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AMENDMENT TO REMEDIAL ACTION PLAN IN SITU RECIRCULATION WELL REMEDIATION AT OPERABLE UNIT 4 (OU 4) NTC ORLANDO FL

9/1/1998

SBP TECHNOLOGY

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AMENDMENT to the REMEDIAL ACTION PLAN IN-SITU RECIRCULATION WELL REMEDIATION SYSTEMS OPERABLE UNIT 4, NAVAL TRAINING CENTER ORLANDO, FLORIDA

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AMENDMENT to the REMEDIAL ACTION PLAN
IN-SITU RECIRCULATION WELL REMEDIATION SYSTEMS
OPERABLE UNIT 4, NAVAL TRAINING CENTER
ORLANDO, FLORIDA

STATEMENT of PROFESSIONAL REVIEW

The engineering work described and professional opinions rendered in this amendment to the Remedial Action Plan for the UVB remediation wells located at Operable Unit 4, Naval Training Center, Orlando, Florida, dated September 1998, were conducted or developed using commonly accepted engineering practices and standards.

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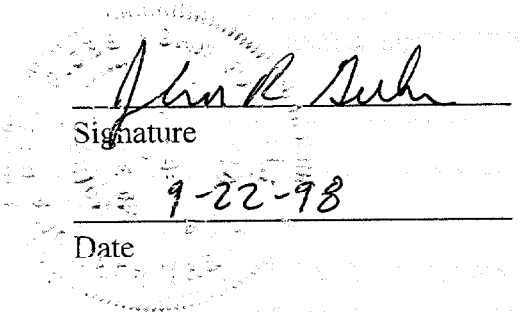


Signature

9-22-98

Date

1.0 BACKGROUND

SBP installed two (2) UVB treatment wells in December 1997 to capture and treat the groundwater plume from the former NTC dry cleaning facility. The treatment wells were activated in late December and operated through April 1998, when it was determined that the inflatable packers failed at UVB-01 and that the discharge line connecting the packer at UVB-02 was disconnected. A review of the site data indicated that the UVB-01 packer failed in late February, 1998. The packers were replaced by the manufacturer and reinstalled in early May. Subsequently, the systems have continued to operate at various flow rates. During the operational period of the systems, SBP has had to make additional O & M visits outside the normal scheduled visits. These visits were predominantly related to balancing the effluent flow to the influent flow to prevent cascading. The remaining system components (with the exception of the effluent flow meter) have been functioning as designed.

Several factors influenced the increase in our O & M visits which include:

1. The desire to prohibit cascading (water flowing over the internal canister into the upper well, where it dilutes the influent groundwater prior to stripping) from the internal canister lead to the installation of two sump pumps activated by high and low level switches. Initially, the sump pump can handle the design flow rate and down hole pressures, but with time, the down hole pressure increases (see 2 below) to above, the pumps maximum pumping pressure capacity of 15 psi, causing the pump to "dead-head". Once the pumps "dead-head", the system cascades. To prevent cascading and to balance the influent/effluent flow rate, the flow rates (influent/effluent) were reduced (below the design rate of 10 gpm) to compensate for the increase in down hole pressures.

2. Fine to very fine sand was removed from the lower (effluent) well screen on two occasions at UVB 01 (May, August) and once at UVB 02 (May). Grain size analysis, indicated that the sand is finer that the existing sand pack and well screen opening. Thus, formation sand is passing through the well and accumulating in the lower well screen. This sand material may be reducing the transmitting capacity of the lower well screen, or reducing the porosity of the sand pack, or the formation. A decrease in porosity, and/or a reduction in transmitting capacity of the well screen, could be a cause for the increase in the down hole pressures. If the down hole pressure exceeds the pump pressure curve, the system cascades and requires re-balancing.

3. During the August O & M visit, a fine grained particulate was cleaned from the submersible (influent) pump and flow meter. The particulate mater was sent for laboratory analysis and was determined to be an iron precipitate. The iron precipitate of the pump and flow meter reduced the influent flow rate to less than 1 gpm. The material was observed predominantly on the influent side (pump, flow meter).

This recommended RAP addendum addresses the first two conditions listed above and will

improve the accuracy of the effluent flow readings. The iron precipitate will be addressed following system modifications.

2.0 Treated Groundwater Storage Tank

To optimize the influent and effluent flow rates, it is recommended that an external "Treated Groundwater Storage Tank" (hereafter referred to as an external tank) be constructed adjacent to the existing extended treatment well casing, that houses the stripping unit. This tank will store the treated groundwater from the stripping unit, providing a greater storage volume than existing internal canister. The increase in storage volume should improve the balancing between the influent and effluent flows and should reduce the frequency of the O & M visits. The advantages of the external tank are:

- An improved cycling ability between the normal high and low switches.
- A larger single pump, capable of handling both the design flow and ("field-observed") pressures, can be used in the larger tank.
- A high volume by-pass actuated ball valve will allow the pump to run continuously.
- By removing the sump pumps from the internal canister, the water level above the stripping plate can be increased and maintained at a constant level, unaffected by cycling.
- The increase in the water level above the stripping plate will increase the air to water contact time. This increased residence time should improve the stripping consistency of the system. The improved stripping performance will improve our ability to consistently achieve the IRA objectives for contaminant levels in the treated groundwater.
- All effluent flow controls will be located outside the external tank, allowing easier adjustments to flow rates, pressures, etc.

The two existing UVB systems will be retrofitted with an external tank. As part of this retrofitting, new equipment will be added outside the extended well casing to regulate the treated groundwater and some changes will occur inside the extended well casing. The equipment changes are described below (2.1 & 2.2) and are shown on the Process Flow Diagram. A description of the process flow is described in section 2.3. The system modifications are as follows:

2.1 Inside the Extended Well Casing

To improve the overall performance of the influent and effluent flow rates, several modifications will be made within the extended well casing. These modifications are discussed below and are shown on the attached Process Flow Diagram.

A. **Effluent Flow Meter** - The existing effluent flow meter will be removed from the external well casing. A new Hayward flow meter and totalizer will be installed on the return piping from the external tank. This meter will consist of an insertion paddle wheel

(FloSite 2000) flow sensor secured to the 1.5 inch effluent pipe by a saddle flange. The flow sensor will be connected to a digital meter that will record the current flow rate (gpm) and a totalizer flow. The rated measuring range is from 3 to 40 gpm with an accuracy of 1% of the indicated flow. The location of the meter is described below and on the attached Process flow diagram.

B. **Sump Pumps** - The two Grundfos AP-12 sump pumps, located in the internal canister, will be removed. A new 3/4 Hp Goulds Submersible Effluent Pump (model 3885) will be installed inside the external tank. This new pump will provide a constant return flow rate to the lower screen and is designed to operate at a maximum discharge head of approximately 60 feet (26 psi) at 10 gpm. The existing discharge head has been calculated to be 47 feet at 10 gpm (see appendix B). Thus, the proposed pump has been designed approximately 25% greater than the expected maximum discharge head.

C. **Water Level Sensors** - The water level sensors (multiTrode) within the internal canister will be removed. These sensors will be used in the external tank to regulate the working water level and to shut down the system if a high water level condition exists. One new water level sensor will be installed in the internal canister to shut down the system should the working water level fall below the stripping plate. This water level switch will ensure that the air to water ratio (contact time) is maximized within the internal canister. The increase in contact time will improve our ability to provide more consistent discharge results.

D. **Internal Canister** - A two inch water tight tank bulkhead fitting will be attached to a barbed flange fitting connected through the base of the canister. A second two inch water tight tank bulkhead fitting will be attached (barbed flange fitting on the inside and a male treaded fitting on the outside) once a rib of the ADS pipe is removed, exposing a smooth wall. A two 2 inch PVC flex hose will connect the two barbed fittings, allowing gravity drainage of the treated water from the internal canister to the external tank.

2.2 External - Treated Groundwater Storage Tank

The external tank will be located next to the existing extended well casing, and will store the treated groundwater prior to its recirculation back into the aquifer through the lower well screen. All return flow controls will be made from this unit. These modifications are discussed below and are shown on the attached Process flow diagram.

A. **External Tank** - A three foot diameter by four foot high tank will be located adjacent to the existing treatment well, on the existing concrete pad. The tank will be fabricated from steel (or equivalent material) to store the treated water under a vacuum of 20 inches of water. The inside of the tank will left unfinished to avoid false positive VOC results while the outside of the tank be primed and painted black to match the existing system.

All connections through the tank will be bulkhead type (see attached cut sheet-appendix A) to prevent leaks. The tank will have a removal cover to access internal equipment and to facilitate in the periodic cleaning. Additionally, a ten inch diameter clean-out will be constructed at the base of the tank to remove sediments/precipitates, if required.

B. **Equalization Pipe** - To maintain the working water level in the internal canister a water trap will be constructed between the extended well casing and the external tank. A two inch PVC pipe will be connected from the extended well casing horizontally to a tee fitting, then vertically to the height of the normal working water level within the internal canister, then horizontally into the external tank. The height of the working water level within the internal canister will remain constant at the height of the inlet into the external tank. The positions of the stripping unit in the internal canister can be field adjusted to optimize its stripping efficiency, based on the column of water above the stripping plate. Initially, the working water level in the canister will be set 12 inches above the stripping plate and the stripping unit will be set 9 inches above the bottom of the internal canister.

C. **Effluent Pump** - A 3/4 Hp Goulds submersible effluent pump (model 3885 - WE0718H) will be located in the external tank (see attached cut sheet-appendix A). This pump will replace the two AP-12 sump pumps located in the internal canister. The pump will sit on a concrete block 3 inches off the floor of the tank to allow for the accumulation of any sediment or precipitate. The concrete block will be fixed to the base to prevent movement.

This pump is designed to meet the design flow rate (8 to 10 gpm) and will be able to pump against 60 of total head or 26 psi prior to the pump dead heading. The discharge pipe will be reduced from a 2 inch to 1.5 inch PVC pipe at the pump. The flow from the pump will be regulated by globe valves outside the external tank as shown on the Process flow diagram.

D. **Water Level Switches** - All level switches will consist of Multi-Trode Sensors (see attached cut sheet-appendix A) in the external tank and the internal canister. Four (4) sensors will be fixed to the discharge pipe from the effluent pump within the external tank. These sensors will regulate the effluent flow based on their vertical placement as described below. The external tank sensors will control the water level as follows:

a. Low-low level switch (LSLL) shall interlock and stop the pump. This level is designed to shut down the effluent pump when the influent (treated) water to the external tank is less than the regulated (via globe valve) low flow rate. The LSLL will be located 1.5 feet from the base of the tank.

b. Low level switch (LSL) shall interlock, re-start the pump, and close the high flow by-pass valve when . This represents the normal low water level. The LSL will be located 2.0 feet from the bottom of the tank.

c. High level switch (LSH) shall interlock and open the high flow by-pass valve.

This represents the normal high water level. The LSH will be located 3.0 feet above the bottom of the tank. Thus, there will be 53 gallons of storage between the high and low normal water levels.

d. High-high level alarm switch (LSHA) shall interlock and will shut down the treatment system and will call out on the telemetry system. This sensor will prevent an overflow condition at the external tank, and will require a manual re-start. The LSHA will be located 3.25 feet above the bottom of the tank.

The internal canister sensor will be set as follows:

a. Low level switch (LSL) shall interlock and shut down the system and will call out on the telemetry system. This sensor will ensure that a dry canister condition will not occur, and will require a manual re-start. This sensor will be located at the stripping plate.

E. **Pressure Gauges** - Two pressure gauges will be installed on the effluent line located prior to and after all effluent control valves or meters. One pressure gauge will be located on the 1.5 inch PVC pipe between the external tank and the check valve. This gauge will determine the operating pressure for the pump. The second gauge will be located between the effluent flow meter and the extended well casing. This gauge will determine the down hole pressure during normal and high flow by-pass conditions.

F. **Globe Valves** - Two globe valves (see attached cut sheet-appendix A) will be installed on the effluent return to the UVB well. One valve will regulate the effluent flow at 75% of the influent flow rate and will have water flow continuously. The second valve will regulate flow through the high volume by-pass valve. This globe valve will be set to 50% of the influent flow rate.

For example, a single cycle could be set as follows. If the influent flow rate is 10 gpm, then 7.5 gpm will flow across globe valve one. The water in the tank will rise from the LSLL to the LSL in 21.2 minutes. Once the water level reaches the LSL, the high volume by-pass ball valve will open and an additional 5 gpm (total flow rate of 12.5 gpm) will be discharged. The water level in the tank will then drop back to the LSLL sensor in 21.2 minutes when the high by-pass valve will close. Thus, one complete cycle will take 42.4 minutes to complete.

G. **High Volume By-Pass Ball Valve** - A Hayward 1.5 inch true union ball valve (model number HCTB1150TACTE) will be used to control the high volume by-pass (see attached cut sheet-appendix A). The by-pass valve will act like the second pump within the existing system and allow the effluent discharge to be balanced on a high/low cycle. This valve will be normally closed and will open when the water level in the tank reaches the LSHA water sensor (normal high water level). Once the water level reaches the LSL or normal low water level sensor, the valve will close.

H. **Effluent Flow Meter** - A Hayward insert paddlewheel type flow meter (model FloSite

2000) will be attached to the 1.5 inch PVC pipe with a saddle mount (see attached cut sheet-appendix A). This sensor will be located on the effluent line after the high volume by-pass valve per the manufacturer's specification and replaces the existing meter in the treatment well. The sensor will be connected to a digital read-out (model 2300) display located on the electrical panel. The display will read direct flow through the pipe and total flow in gallons. This instrument will be calibrated to the manufacturer's specifications and will be field verified by measuring a known quantity of water (ie 53 gallons between the normal high and low water sensors).

I. **Vacuum Line Equalizer** - A three inch pipe will be connected from the existing extended well head cover to the cover of the new external tank to equalize the vacuum on the entire system. The elektror blower will maintain the vacuum on the system.

J. **Effluent Sampling Port** - The existing sampling port located within the extended well casing will be relocated. The effluent sampling port will be located on the 1.5 inch PVC pipe just after the connection from the external tank and prior to the check valve. At this location the pipe pressure should be sufficient to collect a free flowing effluent sample.

K. **Control Panel** - The electrical control panel will be modified to reflect the proposed changes in both the internal canister and the external tank.

L. **Telemetry**- The existing telemetry system will be modified to reflect the proposed modification.

2.3 Process Flow Description

Groundwater will be pumped from the upper screen to the stripping unit located in the internal canister. Fresh air is introduced below the stripping plate which is in contact with the influent groundwater. Air stripping of volatile organics occurs in the internal canister. The off gas exits the system to the ambient air via the blower, and the treated groundwater gravity drains from the internal canister through the extended well casing into the external tank.

The water level in the external tank will be regulated by the water level sensors. Under normal conditions, water will be pumped from the external tank to the lower well screen at a flow rate of 7.5 gpm. Once the water level reaches the normal high water level a high volume by-pass valve will be opened. Water will then flow from the external tank at a flow rate of 12.5 gpm. Once the water level reaches the normal low water level sensor, the high volume by-pass valve will close. This cycle will then be repeated.

Several safety features will be included to prevent overflow of the external tank and to ensure that a normal working water level is maintained above the stripping plate. In the external tank, the high-high level switch will shut down the entire system, preventing the potential for over flow. The low-low level switch will shut down the effluent pump, preventing the pump from

running dry. A low water level switch in the internal canister will shut down the entire system.

3.0 UVB Well Reconstruction (Recommendation)

To prevent the fine sand from entering the upper well screen, it is recommended that a new six inch upper well screen be sleeved within the ten inch well above the existing packer. The new screen will consist of a Johnson stainless steel channel prepacked screen. The new screen will be attached to the existing TAM's packer with a prefabricated stainless steel co-axial adaptor. The new upper well will be secured to the existing well head. A description of the well construction follows and is shown on the attached drawing.

3.1 Redevelopment

In August, approximately six feet (3.3 cf) of sand (see attached grain size analysis) was removed from the lower UVB-01 well screen. To ensure that good communication exists between the well screen and the formation, the well should be redeveloped to remove any new sand that may have accumulated in the well, and any sand that may be reducing porosity either in the sand pack or in the formation.

The development program will consist of surging (surge block) and purging (in 15 minute cycles) the entire upper and lower well screens (UVB-01 & UVB-02) for a total of three cycles (1.5 hours) per well screen. Once each screen has been developed, a pump will be lowered into the center of the well and pumped at 20 gallons per minute until the well is clear (less than 50 NTU units).

3.2 Well Construction

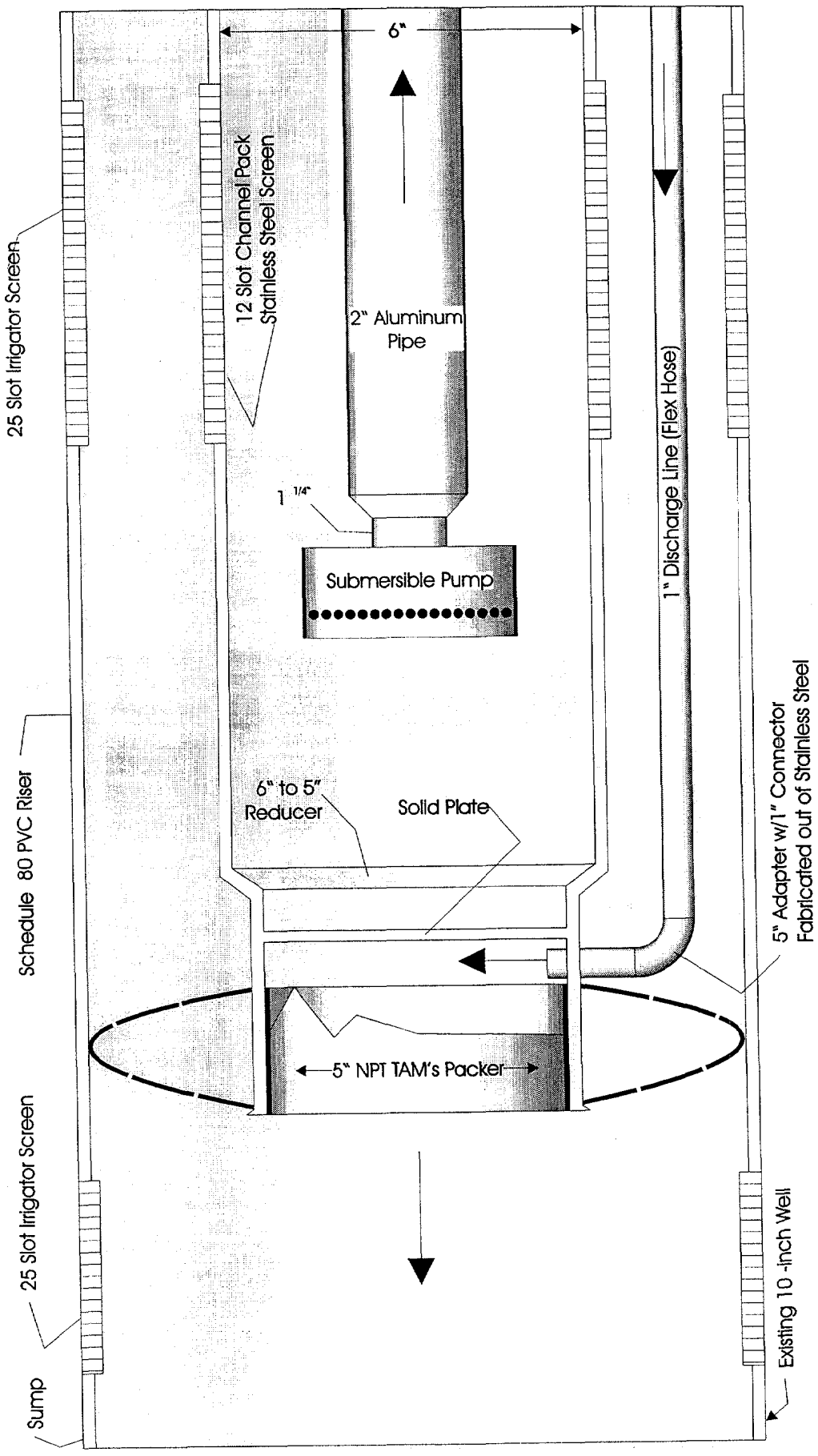
The new upper well screen (see figure 1) will be six inches in diameter and will be sleeved into the existing well above the existing TAM's packer. The construction of the well is as follows:

A. **Lower Screen** -will remain unchanged. The effluent discharge pressure should prevent fine sand from entering the lower well screen.

B. **Upper Screen** - will consist of a 12.5 foot Johnson 12 slot (based upon grain size data and manufacturer's recommendation) channel 20 x 40 per-packed stainless steel screen. The open area will be 520 square inches or 60 square inches less than the existing screen. Slight well loses may be seen on the influent side. However, based on preliminary specific capacity calculations (2.7 gpm/lf), of the existing 10 inch screen, the proposed well screen will not be a limiting factor to meet the proposed design flow rate.

C. **Riser Pipe** - will consist of schedule 80 PVC.

Figure 1-Proposed UVB Well Modifications



D. **Co-axial adaptor** - will consist of a six to five inch reducer from the six inch channel pack screen to a standard five inch pipe. Johnson Well Products will fabricate a stainless steel co-axial connector from the five inch pipe to the existing five inch NPT TAM's packer. This co-axial connector will consist of a solid plate, within the upper portion of the connector, to prevent the hydraulic connection between the upper six inch channel pack screen (influent side) from the lower existing well screen (effluent side). Below the solid plate, a one inch 90° elbow will be fabricated to five inch connector. The one inch elbow will be used to connect the effluent discharge (flex hose) to the co-axial adaptor. Thus, the effluent (treated groundwater) will be discharged below the solid plate. This fabricated connector will then be attached to the TAM's packer.

E. **Packer** - The existing TAM's packer (model 725-SD-01) connected to the new upper well screen well be inflated to 80 psi to prevent a hydraulic connection between the upper and lower well screens. The packer will be lowered into place by stainless steel cables which will serve as safety cables, afer the packer is inflated.

F. **Annulus between 6 & 10 inch screens** - can be used to introduce chemical into the influent pump to prevent iron precipitation. With time the annulus may collect the fine sand that enters the ten inch well screen and will accumulate above the packer. Should the packer require maintenance, the fine sand can be jetted from the upper portion of the well prior to its removal.

G. **Submersible Pump** - The existing four inch submersible pump will be used in the new six inch channel pack screen. The pump will be lowered into the well by the existing two inch aluminum pipe and secured to the existing well head. The pump's intake screen will be set three feet below the bottom of the channel pack screen. A Multi-Trode water level sensor will be set three feet above the pump's intake screen and will shut down the treatment system, should ground water be drawn below the bottom of the sell screen.

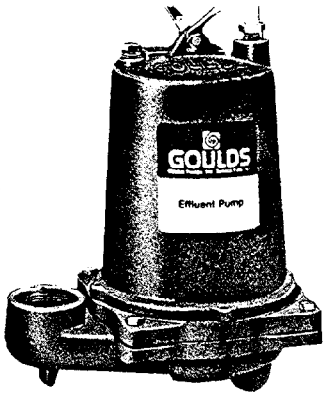
4.0 CONCLUSIONS

The recommended modifications to the remediation systems at the Orlando, Florida, Naval Training Center, Operable Unit 4, should:

- improve the overall performance of the UVB systems,
- increase the operation performance,
- reduce the frequency of the operation & maintenance, and
- improve the stripping performance, and
- increase the ability of the systems to consistently achieve the IRA objectives on the treated effluent groundwater.

Appendix A
Equipment Cut Sheets

EFFLUENT PUMP



MODEL

3885

APPLICATIONS

Specifically designed for the following uses:

- Homes
- Farms
- Trailer courts
- Motels
- Schools
- Hospitals
- Industry
- Effluent systems

SPECIFICATIONS

Pump

- Solids handling capabilities: ¾" maximum.
- Discharge size: 2" NPT.
- Capacities: up to 128 GPM.
- Total heads: up to 123 feet TDH.
- Mechanical seal: silicon carbide-rotary seat/silicon carbide-stationary seat, 300 series stainless steel metal parts, BUNA-N elastomers.
- Temperature: 104°F (40°C) continuous 140°F (60°C) intermittent.
- Fasteners: 300 series stainless steel.
- Capable of running dry without damage to components.

Motor

Single phase:

- ⅓ HP, 115 V, 200 V, 230 V. 60 Hz, 1750 RPM; ½ HP. 115 V, 60 Hz, 3500 RPM: ½ HP – 1½ HP. 230 V. 60 Hz, 3500 RPM.
- Built-in overload with automatic reset.
- Class B insulation.

Three phase:

- ½ HP – 1½ HP 200/230/460 V, 60 Hz. 3500 RPM.
- Class B insulation.
- Overload protection must be provided in starter unit.
- Shaft: threaded, 400 series stainless steel.
- Bearings: ball bearings upper and lower.
- Power cord: 20 foot standard length (optional lengths available).

Single phase:

- ⅓ and ½ HP – 16/3 SJTO with 115 V or 230 V three prong plug.
- ¾-1½ HP – 14/3 STO with bare leads.

Three phase:

- ½-1½ HP – 14/4 STO with bare leads. On CSA listed models – 20 foot length SJTW and STW are standard.

FEATURES

■ **Impeller:** Cast iron, semi-open, non-clog with pump-out vanes for mechanical seal protection. Balanced for smooth operation. Silicon bronze impeller available as an option.

■ **Casing:** Cast iron volute type for maximum efficiency. 2" NPT discharge adaptable for slide rail systems.

■ **Mechanical Seal: SILICON CARBIDE VS. SILICON CARBIDE** sealing faces. Stainless steel metal parts. BUNA-N elastomers.

■ **Shaft:** Corrosion-resistant stainless steel. Threaded design. Locknut on three phase models to guard against component damage on accidental reverse rotation.

■ **Motor:** Fully submerged in high-grade turbine oil for lubrication and efficient heat transfer.

■ **Designed for Continuous Operation:** Pump ratings are within the motor manufacturer's recommended working limits, can be operated continuously without damage.

■ **Bearings:** Upper and lower heavy duty ball bearing construction.

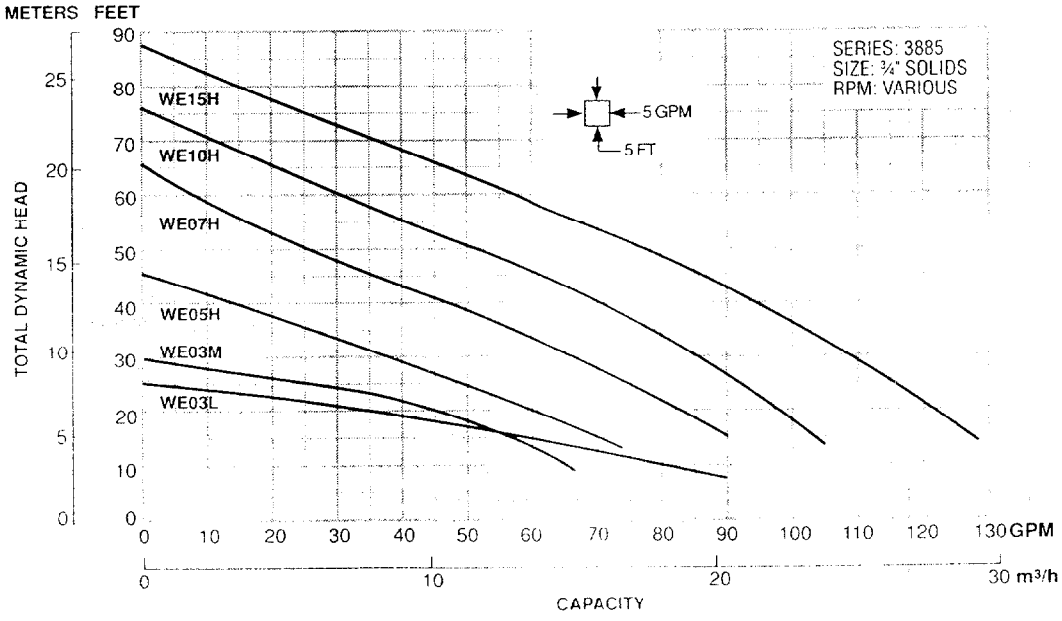
■ **Power Cable:** Severe duty rated, oil and water resistant. Epoxy seal on motor end provides secondary moisture barrier in case of outer jacket damage and to prevent oil wicking.

■ **O-ring:** Assures positive sealing against contaminants and oil leakage.

AGENCY LISTINGS

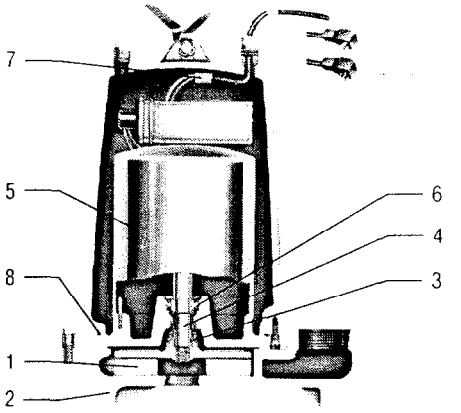
Canadian Standards Association

Underwriters Laboratories



PARTS

Item No.	Description
1	Impeller
2	Casing
3	Mechanical seal
4	Shaft
5	Motor
6	Bearings – upper and lower
7	Power cable
8	O-ring



MODEL

3885

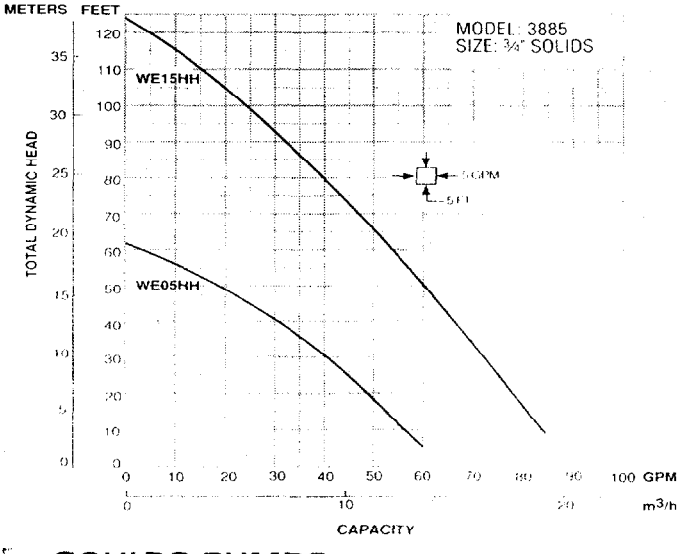
MODELS

Order No.	HP	Volts*	Phase	Max. Amp.	RPM	3ø Heater Size	Wt. (lbs.)
WE0311L	⅓	115	1	9.4	1750	N/A	56
WE0312L		230		4.7			
WE0318L		200		5.4			
WE0311M		115		9.4			
WE0312M		230		4.7			
WE0318M		200		5.4			
WE0511H	½	115	1	14.5	3500	N/A	60
WE0512H		230		7.3			
WE0518H		200		8.4			
WE0538H		200	3	3.9		K32	
WE0532H		230		3.4		K32	
WE0534H		460		1.7		K21	
WE0511HH		115	1	14.5		N/A	
WE0512HH		230		7.3			
WE0518HH		200		8.4			
WE0538HH		200	3	3.8		K32	
WE0532HH		230		3.3		K31	
WE0534HH		460		1.65		K21	
WE0712H	¾	230	1	10.0		N/A	70
WE0718H		200		11.5			
WE0738H		200	3	6.2		K49	
WE0732H		230		5.4		K39	
WE0734H		460		2.7		K28	
WE1012H	1	230	1	12.5		N/A	
WE1018H		200		14.4			
WE1038H		200	3	8.1		K43	
WE1032H		230		7.0		K43	
WE1034H		460		3.5		K32	
WE1512H	1½	230	1	15.7		N/A	80
WE1538H		200	3	10.6		K53	
WE1532H		230		9.2		K50	
WE1534H		460		4.6		K36	
WE1512HH		230	1	15.0		N/A	
WE1538HH		200	3	10.6		K53	
WE1532HH		230		9.2		K50	
WE1534HH		460		4.6		K36	

* For 575 V consult factory.

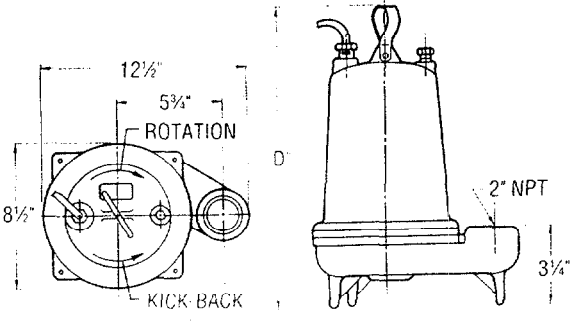
PERFORMANCE RATINGS (gallons per minute)

Order No.		WE0311L WE0312L WE0318L	WE0311M WE0312M WE0318M	WE0511H WE0512H WE0538H WE0532H WE0534H WE0518H	WE0712H WE0738H WE0732H WE0734H WE0718H	WE1012H WE1038H WE1032H WE1034H WE1018H	WE1512H WE1538H WE1532H WE1534H	WE0511HH WE0512HH WE0538HH WE0532HH WE0534HH WE0518HH	WE1512HH WE1538HH WE1532HH WE1534HH
	HP	⅓	⅓	½	¾	1	1½	½	1½
	RPM	1750	1750	3500	3500	3500	3500	3500	3500
Total Head Feet of Water	5	–	–	–	–	–	–	60	–
	10	80	65	–	–	–	–	56	84
	15	60	57	69	90	104	128	53	82
	20	36	45	60	83	98	122	48	77
	25		25	50	76	92	116	45	75
	30			38	67	85	109	40	72
	35			26	58	78	102	35	70
	40			15	47	70	94	30	67
	45				36	62	86	25	64
	50				25	52	77	18	60
	55				17	42	67	12	58
	60				8	32	56	3	54
	65					21	46		51
	70					11	35		47
	75						25		43
	80						15		40
	90								33
	100								24
	110								15
	120								5



DIMENSIONS

(All dimensions are in inches. Do not use for construction purposes.)
D* ⅓, ½, ¾ and 1 HP = 15"
except for model WE0712H and WE1012H = 18"; 1½HP = 18"



EFFLUENT EJECTOR SYSTEM

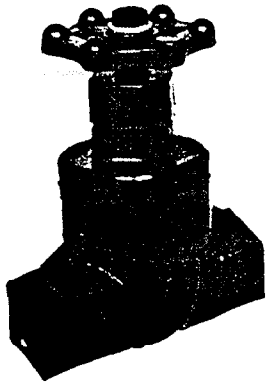
Effluent ejector system offers ease of ordering and installation. A single ordering number specifies a complete system designed for most residential and commercial sump and effluent pump applications.

