OPERATION AND MAINTENANCE MANUAL

Wauconda Landfill Remediation
Wauconda, Illinois

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CONESTOGA-ROVERS & ASSOCIATES

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1.0 INTRODUCTION

This Operation and Maintenance (O&M) Manual has been revised effective September 1996 by Conestoga-Rovers & Associates (CRA) and updates the previous O&M plan, dated April 1991.[1] The plan presents the operation, maintenance and long-term care requirements associated with each component of the final remedial measures for the Wauconda Landfill (Site). This manual and its stated procedures have been prepared in accordance with the approved Remedial Design/Remedial Action Work Plan for the Site.[2] Major aspects of the final remedial measures included:

- leachate collection system;
- landfill cap, drainage system, security fence, access roads;
- landfill gas vents and soil gas monitoring probes; and
- groundwater monitoring wells.

The Village of Wauconda (Village) provides O&M of the leachate collection system (LCS), as provided by an agreement with the Wauconda Task Group (WTG). The Site Custodian, contracted by the WTG, provides custodial/inspection duties for the landfill. CRA will provide ongoing environmental consulting services to the WTG.

Copies of pertinent Site reports, drawings and information are maintained in a filing cabinet located at the leachate storage building.

1.1 SITE DESCRIPTION

The Site is located in Lake County, Illinois, within the Village of Wauconda. The Site location is depicted on Figure 1.1. The 60-acre Site, which consists of a 43-acre unpermitted landfill (the portion of the Site which was operated before permits were required) and a 6-acre permitted

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1 Conestoga-Rovers & Associates. 1991. