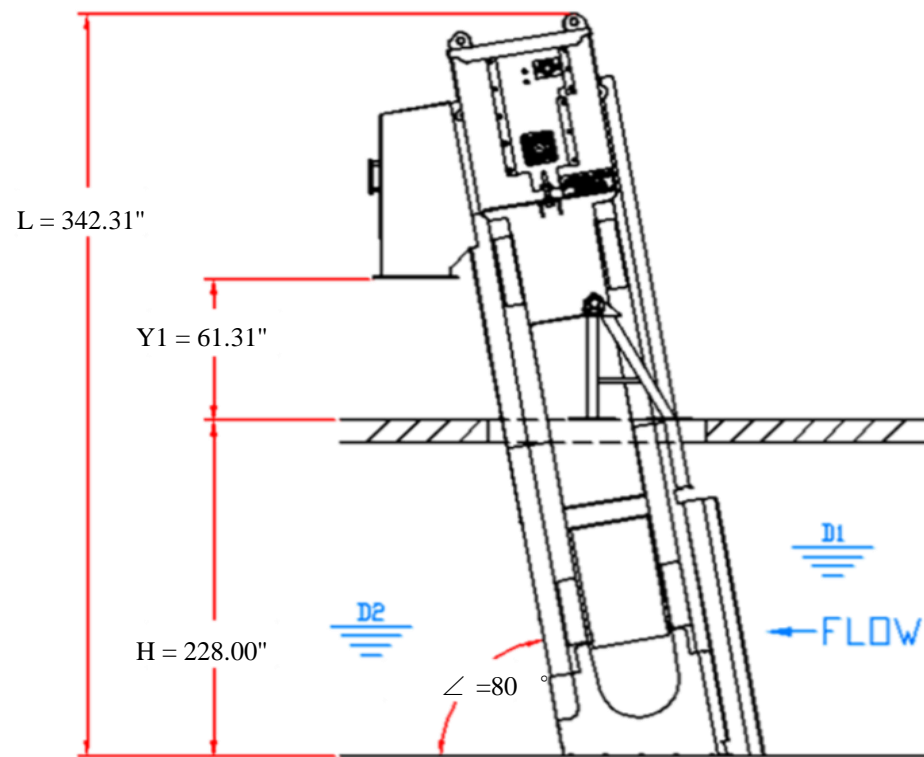
By: RH

Checked: JMB

Model # **MRS- 95 - 342 - 12 - B**

Channel Dimensions:		English Units	SI Units
C	Channel Width	120.00 in	3048 mm
H	Channel Height	228.00 in	5791 mm
TC	Height from Grade to Top of Channel	0.00 in	0 mm
Screen Grid Parameters:			
S	Grid Opening Spacing	12mm	Bar Thickness 1/4 in
Obs	Percent of Screen Obstructed	50 %	Bar Width 1.5 in
OA _{eff} *	Effective Percent of Grid Opening	32.71 %	

Equipment Dimensions:		English Units	SI Units
L	Length of Screen	342.31 in	8695 mm
W	Width of Screen	95.00 in	2413 mm
G	Width of Grid	86.77 in	2204 mm
∠	Screen Angle	80 °	80 °
Y1	Discharge Height from the Screen	61.31 in	1557 mm



NOTE: * Effective Percent of Grid Opening = Percent of Grid Opening at 12mm Opening × (1 - Proposed 50% of Screen Obstructed).

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Tiger Shark Multi-Rake Screen Hydraulic Performance