Package Includes:
Submersible Effluent Pump WE0311L, 12L or WE0311M, 12M, WE0511HH, 12HH
Mechanical Level Control Switch
A2-5 (115V), A2-6 (230V)
Basin A7-1801S, Basin Cover A8-1822
Check Valve A9-2P
Order No. SWE0311L, SWE0312L, SWE0311M, SWE0312M, SWE0511HH, SWE0512HH

GOULDS PUMPS
WATER TECHNOLOGIES NORTH AMERICA
Seneca Falls, New York 13148

GLOBE VALVE

GLOBE VALVES

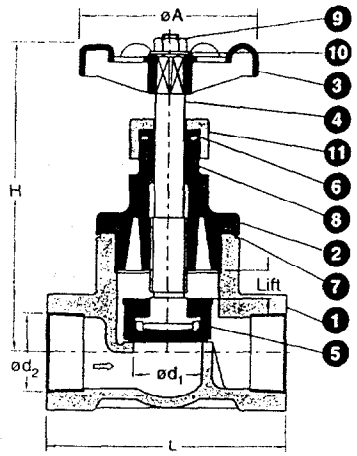


FEATURES

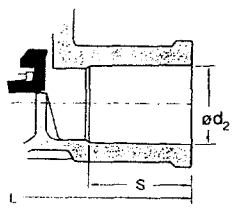
- Used for efficient, frequent throttling of flow
- Positive shut-off
- Displays excellent flow regulating characteristics throughout the entire lift of the disc
- All sizes rated for full vacuum service
- An economical valve that doesn't sacrifice dependability
- EPDM seals. Other elastomers optional
- Stainless steel reinforcing ring on body of polypropylene valve to maintain pressure rating at higher temperatures

SPECIFICATIONS

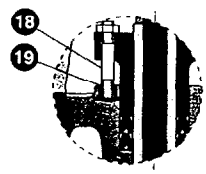
SIZE: 1/2"– 4"
MODELS: Flanged (ANSI–all sizes)
Threaded (1/2"– 2")
Socket (1/2"– 2")
BODY: PVC, PP
PLUG: EPDM
SEALS: EPDM



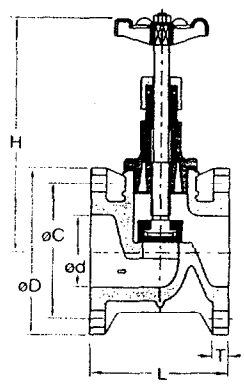
THREADED (Model A)



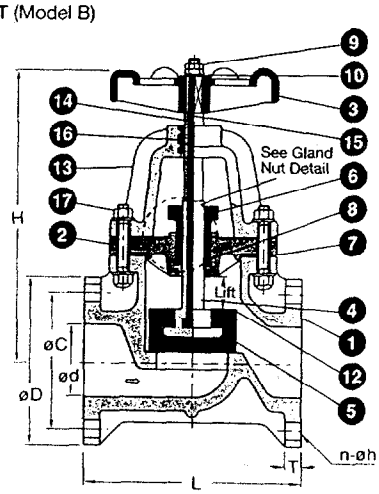
SOCKET (Model B)



Gland Nut Detail



FLANGED 1/2"–2" (Model C)



FLANGED 2 1/2"–4" (Model D)

PARTS (MODELS A, B, C)

No.	Parts	Pcs	Materials
1	Body	1	PVC, PP
2	Bonnet	1	PVC, PP
3	Handwheel	1	PP
4	Stem	1	PVC, PP
5	Disc	1	PP
6	Gland	1	PVC, PP
7	Gasket	1	EPDM
8	Stem Packing	2	EPDM
9	Nut	1	PVC/400 SS*
10	Washer	1	PVC/400 SS*
11	Gland Nut	1	PVC, PP

MODEL D (Same as above with the following changes)

No.	Parts	Pcs	Materials
9	Nut	2	PVC/400 SS*
10	Washer	1	PVC/400 SS*
12	Stem Holder	1	PP
13	Stem Support	1	PP
14	Stem Sleeve	1	Steel
15	Stem w/Trapezoid Screw	1	Copper Alloy
16	Yoke Sleeve	1	Bronze
17	Bolt, Nut	4 Sets	304 SS
18	Gland Stud Bolt and Nut	2 Sets	304 SS
19	Insert	2	Brass

* 1/2" to 2" – PVC; 2 1/2" to 4"– 400 SS.

PRESSURE VS TEMPERATURE (PSI)

Size (inches)	PVC			PP		
	30° F 70° F	71° F 105° F	106° F 120° F	-5° F 70° F	71° F 140° F	141° F 175° F
1/2	150	150	110	110	95	65
3/4	150	150	110	110	95	65
1	150	150	110	110	95	65
1 1/4	150	150	110	110	95	65
1 1/2	150	150	110	110	95	65
2	150	150	95	110	75	45
2 1/2	110	110	95	110	60	35
3	110	110	95	110	60	35
4	110	80	65	110	60	35

DIMENSIONS (INCHES)

Size (inches)	Flanged								Socket and Threaded									Cv Values
	Weight (lbs)	d	C	D	L	T	Lift	H (open)	Weight (lbs)	Threaded d_2	Threaded L	Socket d_2	Socket L	Socket S	Lift	d_1	H (open)	(Gal/Min @ 1 psi pressure drop)
1/2	0.95	0.71	2.38	3.50	3.35	0.47	0.31	5.20	0.64	NPT 1/2	3.35	0.85	4.33	1.18	0.32	0.59	5.20	4.1
3/4	1.10	0.94	2.75	3.88	3.74	0.55	0.31	5.51	1.10	NPT 3/4	3.74	1.06	5.12	1.38	0.32	0.71	5.51	6.4
1	2.20	1.10	3.12	4.25	4.33	0.55	0.43	6.34	1.10	NPT 1	4.33	1.33	5.91	1.58	0.43	0.98	6.34	9.7
1 1/4	2.90	1.46	3.50	4.62	5.31	0.63	0.51	6.57	1.30	NPT 1 1/4	5.32	1.67	5.32	0.98	0.51	1.38	6.58	18.0
1 1/2	4.50	1.61	3.88	5.00	7.48	0.63	0.79	9.06	2.70	NPT 1 1/2	5.51	1.91	5.51	0.98	0.67	1.61	9.65	22.0
2	5.30	2.05	4.75	6.00	7.87	0.63	0.94	9.92	3.50	NPT 2	7.09	2.38	7.09	1.06	0.87	2.05	10.20	29.0
2 1/2	13.25	2.64	5.50	7.00	8.66	0.71	1.38	13.58	—	—	—	—	—	—	—	—	—	57.0
3	15.00	3.07	6.00	7.50	9.45	0.71	1.38	14.13	—	—	—	—	—	—	—	—	—	78.0
4	22.00	3.94	7.50	9.00	11.42	0.71	1.57	16.50	—	—	—	—	—	—	—	—	—	115.0

P.O. Box 653 • 35 Green Street, Malden, MA 02148 • Tel: (800) 343-3618, (617) 321-5409
Fax: (800) 426-7058 • Internet: http://www.asahi-america.com • Email: asahi@asahi-america.com

HIGH VOLUME BY-PASS
BALL VALVE

HAYWARD® Electrically Actuated True Union Ball Valve

Low Cost Automation

The EA electrically actuated true union ball valve is the perfect answer to cost sensitive, automated valve applications that can't get by with less than a full featured valve and actuator combination.

Built to Last

EA Series valves feature a rugged, 110 VAC electric actuator with an output torque of 140 in-lb. A built-in automatic resetting thermal overload protector prevents motor burnout. The 25% duty cycle motor drives the valve through a permanently lubricated, rugged gear train.

Valve Features:

- PVC, will never rust or corrode
- Pressure rating to 225 psi
- Full port design
- Double o-ring stem seal
- True union design
- EPDM seals & Teflon seats
- Fully serviceable

Acutator Features:

- All-plastic enclosure
- Thermal overload protection
- Nema 4X housing
- No adjustments needed
- 3-second cycle time
- Permanently lubricated gear train
- Actuator brake for full open / close
- 25% duty cycle

ctuator Specifications

Torque Output:	140in-lb
Housing:	PP plastic
Duty Cycle:	25%
Cycle Time:	3 seconds
Voltage:	110 VAC
Enclosure:	NEMA 4X
ration:	Unidirectional
rmal Overload:	Standard
Mechanical Brake:	Standard
Gear Train:	Permanently lubricated
Locked Rotor Current:	1.5 amp
Conduit Connection:	1/2" NPT

Valve Specifications

Valve Type:	True union
Material of Const.:	PVC plastic
Seals:	EPDM
Seats:	Teflon
End Connections:	Socket or Threaded
Sizes:	1/2", 3/4", 1", 1 1/2", 2"
Pressure Rating:	225 psi @ 70°F, non-shock
Design:	Full port

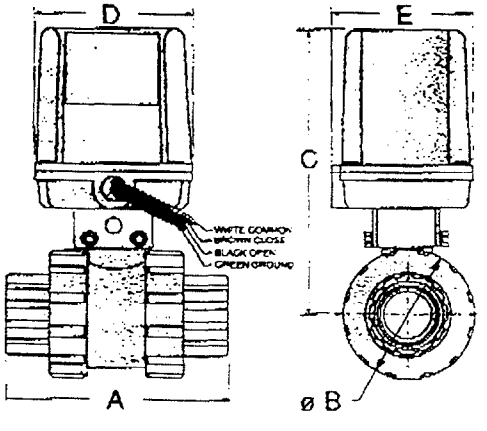
C_V Factors

Size	Value
1/2"	8.0
3/4"	15.0
1"	29.0
1 1/4"	75.0
1 1/2"	90.0
2"	140.0

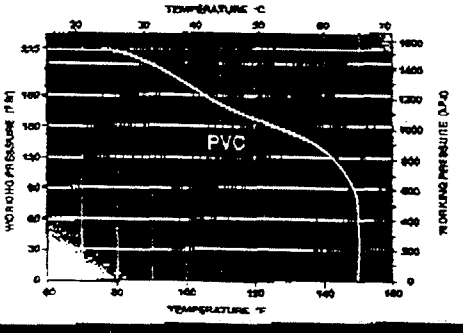
SIZE CODE		005	007	010	015	020
SIZE (IN.)		1/2	3/4	1	1 1/2	2
MATERIAL	Part #					
Valve PVC Actuator PP	2727-	$ 174.00	$ 178.00	$ 182.00	$ 193.00	$ 202.00

P/N: 2727-015

Dimensions - Inches



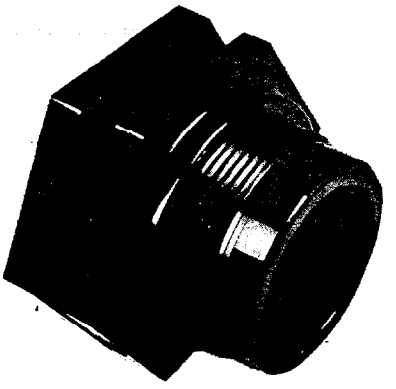
Size	A	B	C	D	E	Weight
1/2"	4.63	2.25	8.40	4.88	4.13	6.8
3/4"	4.75	2.63	8.60	4.88	4.13	6.8
1"	5.25	3.00	9.10	4.88	4.13	7.1
1 1/2"	6.75	4.00	9.50	4.88	4.13	8.1
2"	8.00	4.75	10.10	4.88	4.13	9.8



Temperature / Pressure Chart

BULKHEAD FITTINGS

"Plastic Bulkhead Fittings"



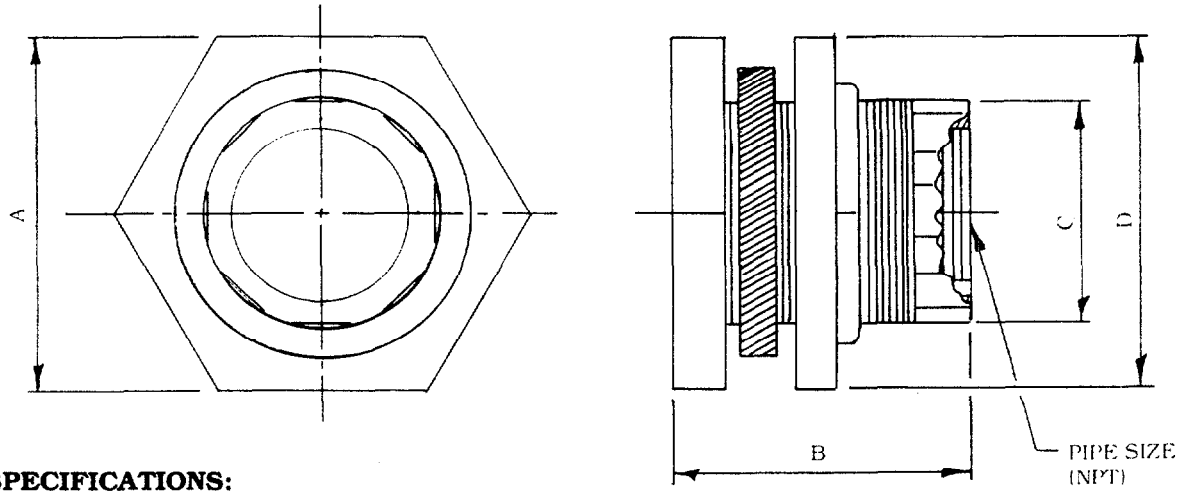
MATERIAL:

Body Material: Unplasticized Type 1, Grade 1
PVC (Polyvinyl Chloride) or
CPVC (Chlorinated Polyvinyl Chloride) (Thru 2" Only)
or Polypropylene

Gaskets: EPDM 40 Durometer Standard
Viton Special

Pressure Rating

Same as working pressure of equivalent size schedule 80 pipe.



SPECIFICATIONS:

PIPE SIZE (NPT)	A	B	C	D	WEIGHT
1/2"	2"	2 3/4"	1-3/8"	2"	3 oz.
3/4"	2 3/8"	2 7/8"	1-5/8"	2-3/8"	5 oz.
1"	2 9/16"	2 7/8"	1-7/8"	2-9/16"	6 oz.
1-1/4"	3"	3"	2-3/8"	3"	7 oz.
1-1/2"	3"	3"	2-3/8"	3"	6 oz.
2"	4-3/8"	3 1/4"	3-1/4"	4-3/8"	1 lb.
3"	6"	3 5/8"	4-1/2"	6"	2 lbs.
4"	8-3/4"	4 3/4"	5-3/4"	8-3/4"	7 lbs.

PolyProcessing COMPANY
Phone (318) 343-7565
Box 4150 Monroe, LA 71211

Tank Fittings

Tank Bulkhead Fittings

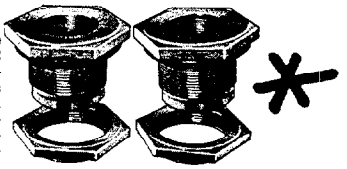
Durable fittings let you make safe, quick pipe connections to plastic and metal tanks when inlets and outlets are needed for faucets, pipes, and spigots. Heavy buttress threads help prevent leaks that can be caused by poor thread engagement. A hex-shaped body end allows quick installation without tools. The three-part fittings include a body adapter, EPDM gasket, and locking nut. Fittings are rated at 150 psi at 73° F.

PVC fittings have a working temperature of 140° F and excellent resistance to chemicals and sunlight. Fittings are available with socket-to-thread and thread-to-thread connections. Color is gray.

CPVC fittings have a working temperature of up to 195° F and are stronger than PVC fittings. CPVC is resistant to stress, cracking, chemicals, corrosion, and ultraviolet light. Fittings are available in socket-to-thread connections and are gray in color.

Polypropylene fittings have a working temperature of 180° F and have excellent chemical resistance and high tensile strength and stiffness. Fittings are translucent white and are available in thread-to-thread connections only.

Polyethylene fittings are rated at 140° F working temperature and resist stress, chemicals, corrosion, and ultraviolet light. Color is black.

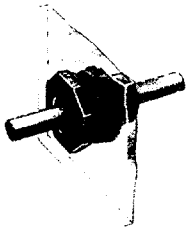


Socket-to-Thread | Thread-to-Thread

Pipe Size	No.	NET EACH 1-4	5-Up
PVC—Socket-to-Thread Connection			
½"	36895K111	$7.50	$6.83
¾"	36895K112	8.53	7.77
1"	36895K113	9.51	8.66
1¼"	36895K114	12.50	11.38
1½"	36895K115	12.50	11.38
2"	36895K116	18.53	16.88
3"	36895K117	34.02	30.98
4"	36895K118	67.01	61.03
PVC—Thread-to-Thread Connection			
½"	36895K121	10.00	9.11
¾"	36895K122	10.98	10.00
1"	36895K123	12.01	10.94
1¼"	36895K124	15.98	14.55
1½"	36895K125	17.50	15.94
2"	36895K126	22.99	20.94
3"	36895K127	40.00	36.43
4"	36895K128	75.00	68.30
CPVC—Socket-to-Thread Connection			
½"	36895K131	10.49	9.55
¾"	36895K132	12.50	11.38
1"	36895K133	$14.02	$12.77
1½"	36895K134	19.51	17.77
2"	36895K135	27.45	25.00
3"	36895K136	48.04	43.75
4"	36895K137	80.39	73.21
Polypropylene—Thread-to-Thread Connection			
½"	36895K141	12.50	11.38
¾"	36895K142	15.49	14.11
1"	36895K143	20.00	18.21
1¼"	36895K144	25.49	23.21
1½"	36895K145	25.49	23.21
2"	36895K146	39.51	35.98
3"	36895K147	77.45	70.54
4"	36895K148	145.10	132.14
Polyethylene—Thread-to-Thread Connection			
¾"	3736K2	10.56	8.64
1"	3736K3	15.00	12.27
1¼"	3736K5	15.00	12.27
1½"	3736K4	15.00	12.27
2"	3736K6	23.89	19.55
3"	3736K8	32.22	26.36

Compression Bulkhead Fittings

Compression fittings provide an excellent seal for pipe and conduit wall penetrations of curved and flat surfaces. Glass-filled polyethylene construction is extremely chemical resistant. Gaskets are made from a thermoplastic elastomer for hand-tight liquid seals and vibration absorption. Max. working temperature is 250° F.



Pipe Size	No.	NET EACH
½"	3770K21	$27.79
¾"	3770K22	29.08
1"	3770K23	31.50
2"	3770K24	37.50
3"	3770K25	49.85

Self-Aligning Bulkhead Fittings

These fittings swivel side-to-side to allow in-line piping connections to curved-wall tanks. Ideal for dome-style tanks that don't have a flat surface. Noncorrosive, noncontaminating PVC fittings have a Teflon seal and lock ring that allow easy rotation of the machined ball seat. Fittings come with an EPDM gasket and have a working temperature of 140° F. Rated at 75 psi at 73° F.

Pipe Size	Max. Swivel	No.	NET EACH
¾"	27°	3766K11	$63.09
1"	27°	3766K12	62.15
1¼"	25°	3766K13	92.95
2"	25°	3766K14	94.08
3"	20°	3766K15	130.00

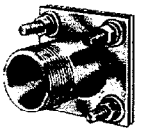
Bolt-On Tank Fittings

Bolt-on fittings provide a tight seal on tank-to-pipe connections. Fittings can be retightened and adjusted from the outside of the tank—no need to drain contents to do maintenance.