Tel: 813-818-0777 Fax: 813-818-0770

Project: Hollywood, FL

Date: 6/7/2023

Rep: TSC-Jacobs

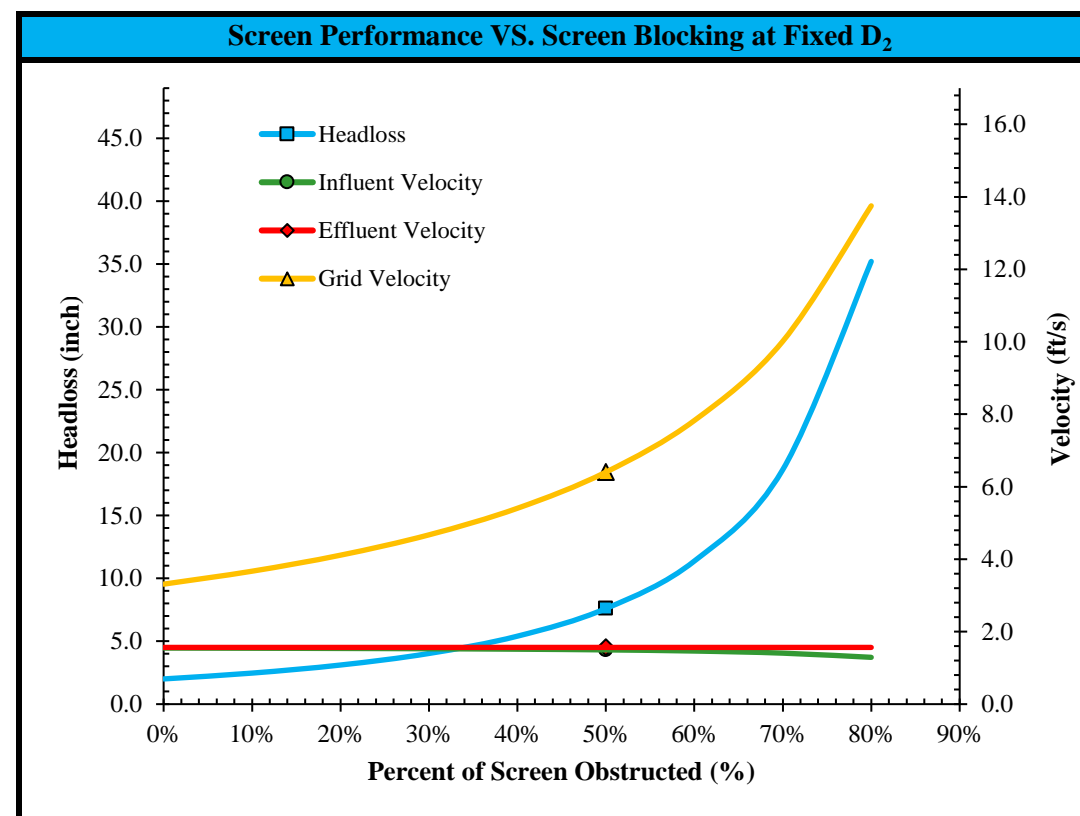
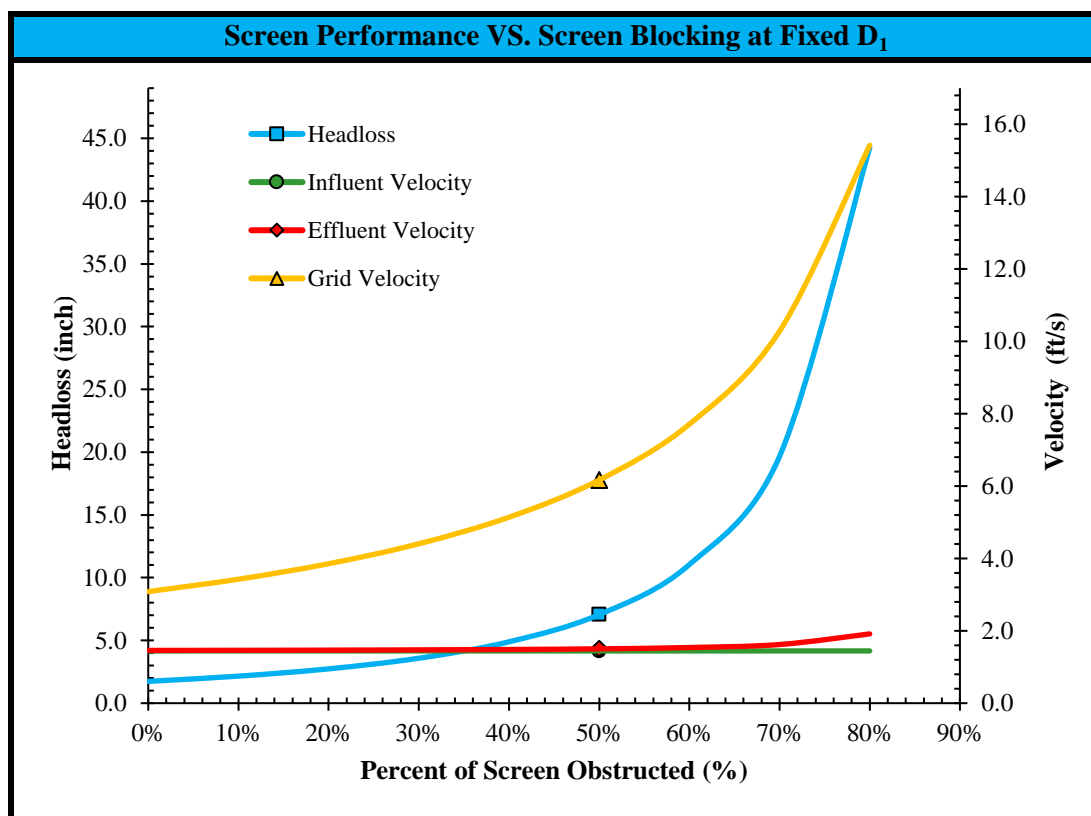
By: RH