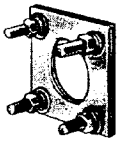
PLASTIC FLANGED FITTINGS—Available in PVC and polypropylene. The 316 stainless steel bolt heads are encapsulated in molded EPDM. Gaskets are also EPDM. Flange size is 150 psi. The 1"-3" fittings include 4 bolts; 4" fitting has 8 bolts. Connections are female threaded.

Pipe Size	PVC No.	POLYPROPYLENE No.	NET EACH
1"	3757K51	3757K61	$46.15
1½"	3757K52	3757K62	50.77
2"	3757K53	3757K63	50.77
3"	3757K54	3757K64	70.15
4"	3757K55	3757K65	136.62

316 STAINLESS STEEL FITTINGS—Ideal for use with most chemicals and in corrosive environments. Bolts are 316 stainless steel and gaskets are EPDM. The ½"-2" fittings have 4 bolts; 3" and 4" fittings have 8 bolts.



Stainless Steel with Male Thread

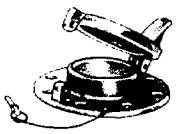


Stainless Steel with Female Thread

Pipe Size	MALE THREADS No.	NET EACH	FEMALE THREADS No.	NET EACH
½"	3765K21	$65.54	3765K31	$63.69
¾"	3765K22	66.46	3765K32	66.46
1"	3765K23	75.69	3765K33	80.31
1½"	3765K24	108.92	3765K34	112.62
2"	3765K25	117.23	3765K35	145.85
3"	3765K26	174.46	3765K36	294.46
4"	3765K27	190.15	3765K37	372.92

Aluminum Tank Hatch Covers

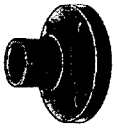
Designed to be installed on tank roofs and roof flanges, these covers provide quick access for product gauging, filling, and sampling, and for temperature measurement. Covers can operate as free-opening or lock-down devices (lock pin included). Prevent tank access with the use of a padlock. Covers come with Buna-N inserts and a foot pedal for hands-free access.



Pipe Size	Flange Dia.	Open Ht.	No.	NET EACH
4"	9"	5²¹⁄₃₂"	3778K51	$291.67
8"	13½"	5½"	3778K52	330.77

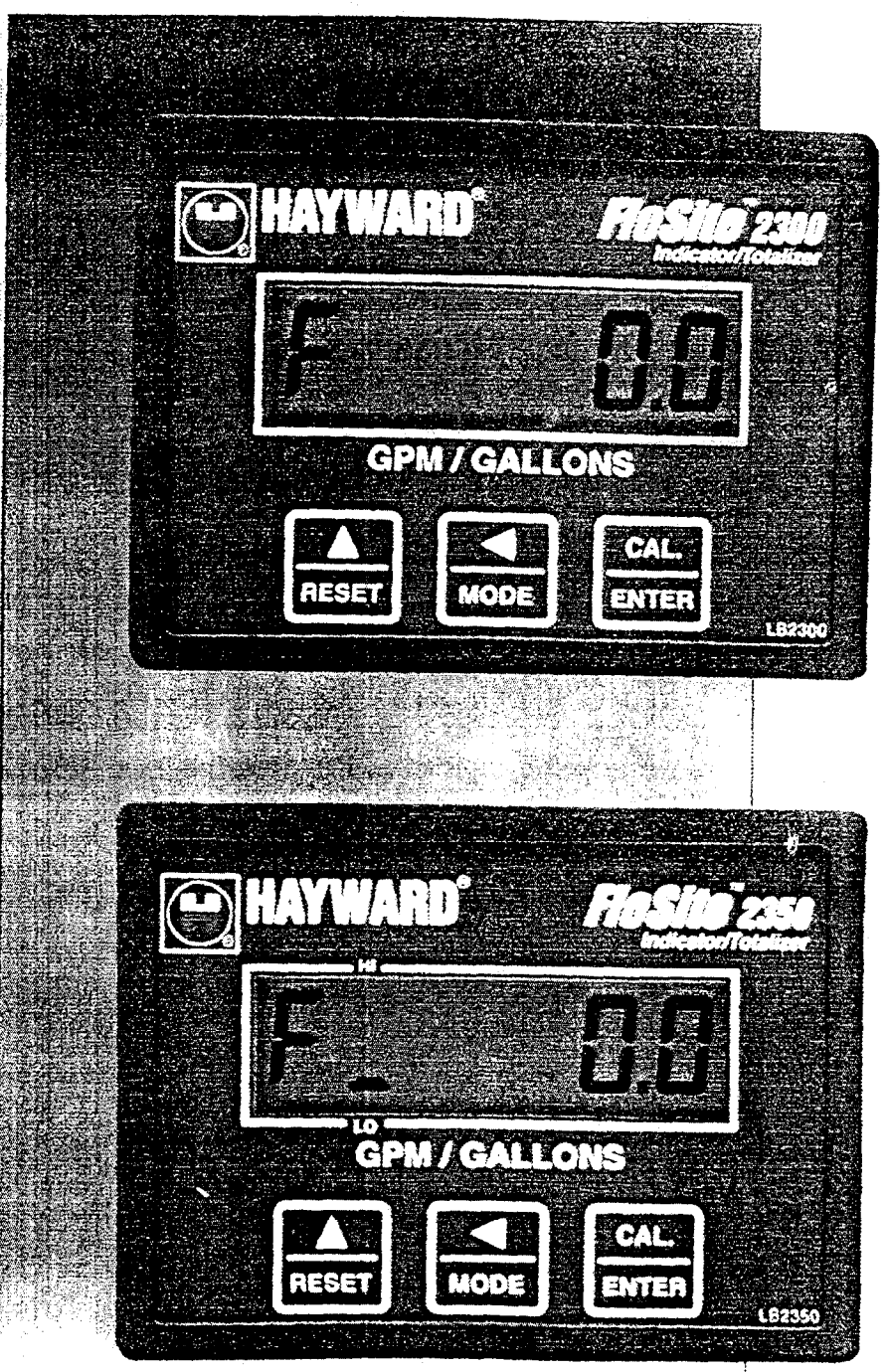
Thread-to-Flange Converters

Convert end connections from female threaded pipe to flanged quickly and easily. One-piece molded polypropylene converters have bolt drillings that meet ANSI 150 lb. dimensions and resist temperatures to 180° F.



Pipe Size	For Pipe OD	Flange OD	Lg.	No.	NET EACH
1"	1⁵⁄₁₆"	4½"	1⁷⁄₁₆"	3759K51	$15.20
1½"	1¹⁵⁄₁₆"	5"	2¹⁵⁄₁₆"	3759K52	24.22
2"	2³⁄₈"	6"	3³⁄₁₆"	3759K53	30.29
3"	3½"	7½"	3⅞"	3759K54	73.77
4"	4½"	9"	4⅞"	3759K55	99.55

HAYWARD FLOW METER



Features

Flow Indication with Totalizer – *Standard indication of flowrate and totalized flow*

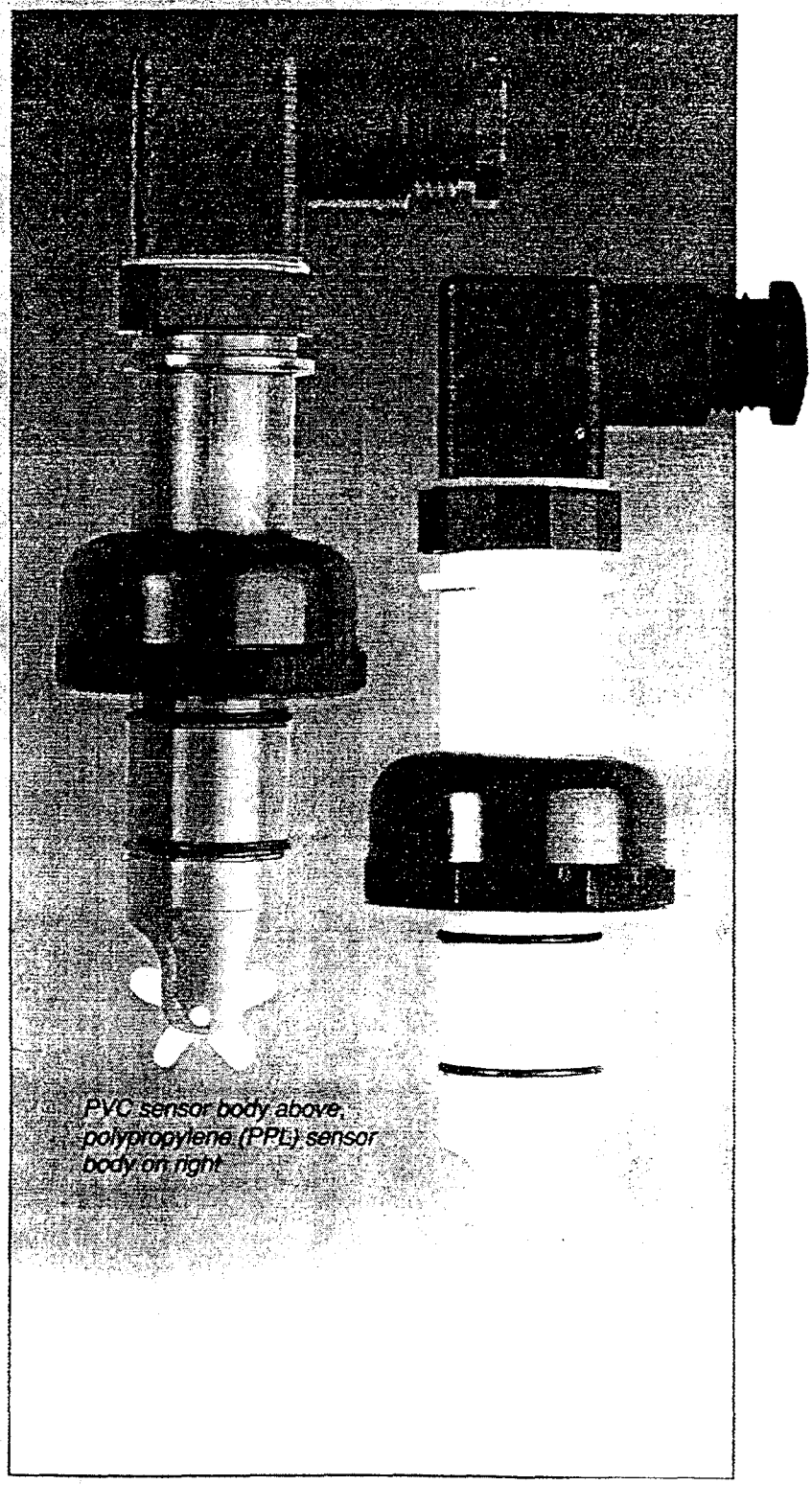
Large Digital Display – *13.5-mm character height*

Easy Calibration – *Calibration is done through the keypad, no tools or equipment are required*

NEMA 4X Enclosure – *Corrosion resistant*

Versatile Mounting – *Panel-mounting or optional wall-mounting enclosure*

Flow Alarms – *Model 2350 has user-selectable High and Low flow alarms as standard*



PVC sensor body above, polypropylene (PPL) sensor body on right

Features

Reliable Hall-Effect Sensor – *Offers a wide flow velocity range from 0.5 ft/sec to 33 ft/sec. Flow can be measured in either direction.*

No Signal Conditioning Required – *Output signal can be sent direct to PLC or computer without the need for additional electronics.*

Rugged Construction – *A choice of PVC, PPL or PVDF sensor materials provides high chemical resistance. A sturdy 3-pole DIN-style electrical connector is provided on the sensor as standard.*

Versatile Mounting – *One sensor for all pipe sizes up to 8".*

High Accuracy – *Unique 5-bladed Hall-effect sensor offers an accuracy of ± 1% over the full measuring range (see diagram on pg. 23).*

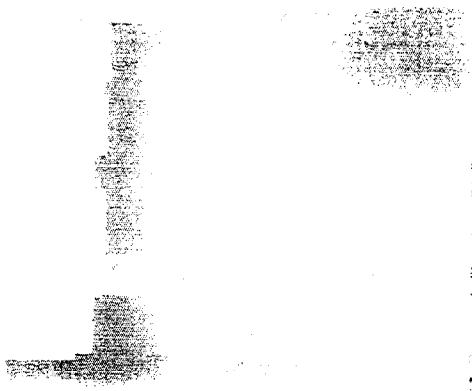
LDM (Low Drag Magnetic) Sensor – *The LDM sensor utilizes smaller magnets than other designs for minimal drag and less fouling.*

Long Life – *Ceramic shaft and bearings for reduced wear, long life.*

Easy Installation – *A matched Tee or Pipe saddle fitting makes installation quick*

FloSite 2300 & 2350

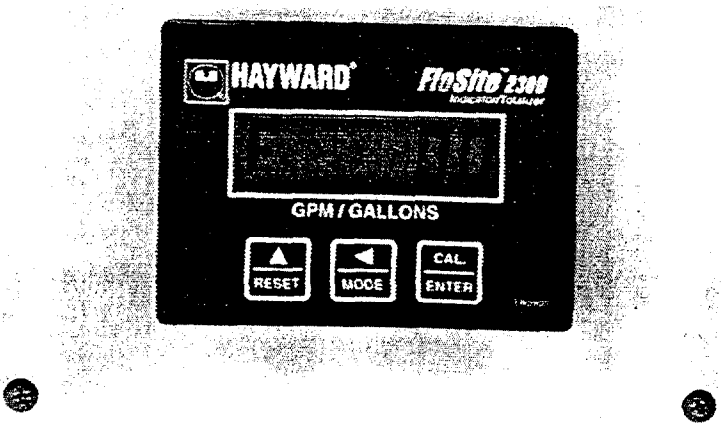
Flow Indicator/Totalizers



Description

Models 2300 and 2350 are panel-mounted instruments that provide large, easy-to-read digital indication (numeric characters are 13.5 mm high) of both flow rate and totalized flow. The Model 2350 also has Low and High flow alarms and relay contacts actuated at user-selectable levels, typically used for remote indication or control.

Used with Model 2000 flow sensors, these NEMA 4X compact monitors are simple to operate and calibrate. A front keypad with three pushbuttons provides the user interface to toggle the display between flow rate and totalized flow, reset the total, and calibrate the display. Calibration is easy and merely involves entering a scaling factor based on type and size of installation fitting used.



Wall-Mounting Enclosure

Technical Data

Models 2300 & 2350

Display Type: 6-digit LCD for flow rate or totalized flow (user-selectable)

Volumetric Units: Flow rate in GPM, totalized flow in gallons

Operating Range: 6.3 to 420 Hz

Input: Square wave, 12 to 24 V p-p from Model 2000 sensor

Sensor to Indicator Distance: Up to 325 ft (100 m)

Accuracy: ±1 % of indicated flow over the full calibrated range

Power Requirement: 110 V AC, 50/60 Hz or 24 V DC. Note: indicator provides 12 V DC power to the sensor

Electrical Connection: 8-point (Model 2300) or 15-point (Model 2350) terminal strip on rear of unit

Enclosure Rating: NEMA 4X (IP65) when panel mounted

Operating Temperature: 32 to 140F (0 to 60C)

Enclosure Materials: ABS

Mounting: Panel

Options: Wall-mounting enclosure (rated NEMA 4X) with two cable glands to accept 4-conductor shielded cable from sensor

Dimensions: See pg. 19

Model 2350 (only)

Alarms: Two adjustable High and Low alarms, indicated on display

Relays: Two unpowered SPDT contacts rated 66 VA. Relays are activated on rising flowrate (set at Low Alarm 2 and High Alarm 2) and are deactivated on falling flowrate (set at Low Alarm 1 and High Alarm 1)

For use with Model 2000 Flow Sensor on pg. 8

FloSite 2000

Flow Sensor

Description

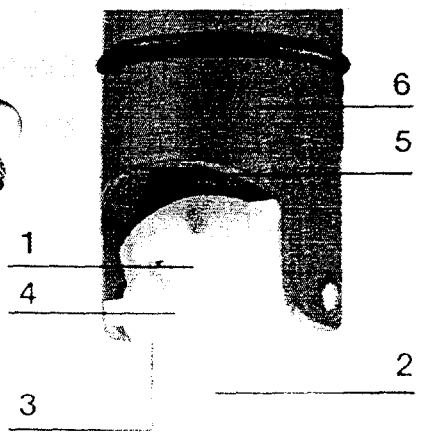
As the heart of the flow monitoring system, the FloSite Model 2000 sensor offers high accuracy and excellent low flow performance, as well as long life. It produces a square-wave output signal with a frequency proportional to the flow, which can be transmitted up to 325 ft to a display unit without signal conditioning. A specially designed pipe fitting makes installation easy.

Unlike other sensor designs that utilize a four-blade rotor, the Hayward FloSite rotor has five blades for 20% more contact with the process fluid and thus higher accuracy at lower velocities. It also employs an LDM (low drag magnetic) design using smaller magnets for less chance of fouling from accumulation of any metallic particles in the process.

Hayward FloSite sensors are available in a choice of three corrosion-resistant materials: PVC, PPL, or PVDF. The Model 2000 sensor output can be sent directly to a PLC or to a versatile range of Hayward remote-mounted flow monitors. The same flow sensor technology is also used in the Hayward Point-of-Use transmitters (see pg. 14) where the display indication is integrally mounted to the sensor.

For use with any monitor/indicators or controller on pgs. 10, 12 and 16. Also see required installation fittings on pgs. 20 and 21.

Principle of Operation



FloSite flow sensor is equipped with a Halar 5-bladed rotor that has permanent magnets straight into each blade. Ceramic bushings are embedded in the rotor and, together with a ceramic shaft, these bearings provide extremely long life at high flow velocities and high chemical resistance.

As the magnetic blade passes by the Hall effect transducer pickup (5) an output pulse is generated. This output signal is processed by the sensor's electronics (6) to a square wave output with a frequency that is proportional to the rate of rotor rotation and thus flow velocity. Unlike other sensors with sine wave outputs, the FloSite sensor's square wave output signal is not reduced at low flow rates and can be connected directly to a PLC without signal conditioning.