Checked: JMB

Model # MRS - 95 - 342 - 12 - B

Fixed D ₁ Condition @ 50% Obs		English Units		SI Units	
Q	Flow Rate	40.00 MGD	97222 gpm	6134 L/s	529957 m ³ /d
D ₁	Upstream Water Depth	180.00 in		4572 mm	
D ₂	Downstream Water Depth	172.94 in		4393 mm	
ΔH	Total Headloss	7.06 in		179 mm	
F	Freeboard	48.00 in		1219 mm	
V ₁	Influent Channel Velocity	1.44 ft/s		0.44 m/s	
V _G	Velocity Through Grid	6.17 ft/s		1.88 m/s	
V ₂	Effluent Channel Velocity	1.50 ft/s		0.46 m/s	

Fixed D ₂ Condition @ 50% Obs		English Units		SI Units	
Q	Flow Rate	140.00 MGD	97222 gpm	6134 L/s	529957 m ³ /d
D ₁	Upstream Water Depth	173.60 in		4409 mm	
D ₂	Downstream Water Depth	166.00 in		4216 mm	
ΔH	Total Headloss	7.60 in		193 mm	
F	Freeboard	54.40 in		1382 mm	
V ₁	Influent Channel Velocity	1.50 ft/s		0.46 m/s	
V _G	Velocity Through Grid	6.40 ft/s		1.95 m/s	
V ₂	Effluent Channel Velocity	1.57 ft/s		0.48 m/s	



Manufacturer Pamphlet



Tiger Shark Multi-Rake Screen

High Lift, Low Maintenance Coarse Screen

- No submerged sprockets, bearings or bushings
- Unloading does not require spray wash or brushes
- Auto-reverse and jam protection
- Directly retrofits into existing channels and can pivot for bypass
- All T304 or T316 stainless steel fabrication



About the Tiger Shark Multi-Rake Screen


The Tiger Shark is differentiated by its dark stripes, or bars, down its body and is noted for having one of the widest food spectrums of all sharks. This is a very fitting representative for our Multi-Rake Screen. With its iconic heavy duty stainless steel bar rakes, the Tiger Shark Multi-Rake Screen efficiently captures a wide variety of solids.

The Tiger Shark screen's practical design combines reliability with efficient operation. Designed for large particle removal, the Tiger Shark's rakes continuously clean the bar rack with grid openings from 5-300mm. Low friction UHMWPE guide links reduce wear and operational costs.



To learn more visit: www.hydro-dyne.com
sales@hydro-dyne.com | +1 (813) 818-0777

Coarse Screens | Fine Screens | Screenings Handling | Grit Removal Equipment

Designed and manufactured in U.S.A. 
 4750 118th Avenue North Clearwater, FL 33762

HYDRO-DYNE
 ENGINEERING
Designed to Protect. Built to Perform.™

Easy installation
and maintenance
with all mounting
and access
above channel

Uninterrupted seal
between rake chain
and frame held to
<0.5mm tolerance
eliminating ragging

Proprietary low
friction UHMWPE
guide links reduce
maintenance and
operations costs

Bar rack
elements are
individually
replaceable
in channel

Screenings
unloading via
scraper bar

Replaceable teeth
(or combs) on rakes

Heavy-duty
dead plate for
high screenings
lift and long life

Multiple rakes
continuously clean
bar rack and allow
for increased flow
and lower headloss

No submerged
sprockets, bearings
or bushings

At-a-glance

grid opening range

5-300mm

flow capacity

1mgd (44 L/s) to 150+mgd (6,570 L/s)

grid types

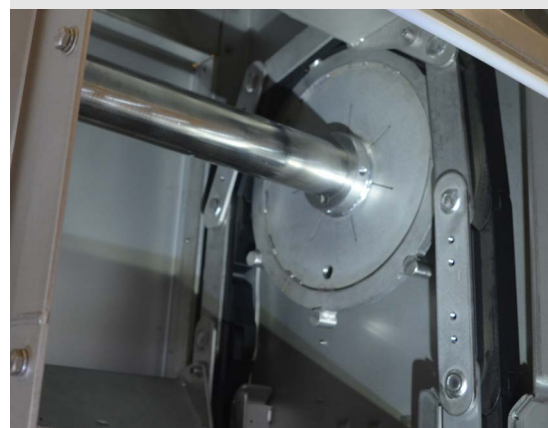
Bar rack

unloading

Replaceable scraper bar

Patented Drive Features

- Grid does not contact drive or unloading mechanism
- Direct drive uses no chains or sprockets
- Fully supports belt for negligible wear
- Fractional hp requirements




Optional Equipment

- Specialty stainless steel construction
- Cold weather/freeze protection
- Multiple screenings discharge and handling options
- Basic to sophisticated automation controls
- Sectional construction for restricted area assembly
- 60° and 90° angle options
- Electric, hydraulic or explosion-proof drives



To learn more visit: www.hydro-dyne.com
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HYDRO-DYNE
ENGINEERING
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TigerShark Multi-Rake Installation List

City	State	Equipment (Model W-D-H-grid)
Wheeling	WV	MRS 17-194-6B (2 EA)
Dallas	GA	MRS 29-161-6B
Tampa	FL	MRS 47-378-25B
Shelby	NC	MRS 23-200-9B
Lewisburg	TN	MRS 22-374-38B
New Philadelphia	OH	MRS 31-391-9B
Bainbridge	GA	MRS 29-185-6B
Harrodsburg	KY	MRS 29-145-6B
Gainesville	GA	MRS 53-327-9B
Smethport	PA	MRS 23-264-6B
Bradford	PA	MRS 35-329-6B
Bogota	Colombia	MRS 71-185-15B
Mason	TN	MRS 17-240-6B
Winchester	KY	MRS 29-152-6B
Dunedin	FL	MRS 53-130-10B
Taft	TX	MRS 20-137-6B
Chinchilla	PA	MRS 29-177-6B (2 EA)
Rivera	Colombia	MRS 41-248-50B (2 EA)
Navarra	Colombia	MRS 41-248-50B (2 EA)
Lisboa	Colombia	MRS 35-413-25B (2 EA)
Bradford	PA	MRS 47-311-12B

Here is the contact for the Dunedin WWTP. The screen there was installed in 2014.

Brian Antonian
Wastewater Plant Superintendent
Email: bantonian@dunedinfl.net
Phone: 1-727-298-3256 ext#1620
Fax: 1-727-298-3249
Cel:1-727-831-1289

Hydro-Dyne Screen Installations in Florida

City	State	Equipment (Model W-D-H-grid)
Frostproof	FL	STR 17 228 6L
Ft. Walton Beach	FL	CF32 67 147 3P
St. Augustine	FL	CF26 43 111 6L
Lady Lake	FL	STR23 112 4L
Kissimmee	FL	CF32 43 171 6P
Dunedin	FL	GC12 98 6C
Sumpterville	FL	CF26 27 127 6P
Green Cove Springs	FL	STR 41 135 4P
Davenport	FL	CF23 24 138 6P
Blountstown	FL	WCP 6S 26 5S
Graceville	FL	STR 17 150 6L GT40, GC
Groveland	FL	CF23 21 98 4L
Lakeland	FL	CF26 36 127 6P GC-12-98
Bradenton	FL	CF44-61-172-6P
St. Petersburg	FL	CF32-61-203-6P CF32-61-203-6P, Rehab/Retrofit 1 CF32-61-203-6P, Rehab/Retrofit 2 CF32-61-203-6P, Rehab/Retrofit 3
Gainesville	FL	H.O.S.S.
Groveland	FL	H.O.S.S. Test
St. Augustine	FL	CF38-36-159-6P
Palm Beach Gardens	FL	STR47-143-4L
Lakeland/Winter Haven	FL	CF23-24-114-6L
Orlando	FL	WCP-10-5S
Tampa	FL	CF32-67-147-3P
Tampa	FL	CF32-43-147-6P
Destin	FL	CF26-36-143-3P
Palm Beach Gardens	FL	H.O.S.S.
Bradenton	FL	DF - BASIN B BID - DF32-36-197-0.5M (4x)
Bradenton	FL	DF - BASIN A BID - DF32-36-181-0.5M (4x)
Ft. Myers	FL	CF38-55-143-6P GT (2), GC (2)
Ft. Myers	FL	CF38-55-143-6P GT (2), GC (2)
Eustis	FL	STR-29-226-6L
Destin	FL	H.O.S.S. Test
Winter Park	FL	WF316-24-24-

Responses to Questions via Email

Subject:

RE: City of Hollywood SRWWTP - Emergency Bypass Bar Screen

From: Austin Moore <austin@tscjacobs.com>**Sent:** Friday, July 14, 2023 10:39 AM**To:** Kelly, Alexandra <akelly@hazenandsawyer.com>**Cc:** Cooke, J. Philip <pcooke@hazenandsawyer.com>**Subject:** RE: City of Hollywood SRWWTP - Emergency Bypass Bar Screen

You don't often get email from austin@tscjacobs.com. [Learn why this is important](#)

Allie,

Please see responses below and information attached from Hydro-Dyne. Feel free to reach out with any questions.