Technical Data

Type: Insertion paddle flow sensor, Hall-effect method of flow measurement

Flow Velocity Range: 0.5 to 33 ft/sec (0.15 to 10 m sec), flow measured in either direction

Measuring Range: See chart on pg. 23

Pipe Size Range: 1/2" to 8"

Output Signal : Square wave, 5 to 24 V dc P-P (depending on input voltage)

Output Frequency: Approximately 12.8 Hz ft sec (42 Hz m sec)

Output Signal Transmission: 325 ft (100 m) without conditioning

Accuracy: ±1% of indicated flow over the full calibrated range

Repeatability: ±0.5% over calibrated range

Linearity: ±1% over calibrated range

Viscosity Range: 0.5 to 20 centistokes

Maximum Percent Solids: 10% (with particulate size not to exceed 0.5 mm length or cross-section

Power Requirement: Any supply voltage between 5 and 24 V DC. Note: If used with digital panel indicators or batch controller (pgs. 12 or 16), sensor is powered from indicator/controller

Electrical Connection: NEMA 4X (IP65), 3-pole DIN43650 connection with ground pin, cable gland for 4-conductor shielded cable. Also accepts 1/2" NPT conduit fitting

Pressure and Temperature Ratings: See chart on pg. 23

Sensor Materials:

Flow Sensor Body: Choice of PVC, PPL, or PVDF

Rotor: 5-bladed E-CTFE (Halar) with magnet inserts

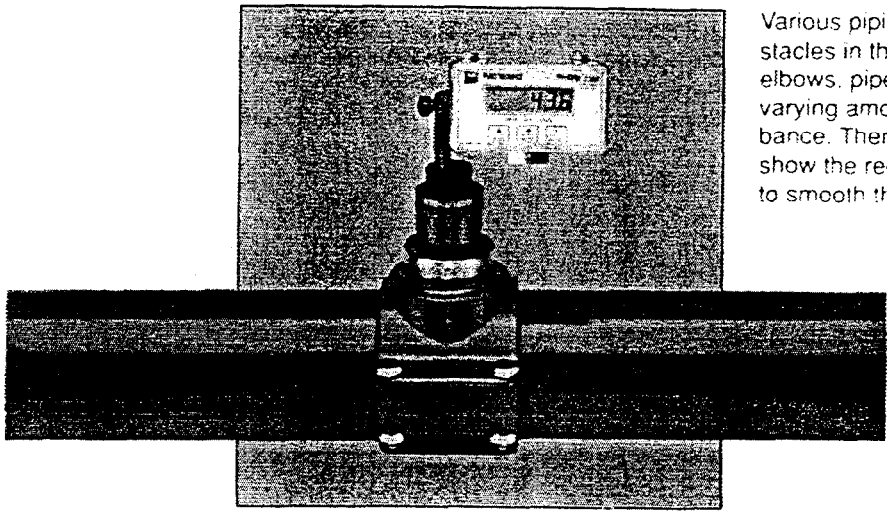
Rotor Shaft: Ceramic

Rotor Bearings: Ceramic

O-Rings: EPDM standard with PVC or PPL bodies (Viton optional). Viton standard with PVDF sensor

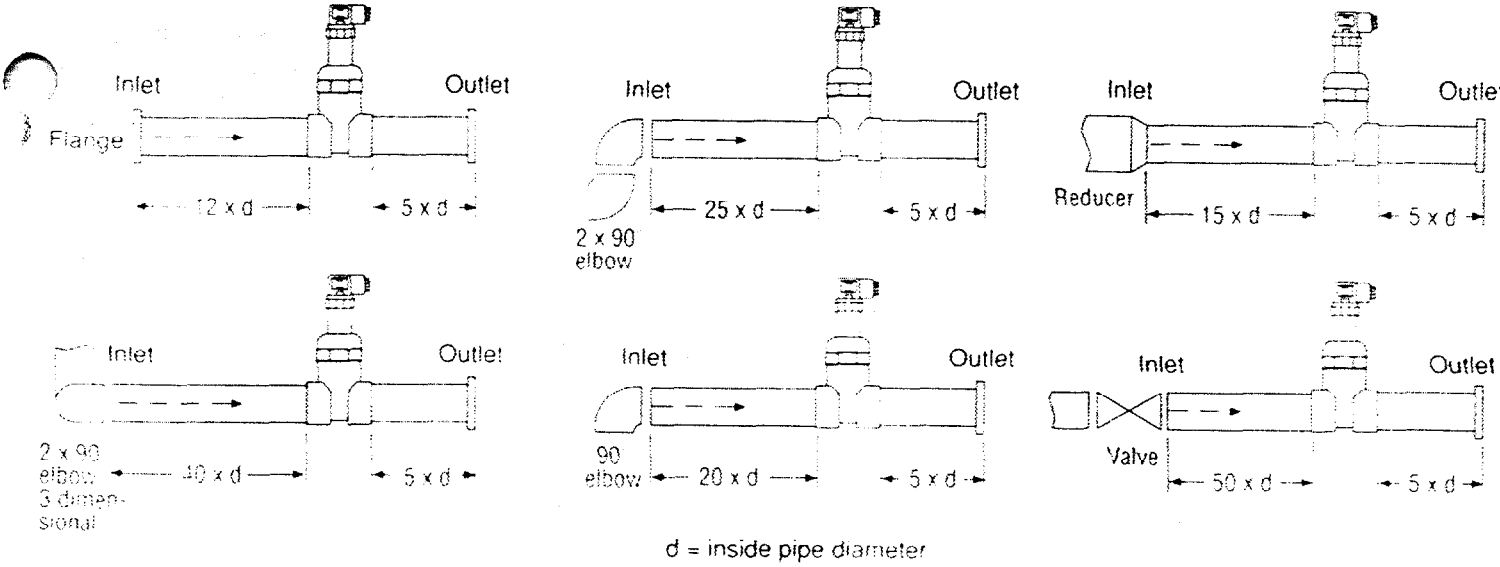
Required Installation Fittings: T-fittings in PVC (1/2" to 1-1/4"). Pipe saddles in PVC (1-1/2" to 8")

Dimensions: See pg. 19



Various piping configurations and obstacles in the flow line such as valves, elbows, pipe bends and strainers create varying amounts and profiles of disturbance. Therefore, the following guidelines show the required lengths of straight pipe to smooth the flow.

Straight Pipe Requirements



d = inside pipe diameter

Recommended Mounting Positions

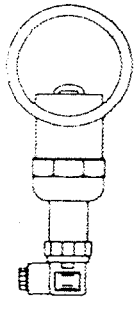


Fig. 1

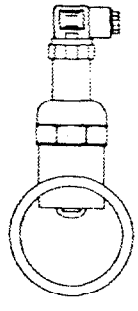


Fig. 2

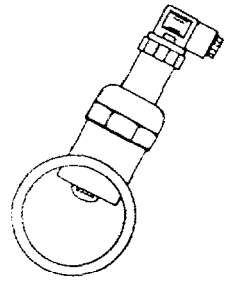
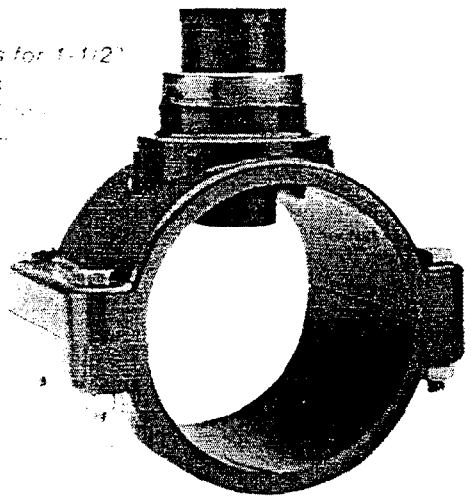


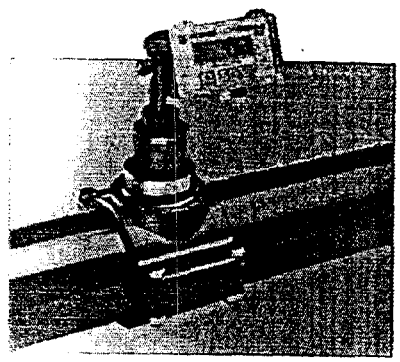
Fig. 3

Fig. 1 – Installation with no sediment present
Fig. 2 – Installation with no air pockets present
Fig. 3 – Installation if sediment or air pockets are present

FloSite
Pipe Saddle Fittings

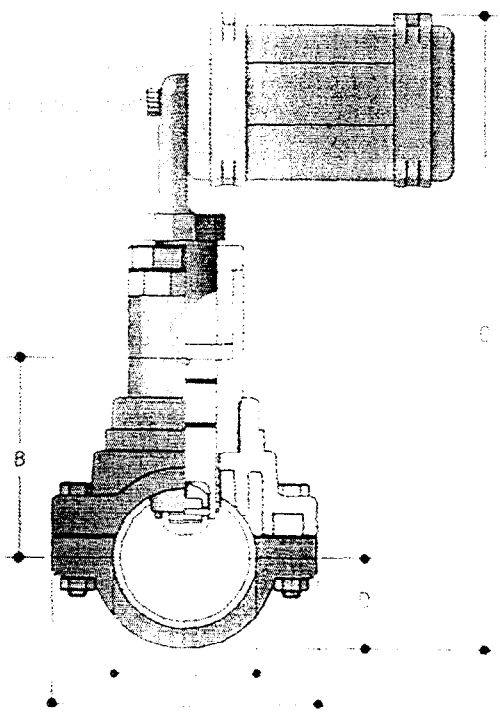
Saddle fittings for 1-1/2" **to 8" pipelines**
- PVC – EPDM
- Bolt-on design



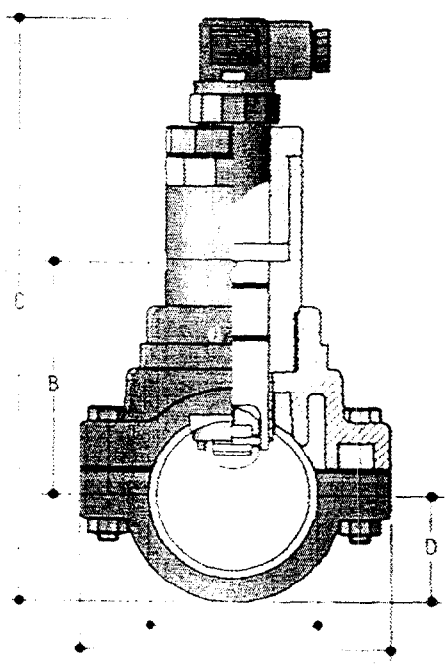


Bolt-on **saddle fittings are** *available in* **PVC for pipe sizes** *from 1-1/2" to 8".*

Models 2100, 2500



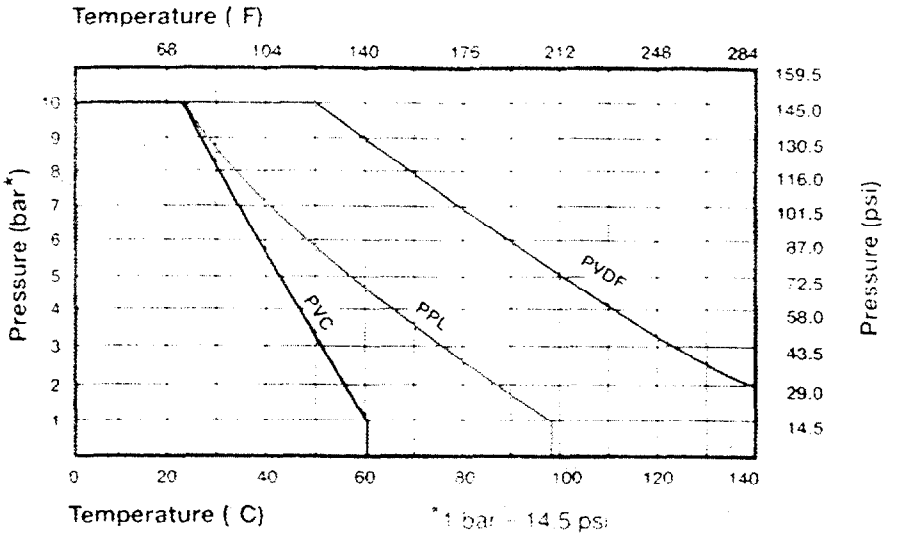
Models 2000, 2600



Size	A	B	C	D	Drilling Hole Dia.
1-1/2"	4.09 (104)	7.89 (200.5)	10.30 (261.5)	1.30 (33)	1.18" (30)
2"	4.57 (116)	8.09 (205.5)	10.49 (266.5)	1.61 (41)	1.18" (30)
2-1/2"	5.28 (134)	8.68 (220.5)	11.08 (281.5)	1.89 (48)	1.57" (40)
3"	5.98 (152)	9.21 (234)	11.61 (295)	2.20 (56)	1.57" (40)
4"	6.93 (176)	9.90 (251.5	12.30 (312.5)	2.60 (66)	1.57" (40)
6"	9.37 (238)	11.59 (294.5)	14.00 (355.5)	3.66 (93)	1.57" (40)
8"	13.11 (333)	13.48 (342.5)	15.89 (403.5)	5.26 (133.5)	1.57" (40)

Dimensions shown in inches and millimeters

Pressure/Temperature Diagram

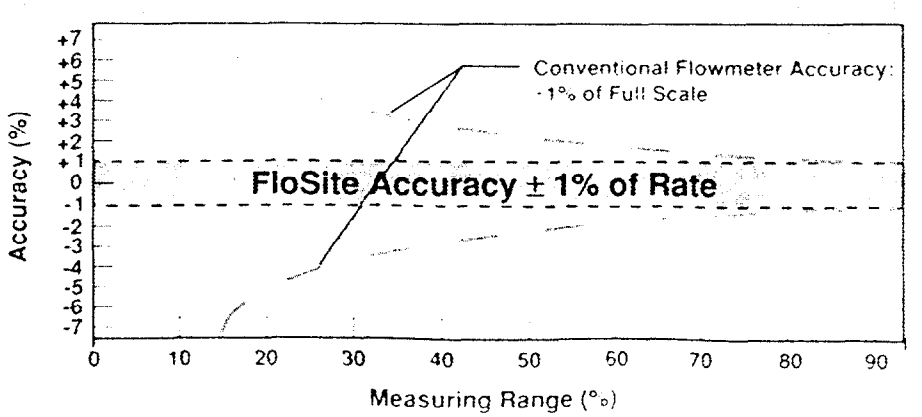


Typical Flow Rate Measuring Range for FloSite Sensors

Pipe Size Sched. 80 PVC	Fluid Velocity (ft/sec) Min	Fluid Velocity (ft/sec) Max	Flow (gpm) Min	Flow (gpm) Max
1.2"	0.529	7.827	0.4	8.0
3.4"	0.574	7.185	0.8	10.0
1"	0.871	6.531	2.0	15.0
1.1.4"	0.525	7.884	2.0	30.0
1.1.2"	0.538	7.171	3.0	40.0
2"	0.65	7.55	6.0	70.0
2.1.2"	0.752	7.522	10.0	100.0
3"	0.986	7.895	20.0	150.0
4"	0.973	7.945	35.0	275.0
6"	1.225	7.971	100.0	550.0
8"	1.577	7.719	225.0	1100.0

Based on water at 60F, max 8 ft sec velocity to minimize water hammer

Flow Sensor Accuracy Comparison



Flo-Site Flow Sensors have an accuracy of ± 1% of indicated flow over the full measuring range, unlike other flow sensors with accuracy stated as a percentage of full scale (maximum flow).

HAYWARD
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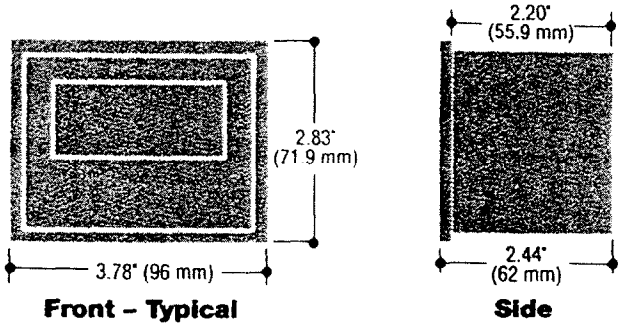
e-mail: industrial@haywardnet.com

Installation, Operation & Service Instructions

HAYWARD *FloSite* ™ Model 2300 DIGITAL FLOW INDICATOR / TOTALIZER

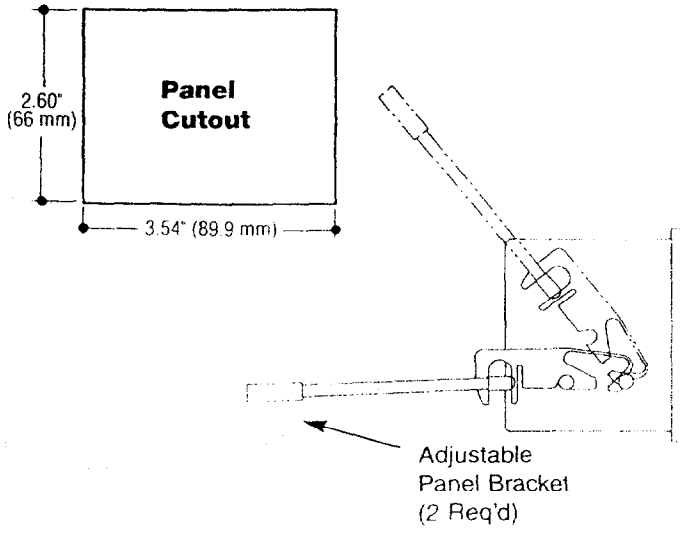
Read all instructions before installation or operation of equipment. Failure to comply with these instructions could result in bodily injury or property damage.



2. Mounting

The unit is panel mountable using the brackets provided. Install the bracket over the buttons on the side of the enclosure as shown below.

The unit can also be surface mounted using the optional wall mounting enclosure.



1. Introduction

The model 2300 Flow Indicator/Totalizer is an AC-powered (or low voltage DC-powered) panel-mounted flow rate indicator and totalizer with a 6-digit LCD display. The unit is programmable to allow display of flow rate and totalized flow in any volumetric unit.