1. Budget cost estimate for a fully enclosed 316SS screen – Included in the attached budgetary proposal.
2. Equipment/material lead time – 24 – 30 weeks
3. Cleaning mechanism – The Tiger Shark Multirake screen uses a counterweighted wiper system to clean the screen rakes as they pass through the head section of the screen. There are no brushes, motors, springs, or other mechanical components that require regular maintenance associated with the screen cleaning system.
4. Level monitoring mechanism – Hydro-Dyne typically recommends an ultrasonic differential level control system to control screen run time but the screen can be run off of just an upstream float or single level transducer if cost is a concern or it is desired to keep the system as simple as possible.
5. “Storm mode” raking capability? For applications where there is the potential for large swings in flow such as a storm condition, Hydro-Dyne recommends operating the screen with a VFD. This allows the screen to speed up the raking frequency so it can keep up with higher than normal screenings loading rates.
6. Electrical requirements Screen: 1.5 HP, 3 phase, 480V motor. Washing Compactor: 5HP, 3 phase, 480V motor.
7. Control features – Controls are custom engineered for each application and can be as simple or complex as desired. At a minimum Hydro-Dyne would require an upstream level control device as referenced above and a timer to exercise the screen at low flow conditions. The screen will also feature a jam removal sequence which allows it to sense an obstruction and attempt to dislodge the obstruction by reversing and running forward a preset number of times. If the screen is unable to clear the obstruction, an alarm signals the plant to address it.
8. Unique features (i.e. pivot capability for bypass, hydraulic lift)
 - Screen can pivot out of channel for full bypass (Pivot is only required for bypass not maintenance)
 - No submerged bearings, sprockets or bushings
 - All screen maintenance is done above top of channel level
 - All equipment is manufactured in its entirety in Hydro-Dyne’s factory in Clearwater, FL. Equipment is AIS and BABA compliant.
 - 100% stainless steel and non-corrosive material construction.
 - Stainless steel components are pickled by means of a four tank system that is in accordance with ASTMs A380 and A967 which ensures the heat affected areas of the stainless steel will not be subject to corrosion in highly corrosive environments.
9. Proposed dimensions and confirmation that the screen can be installed at required depth. [See attached hydraulic profile.](#)
10. Examples of successful installations, preferably in Florida, including contact information and year of installation. [See attached installation list for Tiger Shark Screens and Hydro-Dyne screens in FL.](#)
11. Please elaborate on the “no submerged bearings” feature. The Tiger Shark screen utilizes Hydro-Dyne’s “guide link” drive system used on all of its screen designs for over 30 years. The drive system consists of a chain composed of machined UHMWPE guide links that articulate through a stainless steel track system within the

screens frame. UHMWPE is extremely resistant to wear and abrasion and as such is frequently used as a wear surface in many applications. Benefits of the UHMWPE guide link design are highlighted below as well as some photos.

- Longer wear life than metallic chain designs
- No metal on metal contact in drive surfaces
- Water lubricated
- Lightweight, reducing motor HP
- Machined to include Hydro-Dyne's proprietary sealing system which creates a 0.5mm seal between the chain and screen frame to prevent grit and solids from entering the screen tracks which would otherwise accelerate wear.



Austin Moore

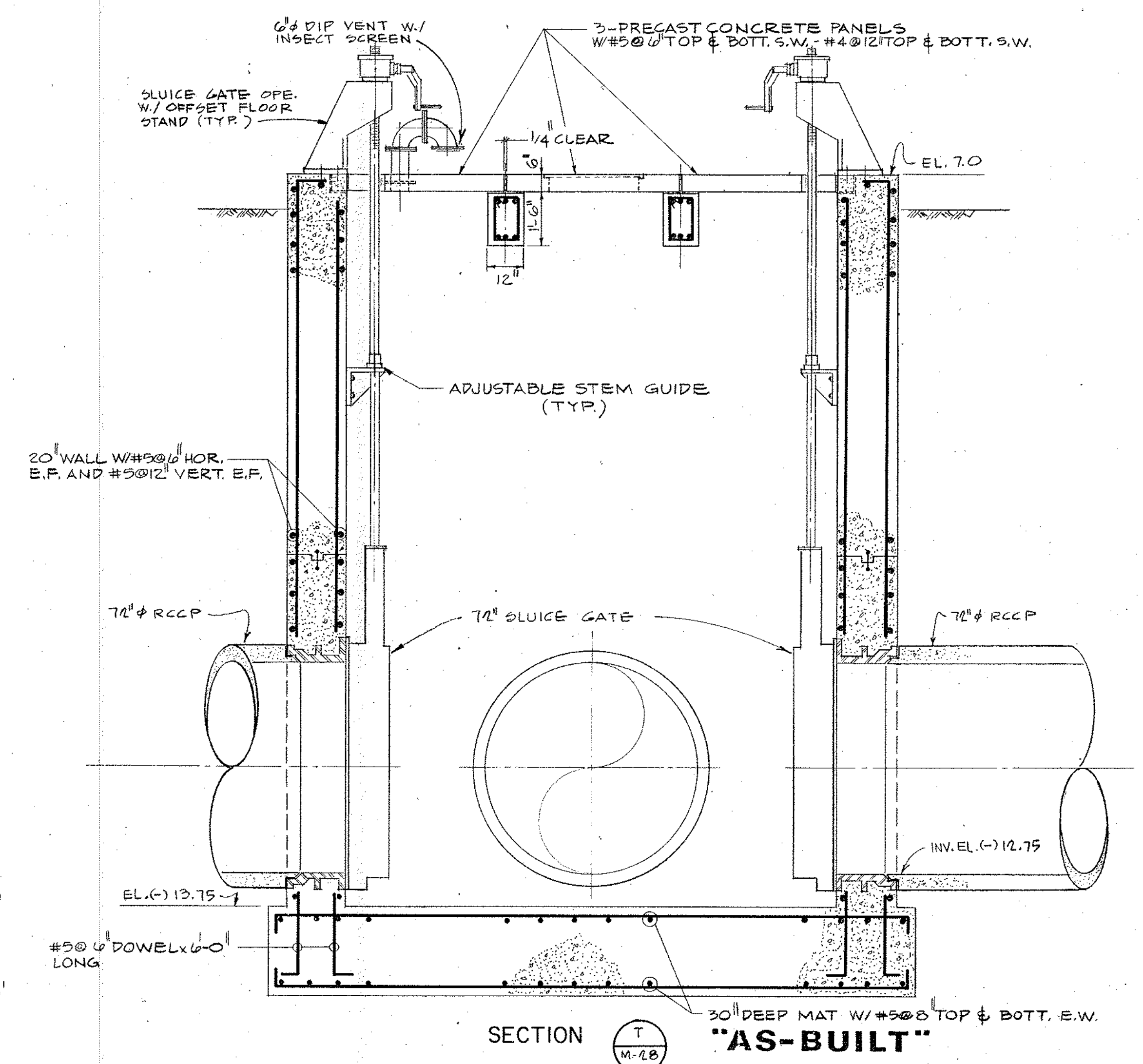
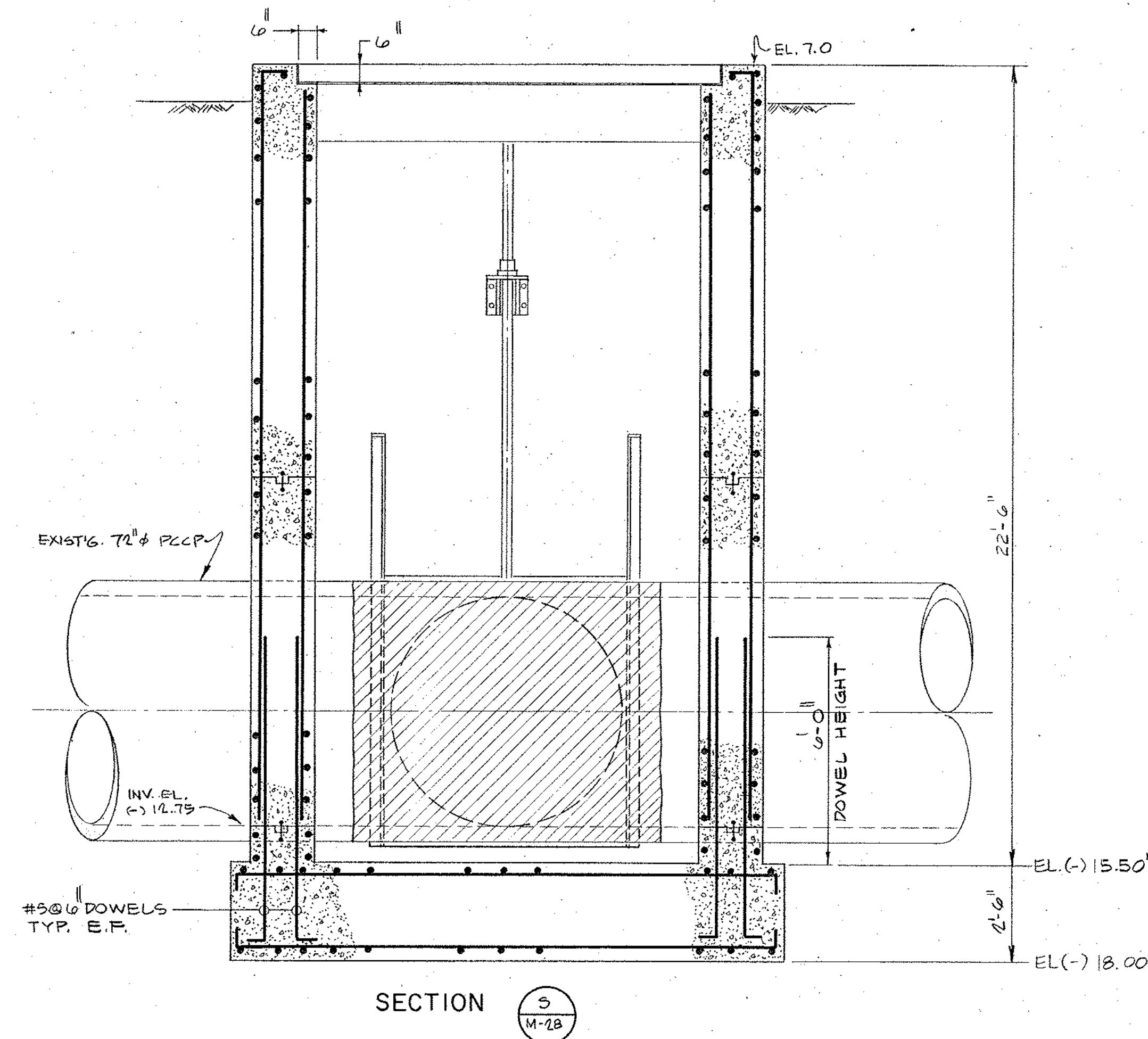