In totalizer mode, the unit counts with a resolution of 0.1. When the totalizer reads 99999.9 the deicmal point will automatically shift to the right, up to a maximum count of 999999. resetting the total can be done through the front panel keypad or remotely by an external reset.

in the flowrate mode, only 4 digits are displayed (for example, F 999.9).

3. Keypad Functions

CAL (calibration) / ENTER Key
Selects between calibration and normal operating mode / accepts selected parameters or adjusted values.

< / MODE Key
In calibration mode selects next digit to be modified / in the normal operating mode selects the display as flow rate or totalized flow.

^ / RESET Key
In the calibration mode increments the digit to be modified / in the normal operating mode resets the totalized flow.

LLOYD'S REGISTER QUALITY CONTROL ISO9001 CERTIFIED

1. Press the **< /MODE** key to switch the display between flow rate (display shows F 0.0) and totalized flow (0.0).

2. In the totalized flow mode, reset the total flow by pressing and holding the **^/RESET** key for about 2 sec. (until display shows 0.0)

5. Calibration

The model 2300 has independent calibration for flow rate and totalized flow.

To calibrate the flowrate:

1. When the display shows flowrate press the **CAL/ENTER** key to enter the flow rate calibration mode. The display shows Fxx.xxx with the far right digit flashing.

2. Enter the calibration factor for the installation fitting used per the table on pg. 3. Press the **^/RESET** key to increment the digit until the desired value is reached. Press the **< /MODE** key to move the flashing digit one position to the left.

3. Store the calibration factor by pressing and holding the **CAL/ENTER** key for about 5 sec. (until display changes back to the flow rate mode).

To calibrate the total:

1. When the display shows the total flow press the **CAL/ENTER** key. The display shows c xxxxx or c x.xxxx with the far right digit flashing.

2. If the decimal point needs to be shifted, press the **CAL/ENTER** key again to switch back to the display of the total flow. Then press the **^/RESET** key and hold for 5 sec. (until the decimal point appears). Press the **CAL/ENTER** key again and the decimal will be shifted.

3. Enter the calibration factor for the installation fitting used per the table on pg. 3. Press the **^/RESET** key to increment the digit until the desired value is reached. Press the **< /MODE** key to move the flashing digit one position to the left.

4. Store the calibration factor by pressing and holding the **CAL/ENTER** key for about 5 sec. (until display changes back to the total mode).

Note:
For all calibration functions, it is important to store any desired setting changes by pressing and holding the **CAL/ENTER** key for the correct length of time - as indicated by the display changing to the next parameter while the key is being held. If the key is not held long enough, the display will advance to the next parameter without storing the new setting. It is therefore recommended any setting changes be checked (by re-scrolling to that parameter) before the unit is placed in operation.

5. Calibration (cont'd)

Use the following table to enter the flow rate and total scaling factors per the calibration procedure on the previous page. In some instances, for example 8" piping, a multiplier will be required for the display of total flow. For these applications, apply the GPM - Gallons x10 decal provided to the front of the indicator to cover the existing imprint.

Calibration in GPM and US Gallons

		To Calibrate FLOW		To Calibrate TOTAL		
Type / Size Installation Fitting	Pulses / Gallon	Flow Rate Calibration Factor 00.001 to 99.999		Totalizer Calibration Factor .00001 to 9.9999	If display shows c xxxxx	If display shows c x.xxxx
			Enter		Enter	Enter
Sch. 80 PVC T-Fittings						
1/2"	903.48	0.066	**00.066**	0.1107	**11070**	**0.1107**
3/4"	539.21	0.111	**00.111**	0.1855	**18550**	**0.1855**
1"	346.44	0.173	**00.173**	0.2887	**28870**	**0.2887**
1-1/4"	195.19	0.307	**00.307**	0.5123	**51230**	**0.5123**
Sch. 80 PVC Saddle Fittings						
1-1/2"	179.94	0.333	**00.333**	0.5557	**55570**	**0.5557**
2"	112.56	0.533	**00.533**	0.884	**88840**	**0.8884**
2-1/2"	76.65	0.783	**00.783**	1.3046	**(shift decimal) 1.3046**	**1.3046**
3"	46.63	1.287	**01.287**	2.1445	**(shift decimal) 2.1445**	**2.1445**
4"	24.45	2.454	**02.454**	4.0900	**(shift decimal) 4.0900**	**4.0900**
6"	10.10	5.941	**05.941**	9.9010	**(shift decimal) 9.9010**	**9.9010**
8"	5.41	11.091	**11.091**	18.484 (1.8484 x 10)	**(shift decimal) 1.8484***	**1.8484***
					*** Use x 10 label**	*** Use x 10 label**

Calibration in Liters/min and Liters

		To Calibrate FLOW		To Calibrate TOTAL		
Type / Size Installation Fitting	Pulses / Liter	Flow Rate Calibration Factor 00.001 to 99.999		Totalizer Calibration Factor .00001 to 9.9999	If display shows c xxxxx	If display shows c x.xxxx
			Enter		Enter	Enter
Sch. 80 PVC T-Fittings						
1/2"	238.70	0.251	**00.251**	0.4189	**41890**	**0.4189**
3/4"	142.46	0.421	**00.142**	0.7020	**70200**	**0.7020**
1"	91.53	0.656	**00.656**	1.0925	**(shift decimal) 1.0925**	**1.0925**
1-1/4"	51.57	1.163	**01.163**	1.9391	**(shift decimal) 1.9391**	**1.9391**
Sch. 80 PVC Saddle Fittings						
1-1/2"	47.54	1.262	**01.262**	2.1035	**(shift decimal) 2.1035**	**2.1035**
2"	29.74	2.017	**02.017**	3.3625	**(shift decimal) 3.3625**	**3.3625**
2-1/2"	20.25	2.963	**02.963**	4.9383	**(shift decimal) 4.9383**	**4.9383**
3"	12.32	4.870	**04.870**	8.1169	**(shift decimal) 8.1169**	**8.1169**
4"	6.46	9.288	**09.288**	15.4799	**(shift decimal) 1.5480***	**1.5480***
6"	2.67	22.472	**22.472**	37.4532	**(shift decimal) 3.7453***	**3.7453***
8"	1.43	41.958	**41.958**	69.9301	**(shift decimal) 6.9930***	**6.9930***
					*** Use x 10 label**	*** Use x 10 label**

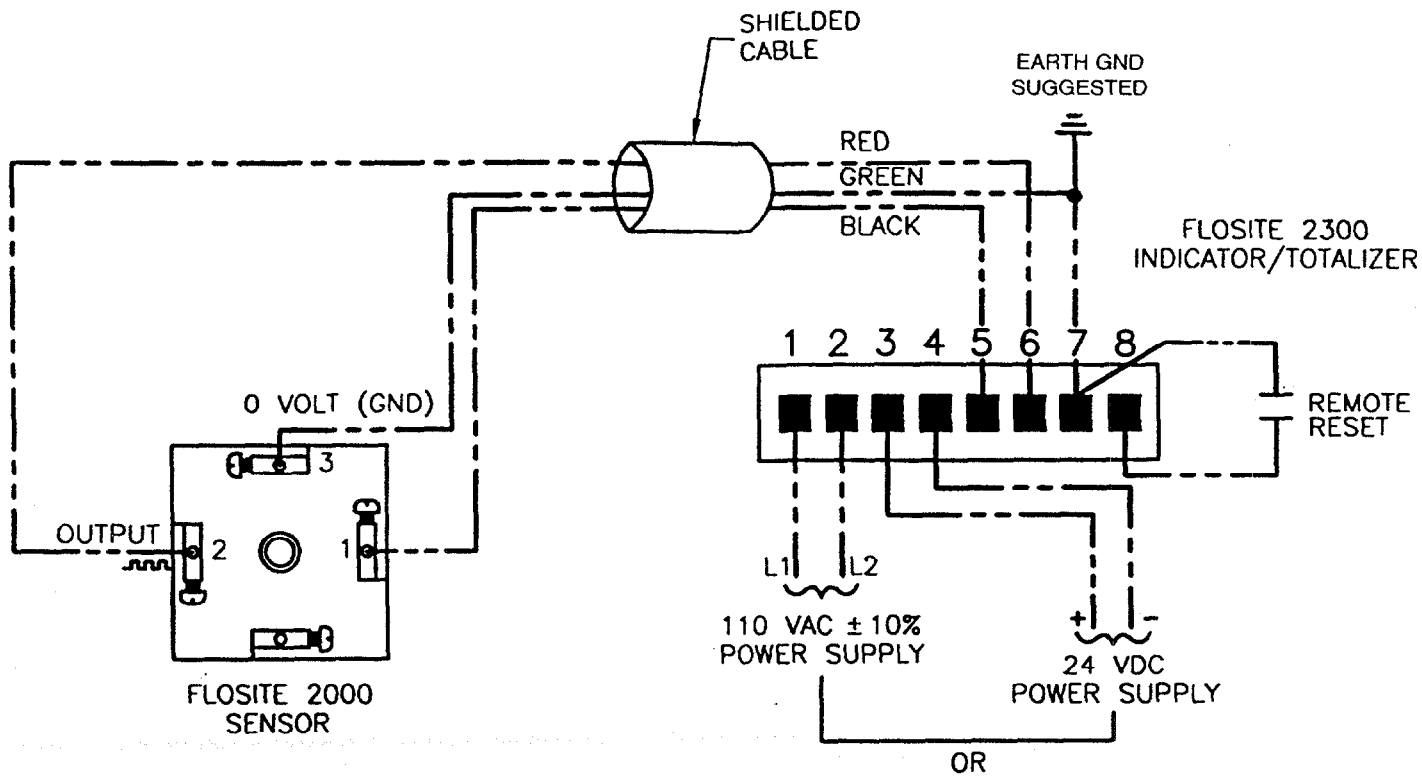
5. Installation Wiring

a. Use 4-conductor shielded cable (24 AWG) for instrument wiring up to 325 ft. from sensor

. All wiring should conform to local electrical codes

WARNING

Disconnect power supply before making any wiring connections. Failure to do so may result in personal injury or damage to the instrument.



7. Technical Data

Display Type: 6-digit LCD for flowrate or totalized flow (user-selectable)

Volumetric Units: Flowrate in GPM

Operating Range: 6.3 to 420 Hz.

Input: Square wave, 12 to 24 V p-p from model 2000 flow sensor

Sensor to Indicator Distance: Up to 325 ft. (100m)

Power Requirement: 110VAC, 50/60 Hz or 24V dc. (Note: Indicator provides 12V dc power to the sensor)

Electrical Connection 8-point terminal strip on rear of unit

Enclosure Rating: NEMA 4X (IP65) when panel mounted

Operating Temperature: 32 to 140F (0 to 60C)

Enclosure Materials: ABS

Mounting: Panel

Options: Wall-mounting enclosure (rated NEMA 4X) with two cable glands to accept 4-conductor shielded cable from sensor

8. Warranty

Consult your Hayward FloSite Distributor for warranty details.

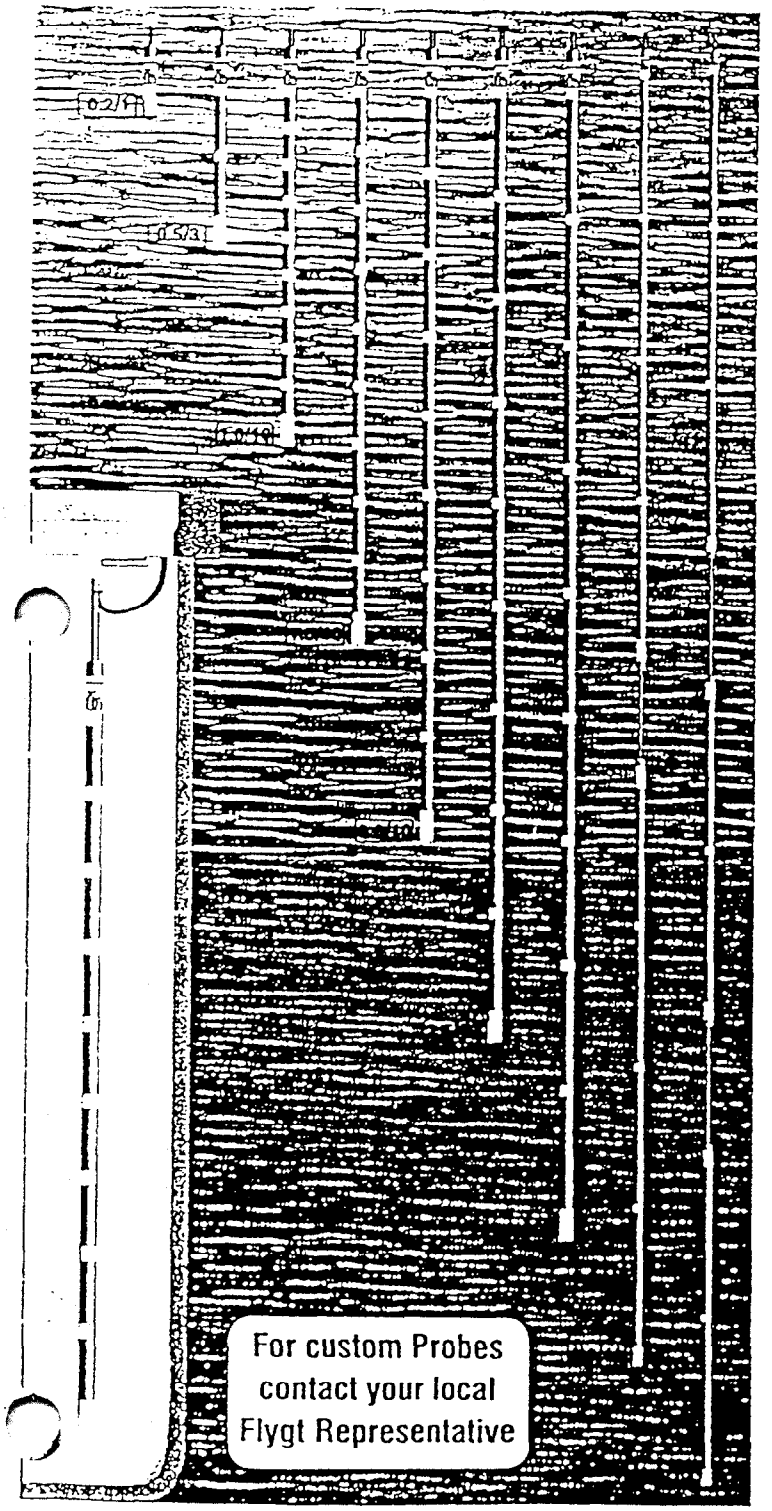
LEVEL SENSORS

Probe

Conductive level sensor

The Probe is ideal for conductive liquids in aggressive and turbulent applications.

FLYGT® MULTITRODE



- ☐ Virtually nil maintenance required
- ☐ Simple installation from outside of sump
- ☐ Safe, low sensing voltage.
- ☐ Unaffected by fat, grease, debris and foam
- ☐ Excellent in turbulent sumps.
- ☐ Positive pump cutout (no overruns)
- ☐ Cost-savings, short and long term.
- ☐ Environmentally friendly
- ☐ Operates with a Flygt mix & flush valve
- ☐ Intrinsically Safe operation using MultiTrode's I.S. Barrier

MultiTrode has proven to be the most reliable and cost-effective liquid level control system available. MultiTrode Probes were specifically designed for the arduous, turbulent conditions encountered in water, sewage and industrial tanks and sumps.

Installation: Probe installation is easily achieved without the need to enter the wet area. The probe is simply lowered in from the top and suspended by its own cable, using the mounting kit supplied.

Fat, Grease, Debris and Foam: The probe's operation is unaffected by the build-up of fat, grease, debris and foam, which cause systems such as floats, bubblers, pressure and ultrasonic transducers, as well as other conductive probe systems, to fail.

Turbulence: Turbulence does not affect the probes operation, in fact it has a beneficial cleaning effect. The rugged, streamlined construction of the probe eliminates tangling and allows for operation in confined spaces and is a perfect partner for the Flygt mix & flush valve.

Safety: The personal safety of operators and maintenance staff is assured due to the extra-low sensing voltage, eliminates the use of dangerous high voltage equipment, and the risk of electric shock.

Positive Pump Cut-Out: The probe ensures your pumps are turned off at the same level every time. This avoids damage due to pump over runs and the need costly control equipment

Cost Savings The low cost of equipment and installation makes MultiTrode one of the most economical systems available. MultiTrode's long life ensures continued cost savings, as compared to alternate forms of level control.

Environmentally Safe
MultiTrode probes do not contain mercury or any other environmentally damaging contaminants.

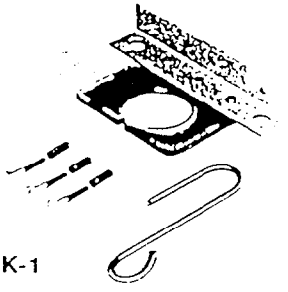
All MultiTrode Products carry a full two year warranty

Supplied mounting kit

The MTAK-1 mounting bracket is SUPPLIED STANDARD with all multi-sensored probes.

The MTAK-1 mounting bracket has an integral cleaning device.

All metal components are manufactured from #316 stainless steel.



MTAK-1

Custom Probes also available

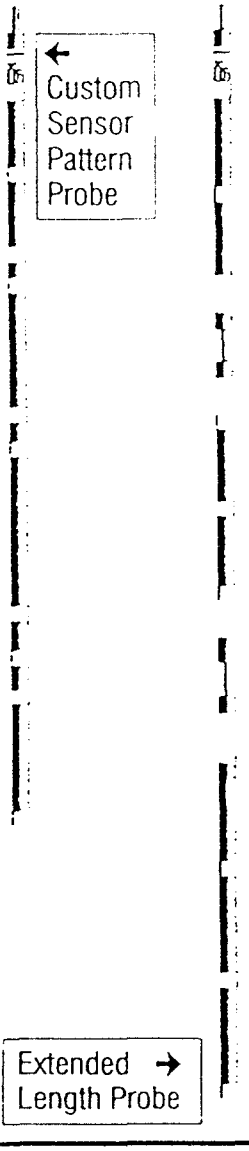
MultiTrode offers a variety of custom probes. Your custom probe is manufactured exactly to your requirements.
(Within the following limits.)