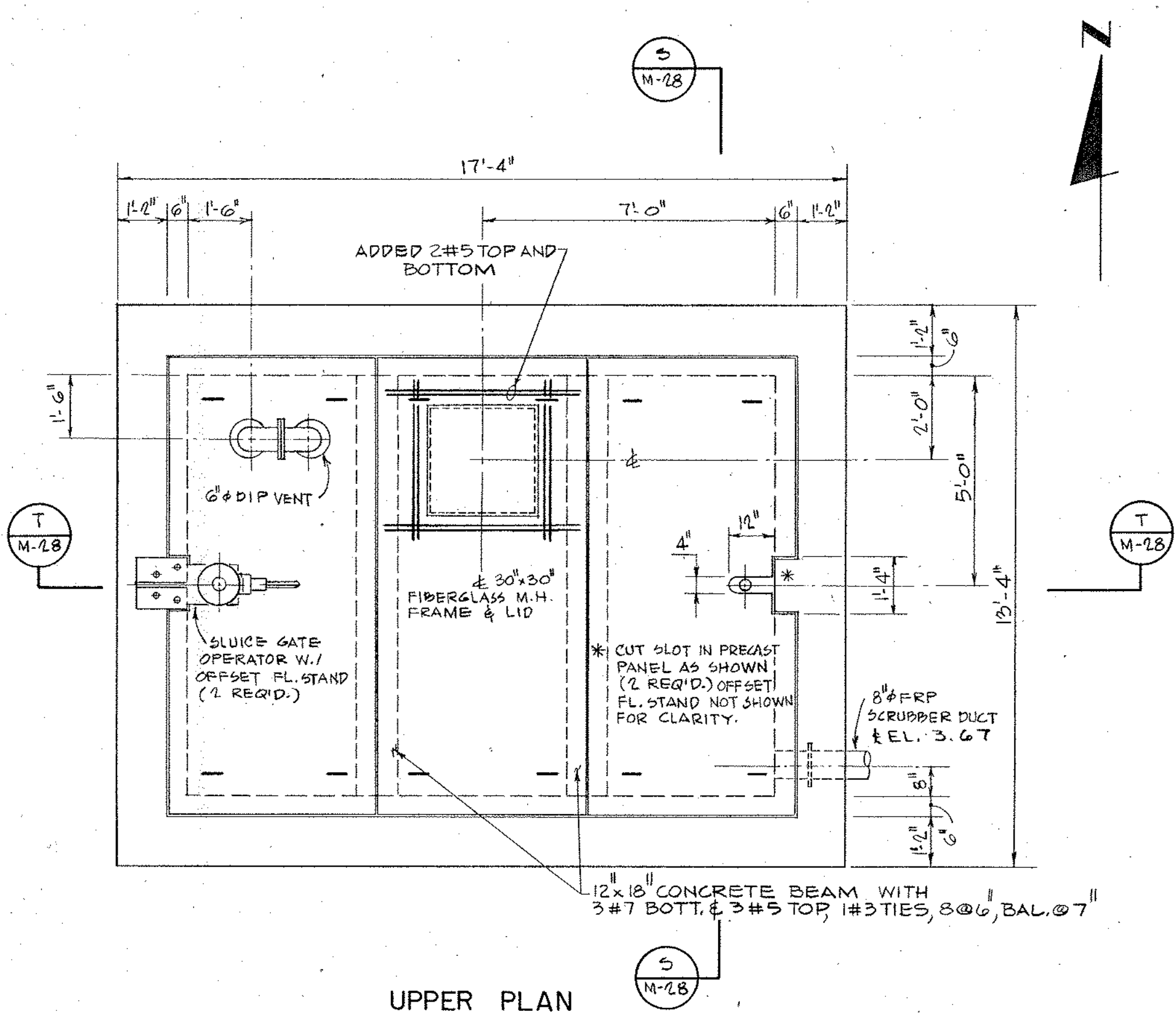
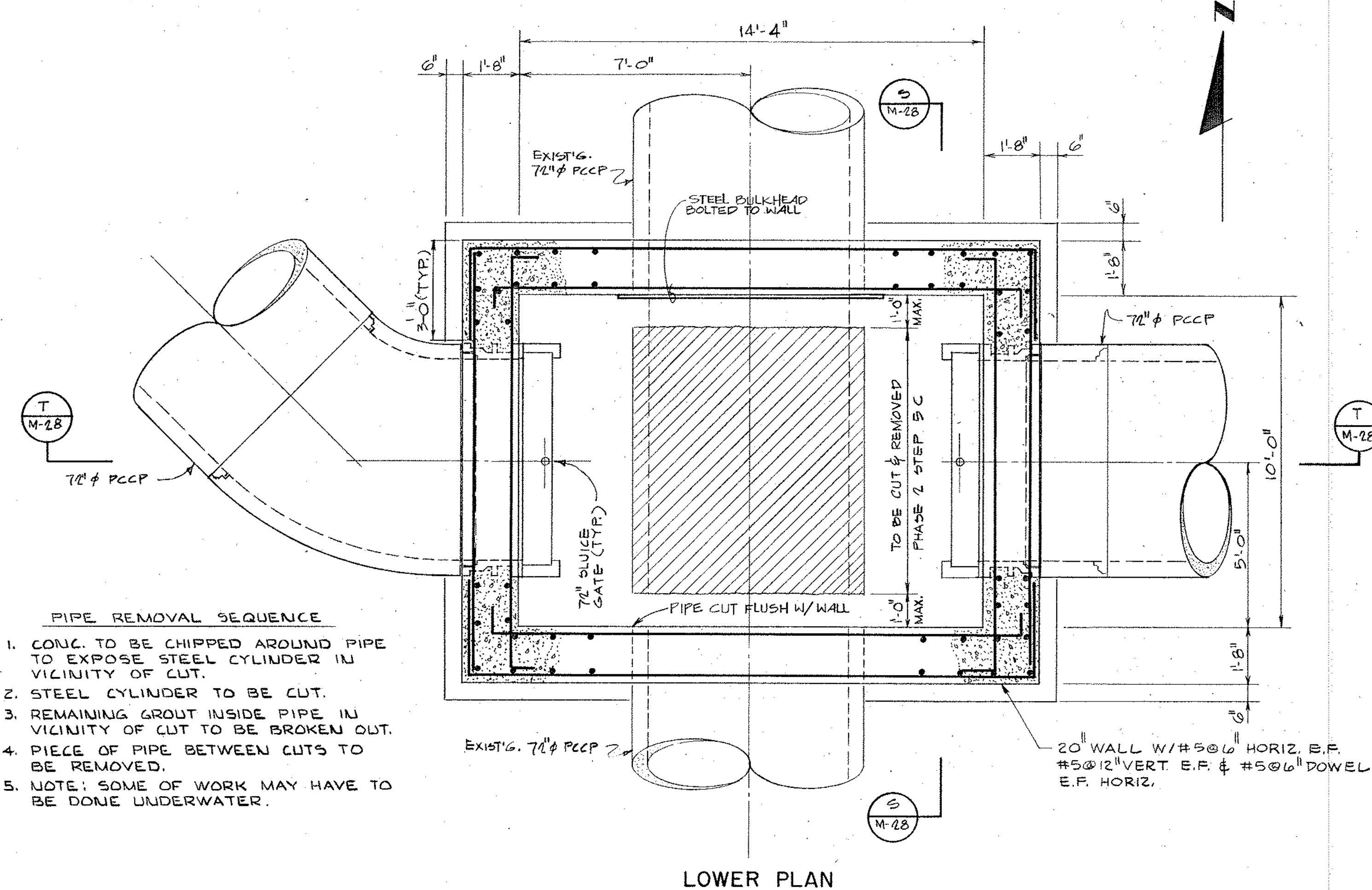
Mobile: 813-300-7415