No. of Sensors	25 max
Sensor spacing	3.1/2in min
Section length	115in max
Cable length	1500ft max

Your assistance with an application drawing, specifying cable lengths and sensor spacings will ensure prompt and accurate service.

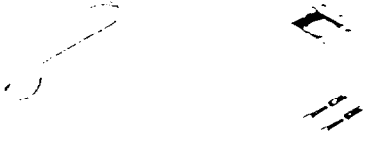
Probes over three metres in length are made in sections.

Please contact your local ITT-Flygt ~ MultiTrode representative for a copy of the Custom Probe Order Form.



Mounting Options:

MultiTrode's MTAK-2 Extended mounting bracket provides up to 12 inches of extra wall clearance.
(For further details please refer to the MultiTrode accessories section)



MTAK-2

Specifications — Probe

Materials

Sensors:	Avesta 254 SMO High Grade Stainless Steel Alloy
Probe Casing:	uPVC Premium Quality Extruded Tube
Cable:	PVC/PVC Multi-core, Purpose manufactured (see below)

Dimensions

1.1/4 inches diameter x specified length
32mm diameter x specified length

Mounting: Via the supplied suspension/ cleaning bracket inside the wet well

Temperature Range

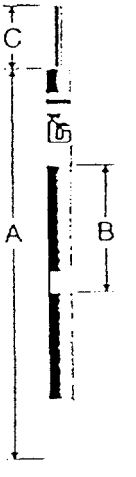
0° to 100° C
32° to 212° F

Cable

	Multicore	Three core	Single core
Conductor:			
Conductor Size	0.75 mm²	0.75 mm²	1.0 mm²
Strands	24	24	30
Ω/km	25 Ω	25 Ω	20 Ω
Ω/mile	40 Ω	40 Ω	32 Ω
Oversheath:			
Nom Diameter	12 mm	8 mm	6.9 mm
Colours:	Multi cores	Light blue	
	Oversheath	Dark blue.	
Identification:	All cores are light blue printed to read 1-ONE-1, 2-TWO-2, etc. Every 8 inches. *(Numbering applies to multicore cable only).*		

Ordering Information - Standard Probes

MODEL A / D - C	Length A Inches	Spacing B Inches	Cable C Feet
0.2/ 1 - C	8	/ N/A	- 33 or 100
0.5/ 3 - C	16	/ 6	- 33 or 100
1.0/ 10 - C	40	/ 5	- 33 or 100
1.5/ 10 - C	60	/ 6	- 33 or 100
2.0/ 10 - C	80	/ 7	- 33 or 100
2.5/ 10 - C	96	/ 10	- 33 or 100
3.0/ 10 - C	115	/ 12	- 33 or 100
6.0/ 10 - C	224	/ 24	- 33 or 100
9.0/ 10 - C	368	/ 40	- 100



A = Nominal probe length
B = Distance between sensor points
C = Cable length
D = Number of sensors

e.g. 80 / 10 – 100 (Probe length / Sensor points – Cable length)

Cable lengths of up to 1500ft are available

Approvals:

UL listed 2P27

Approved for I.S. applications when installed in conjunction with a MultiTrode MTISB Intrinsically Safe Barrier

FLYGT ~ MULTITRODE

PROBE Specification

Description

1.1 The probe shall be constructed from uPVC 32mm tubing with moulded sensor units at regular intervals along the probe. Each sensor unit will be PVC injected to prohibit ingress of moisture, and the sensor material will be Avesta SMO254 stainless steel.

2. Mounting

2.1 The probe will be mounted in a turbulent area of the wet well, suspended on its own cable and connected to a 6mm stainless steel hook which would hang from a 30mm stainless steel angle containing a polyurethane squeegee pad positioned in the opening into the wet well, so that the probe can be removed without entering the wet well. The squeegee will have a 30mm hole and slot, enabling the probe to be pulled through and cleaned.

2.2 Installation will be effected done in accordance with the manufacturer's installation instructions.

2.3 The probe is covered by the manufacturer's two-year warranty.

3. Probe & Sensors

3.1 10 sensors will be spaced along the length of the probe assembly, and each will be individually connected to a correspondingly numbered PVC/PVC .75mm flexible cable.

3.2 The moulded sensor unit will contain two Avesta sensors mounted on opposite sides of sensor unit. Each Avesta sensor will be 24mm high and no wider than 2mm, and will protrude from the surface of the PVC.

3.3 The probe shall be pressure injected with an epoxy resin to encapsulate all internal components and connections to form a rigid, homogenous unit.

3.4 Each sensor unit containing the two Avesta sensors will be rotated 90 degrees to the previous sensor unit to eliminate tracking between sensors.

4. Cable

4.1 The cable will be encoded with number and text along the entirety of the cable and at intervals not greater than 200mm, for identification. This cable will be dark blue in colour, with the cores light blue.

4.2 The flexible cables shall be capable of supporting the weight of the probe and cable, without the need for additional support.

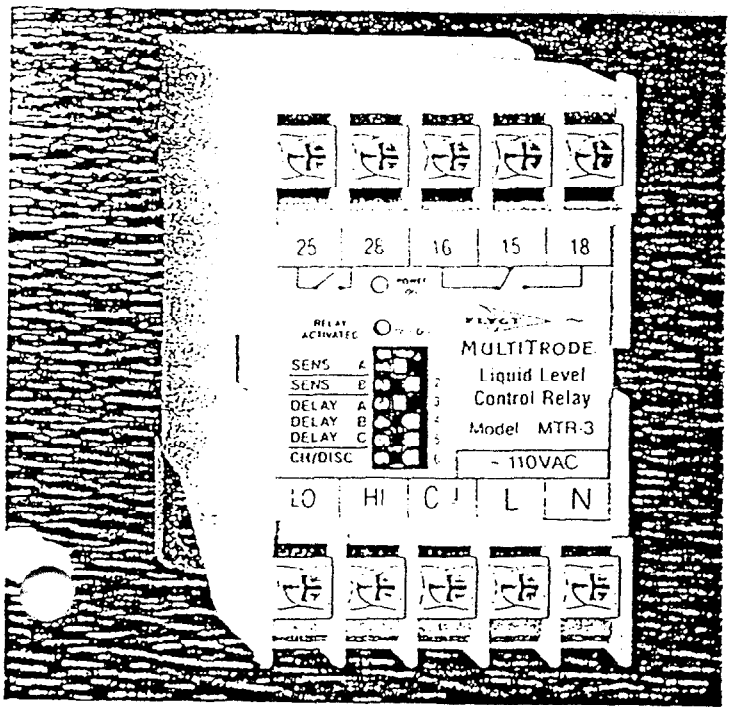
4.3 The cable shall be secured to the top of the probe by a synthetic rubber compression fitting.

Basic Relay

MTR
MultiTrode Relay

Controls either one pump, alarm or solenoid.

FLYGT ~ MULTITRODE.



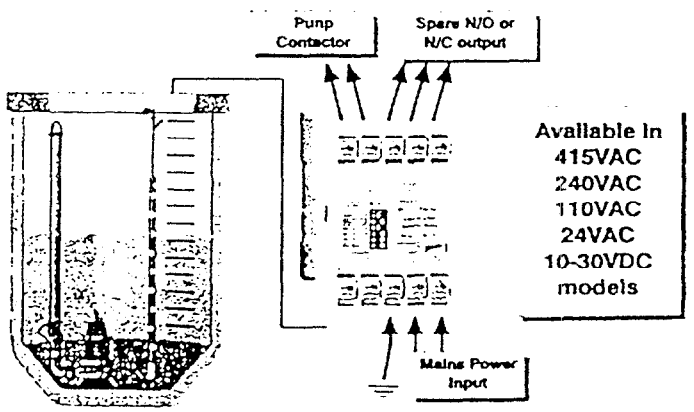
The MultiTrode MTR is a latching conductive liquid level relay. When connected to a MultiTrode probe, the MTR controls the activation and de-activation of pumps, alarms and other monitoring and control equipment.

The relay senses the liquid via a safe extra-low voltage signal and latches. This state is maintained until the circuit is broken when the liquid passes the selected stop sensor. The relay then resets for the next operation. A single sensor may be used for alarms

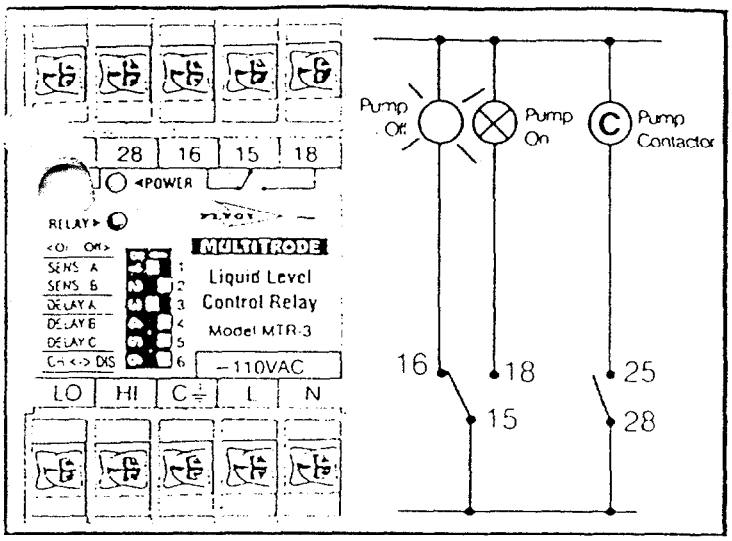
The MTR relay offers many features found in several discrete devices such as latching and time delay relays. Normally all of these devices must be installed individually. MultiTrode's MTR includes all of these features in one compact case, simplifying installation and reducing labour costs.

Use the MTR in any applications where level control is required, such as sumps, wells, bores, collection tanks, effluent pits, drainage ponds, pump stations, reservoirs, and sullage pits.

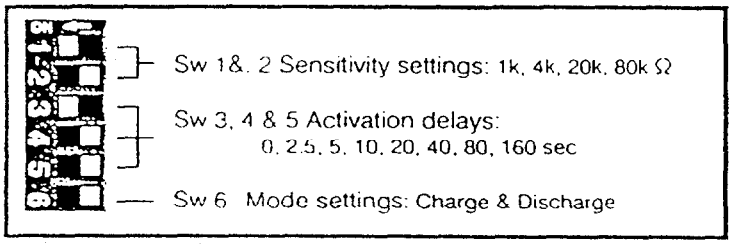
- **Safe, extra-low, sensing voltage:** Ensures safety for operators and maintenance personnel .
- **Charge or discharge:** The modes of operation are selectable to either fill or empty a tank.
- **Dip Switch Programmable:** All settings are easily selected from the front panel. Fixed settings ensure repetition and accuracy.
- **4 Sensitivities:** Enable the relay to operate effectively in a wide range of conductive liquids.
- **8 Activation Delays.** Used for staggering multiple pump starts or to overcome premature activation due to wave action or turbulence.
- **LED Indication.** Power On (green) and Relay Activation (red) via high intensity LED indicators.
- **Battery Operation.** As well as 24, 110, 240 and 415VAC, the MTR Relay is also available in 10-30 VDC.
- **Proven Reliability.** The proven design of the relay ensures long-term reliability of the MultiTrode system.
- **I.S. application** Perfect for I.S. application when used with MTISB.
- **DIN rail or screw mounting**
- **Low installed cost**



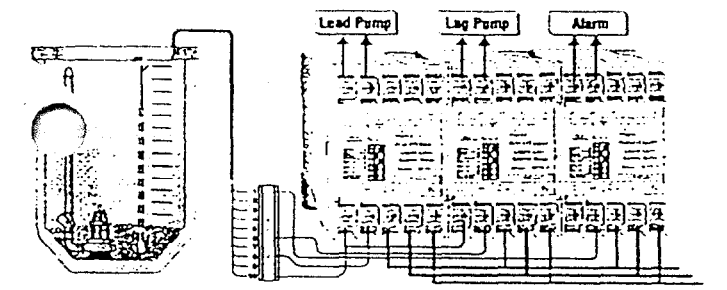
All MultiTrode Products carry a full two year warranty



Dip Switch Settings

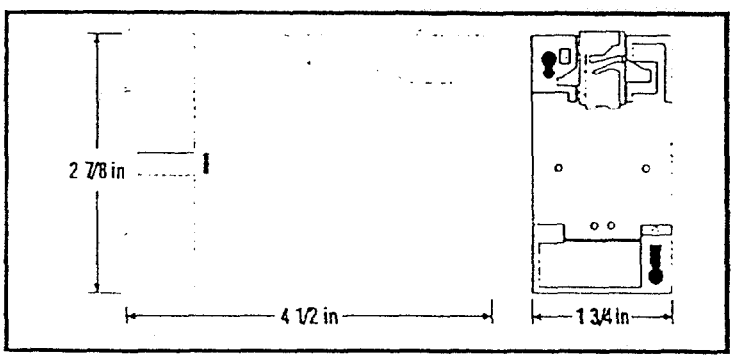


Multiple MTR Application



Note: Several relays can be connected to a single probe

Dimensions



Approvals

UL listed 2P27

Perfect in I.S. applications when installed in conjunction with a MultiTrode MTISB Intrinsically Safe Barrier

Mode of operation

Charge or Discharge (Filling or Emptying)

Probe Inputs

Sensor inputs	2
Sensor voltage	12VAC Nominal
Sensor current	0.8mA max. (per sensor)
Sensitivity	1k, 4k, 20k, 80k Ω

Other Inputs

None

Relay Outputs

No of relay outputs	2 sets : 1 N/O & 1 C/O
Output delay	0, 2.5, 5, 10, 20, 40, 80, 160 sec
Relay contact rating	250 VAC 5A Resistive, 2A Inductive
Relay contact life	10^5 Operations
Terminal size	2 x 2.5mm², #13

Other outputs

None

Display

LEDs	Green : Power On, Red : Pump activation

Communications

None

Physical Product

Dimensions mm	72H x 45W x 114D
Dimensions inches	2.7/8H x 1.3/4W x 4.1/2D
Mounting	DIN Rail or 2 x M4 Screws #6
Enclosure	Makrolon (self extinguishing)

Power Supply

Supply Voltage AC	24, 110, 240, 415VAC 50/60Hz
Power Consumption	3.4VA max
Supply Voltage DC	10 to 30VDC, 3 Watts max

Working Temperature Range

-10° to $+60^{\circ}$C
$+14^{\circ}$ to $+140^{\circ}$F

Ordering Information

AVAILABLE MODELS	
MTR - 1	415VAC
MTR - 2	240VAC
MTR - 3	110VAC
MTR - 4	24VAC
MTR - 7	10-30VDC

Ordering Example

e.g. MTR – 3 (Model – Voltage)

All MultiTrode Products carry a full two year warranty

FLYGT ~ MULTITRODE

MTR Relay Specification

The conductance level control relay shall be a DinRail mounted device with supply and activation LEDs, eight programmable activation delays, charge/discharge settings, and four sensitivity settings all easily carried out whilst installed.

1. Mounting

1.1 The relay shall be mounted via Din rail or optionally screw mounted

2. Indication

2.1 A green LED shall be provided on the front of the relay and will remain illuminated whilst power is connected to the unit.

2.2 A red LED shall be provided on the front of the relay and will remain illuminated whilst the output relay is active.

3. Outputs

3.1 Two independent contact sets shall be provided, - one normally open contact and one change-over contact.

3.2 Each output shall be capable of a 5amp resistive load at 250VAC.

4. Sensitivity

4.1 DIP switches shall be provided for adjustment of probe sensitivity in four steps.

4.2 2K, 4K, 20K, 80K settings shall be provided.

5. Time Delays

5.1 An instantaneous, 2.5, 5, 10, 20, 40, 80 and 160 second activation delay will be selectable from DIP switches mounted on the front of the unit.

6. Programming Label

6.1 A programming label shall be attached to the right hand side of the unit, clearly indicating all programmable settings.

7. Probe Inputs

7.1 Two probe inputs will be provided.

8. Sensing Voltage

8.1 Max 13VDC at 0.8mA each.

9. Mode

9.1 The shall be programmable for charge or discharge operation.

Appendix B
Pump Calculations

WESTON MANAGERS DESIGNERS/CONSULTANTS

SHEET P-1 of ____

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____ DEPT _____ DATE _____

DETERMINE Pump Discharge Pressure

1. Normal operation would be to regulate the flow through the globe valve slightly less than influent flow. Normal flow is 8 GPM so flow will be regulated at 7 GPM.
2. Emergency operation is to open solenoid valve and allow additional flow to pass through the sol. valve.

During the emergency operation the flow rate will be distributed into each leg so that the ΔP thru each leg will be equal and the flow through each leg will vary. In order to calculate the pump requirements evaluate the worst case scenario which will be the total flow, 10 GPM, flowing through the leg with the globe valve and solenoid valve.

A. Calculate the friction in the pipe system from the pump to the flow meter.

Pipe Size: 1½", SCH 40 ID = 1.6"
Pipe Matl: PVC
C Factor: 140

Hazen Williams formula $h_f = (.002083)(L)\left(\frac{100}{C}\right)^{1.85}\frac{(GPM)^{1.85}}{d^{4.8655}}$

(SEE ATTached Piping Arrangement)

Pipe Length	=	7 FT
90° ELL = 2×4	=	8
Tee Branch 2×8	=	16
CK Valve 1	=	13
Globe Valve 1	=	46
	TEL =	90 FT Say 100 FT

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____ | APPROVED BY

MATH CHECK BY _____ DEPT _____ DATE _____ | _____

METHOD REV. BY _____ DEPT _____ DATE _____ | DEPT _____ DATE _____

$h_f = (.002083)(100)\left(\frac{100}{140}\right)^{1.85} \frac{(10)^{1.85}}{(1.6)^{4.8655}} = .8$ FT

Pressure Drop Sol Vlv = .45 ft

Total dP from Pump To Flow meter = 1.3 FT

B. Based on discussions and information from SBP The following Down Hole Pressures as measured on The Effluent Pressure Gauge has been recorded relative to influent flow rate. It is assumed That The influent flow = Effluent Flow

On 8/6/98 it was reported That for UVB-1 @ 1.1 GPM 'P' Gage = 1.75 PSI one Pump operating - And For UVB-2 @ 7.23 GPM 'P' Gage = 11 PSI for 2 Pumps operating.

See Attached sheet for other 'P' Gage readings

For This Calculation I will Assume That The Down Hole Pressure is 15 PSI (34.7 feet) @ a Flow Rate of 10 GPM

C. The Static Head from The Pump To The Pressure Gage is 7.0 - 1.5 = 5.5 ft

D. Add Pressure Drop For Piping Friction from The Flow Meter To The Pressure Gage

Pipe Length Vert = 5'

Horiz = 15'

90° Ell 1 = 8' TEL = 28' → 30'

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

PREPARED BY _____ DEPT _____ DATE _____

MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY

DEPT _____ DATE _____

$h_f = (.002083)(30)\left(\frac{100}{140}\right)^{1.85}\frac{(10)^{1.85}}{(1.6)^{4.8655}} = .24$ FT

E. ADD Pressure Drop Through Flow Meter

NO Info. Avail. Assume 2 PSI AND Revise when Receipt of Info from Vendor.

TOTAL PUMP TDH = 1.3 + 34.7 + 5.5 + .24 + 4.6 = 46.3 ft

10 GPM @ 47 FT

WESTON
MANAGERS DESIGNERS CONSULTANTS

SHEET P-4 of ___

CLIENT/SUBJECT _____ W.O. NO. _____

TASK DESCRIPTION _____ TASK NO. _____

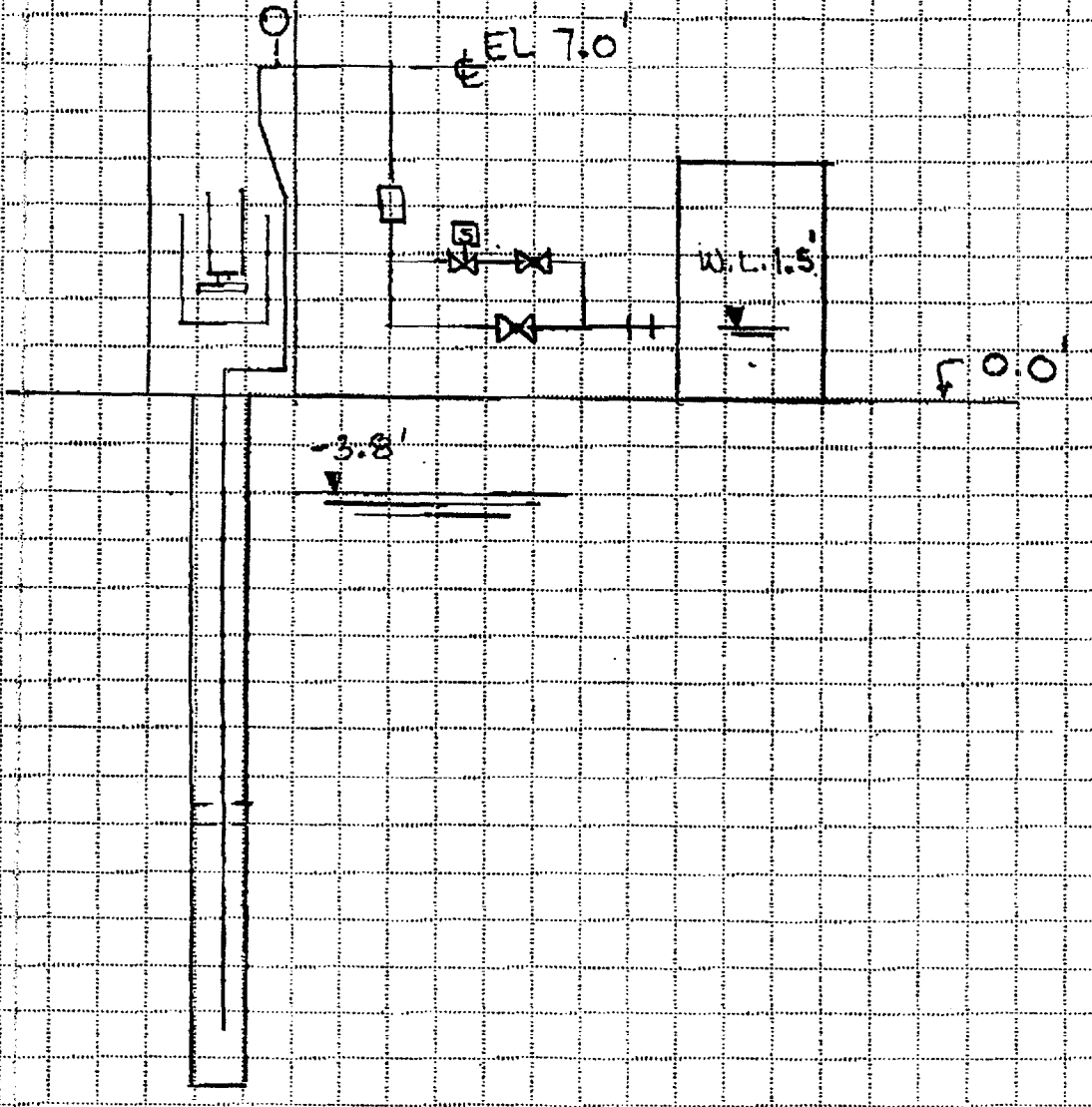
PREPARED BY _____ DEPT _____ DATE _____

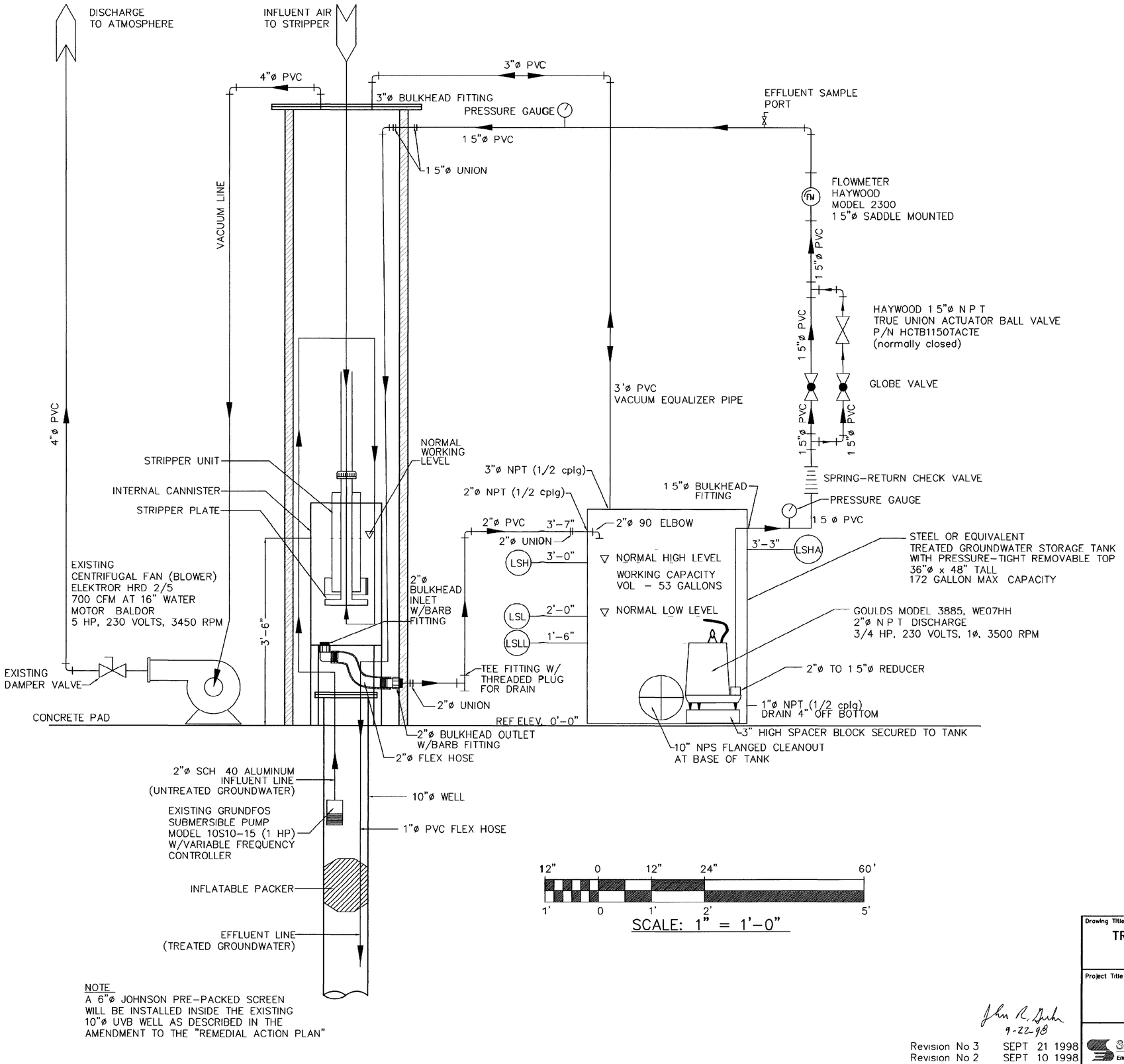
MATH CHECK BY _____ DEPT _____ DATE _____

METHOD REV. BY _____ DEPT _____ DATE _____

APPROVED BY _____

DEPT _____ DATE _____





NOTE
A 6"ø JOHNSON PRE-PACKED SCREEN WILL BE INSTALLED INSIDE THE EXISTING 10"ø UVB WELL AS DESCRIBED IN THE AMENDMENT TO THE "REMEDIAL ACTION PLAN"

John R. Duke
9-22-98

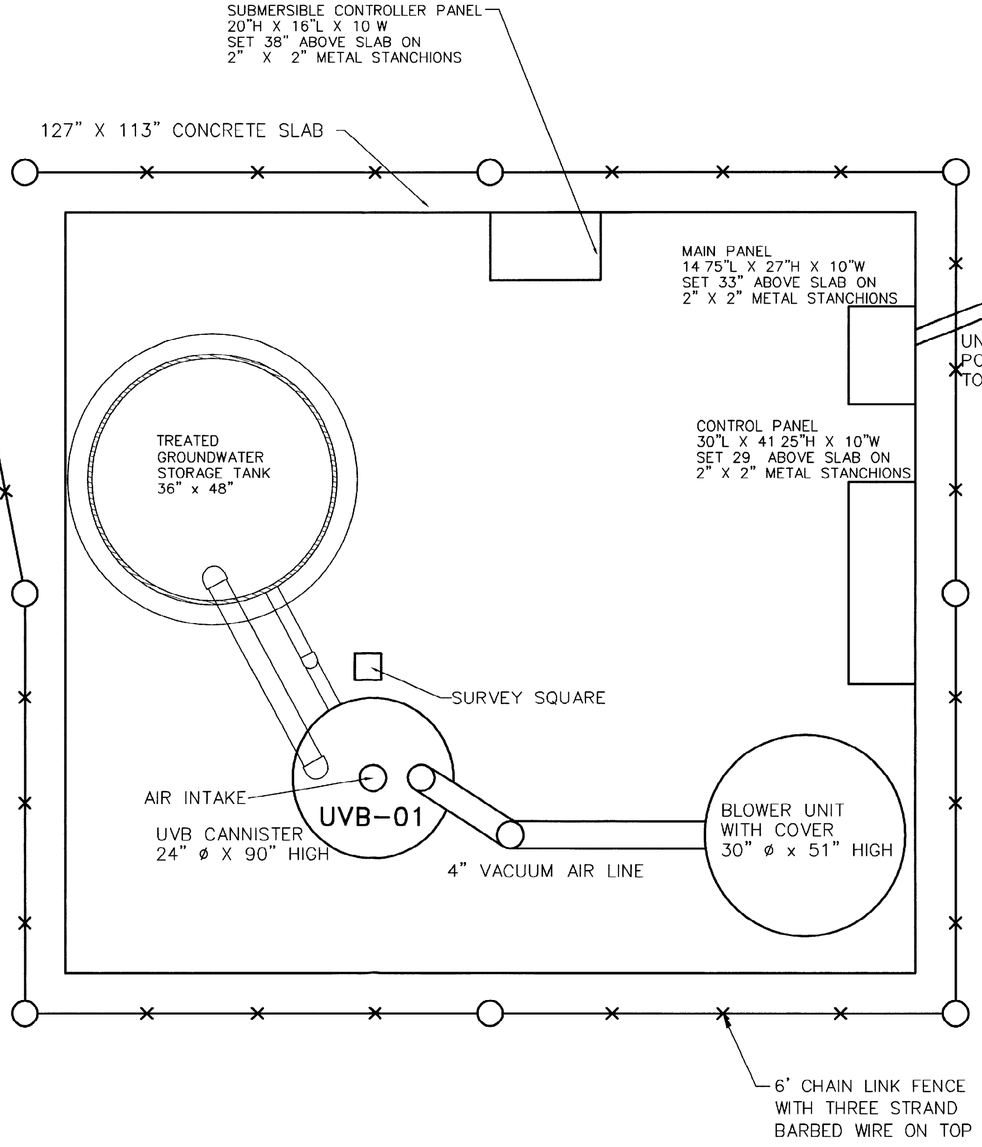
Revision No 3 SEPT 21 1998
Revision No 2 SEPT 10 1998
Revision No 1 SEPT 02 1998

Drawing Title
TREATED GROUNDWATER STORAGE TANK PROCESS FLOW DIAGRAM

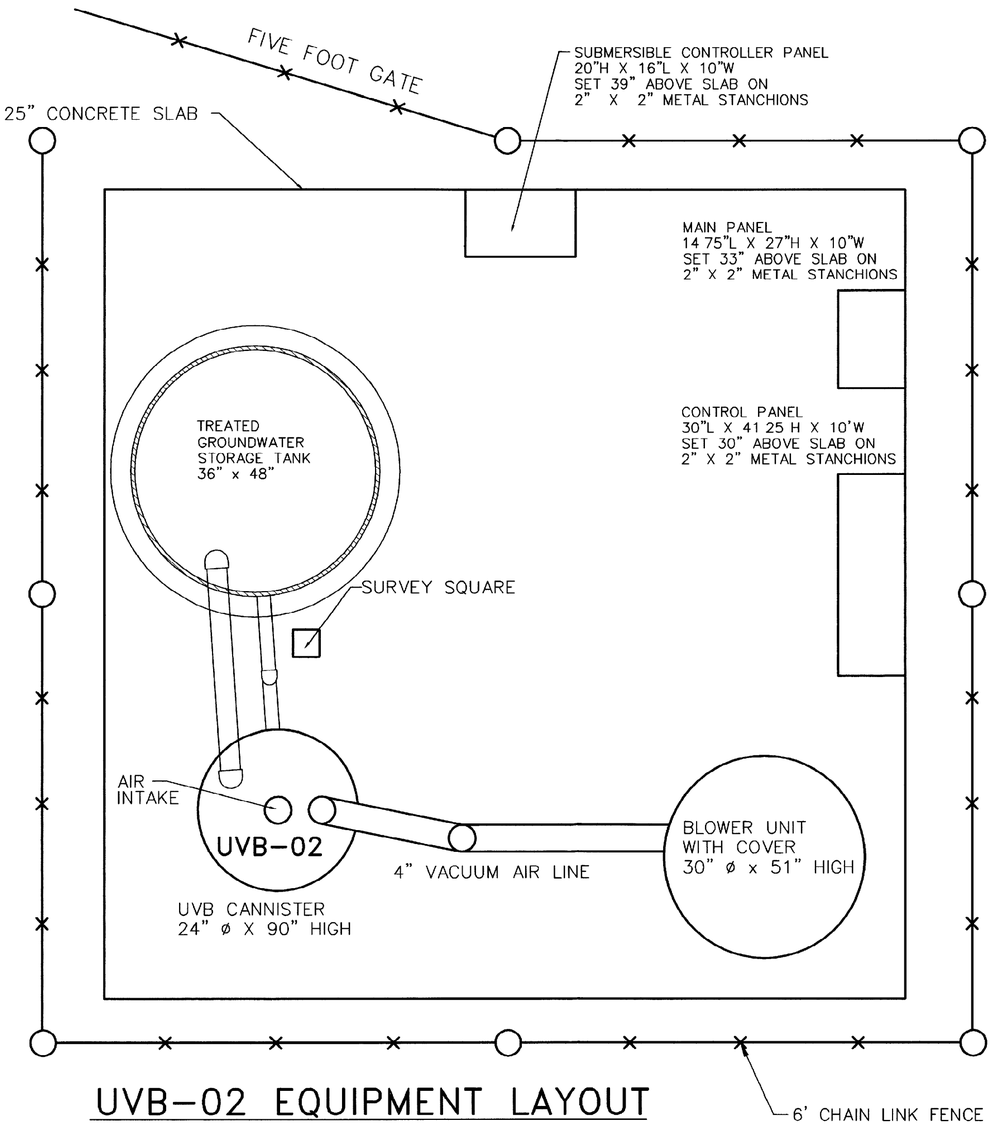
Project Title
ORLANDO NAVAL TRAINING CENTER ORLANDO, FLORIDA

SBP Technologies, Inc
Environmental Engineers and Bioremediation Specialists

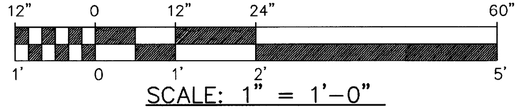
DWN	DES.	PROJECT NO
AJM	RFW	98198 10
CHKD	APPD	
RJD	XXX	FIGURE NO
DATE	REV	98198-A
8-14-98	XXX	



UVB-01 EQUIPMENT LAYOUT



UVB-02 EQUIPMENT LAYOUT



SCALE: 1" = 1'-0"

John R Gish 9-22-98

Revision		
No 3	SEPT 21	1998
No 2	SEPT 10	1998
No 1	SEPT 02	1998

Drawing Title

EQUIPMENT LAYOUT PLAN

Project Title

ORLANDO NAVAL TRAINING CENTER
ORLANDO, FLORIDA

SBP Technologies, Inc
Environmental Engineers and Bioremediation Specialists

DWN AJM	DES RFW	PROJECT NO. 98198 10
CHKD RJD	APPD xxx	FIGURE NO 98198-B
DATE 8-14-98	REV xxx	