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SOUTH

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Appendix E: 1985 Improvements Diversion Box As-Builts



4

6/16/88

"AS-BUILT" RECORD

P.E.R.

3

1/27/86

BIDDING

P.E.R.

2

4/19/85

DER REVISIONS

P.E.R.

1

1/14/85

DER REVIEW

P.E.R.

NO.

DATE

ISSUED FOR

BY

DESIGNED G.N.C.

DRAWN D.J.B.

CHECKED G.N.C.

PROJ. ENGR. P.E.R.

HAZEN AND SAWYER, P.C.
ENGINEERS

PETER E. ROBINSON P.E.
No.19277

MIAMI - HOLLYWOOD - RALEIGH - NEW YORK - MOUNT KISCO

SCALE

3/8" = 1'- 0"

CLIENTS PROJECT: 29200

DER PROJECT: 594080

ENGINEERS PROJECT: 4200

CITY OF HOLLYWOOD, FLORIDA

1985 IMPROVEMENTS

DIVERSION BOX
PLANS AND SECTIONS

DATE: JAN. 14, 1985

SHEET: 32 OF 68

DRAWING: M-28

PETER E. ROBINSON P.E.
No 19277

HAZEN AND SAWYER, P.C.
ENGINEERS
MIAMI - HOLLYWOOD - RALEIGH - NEW YORK - MOUNT KISCO

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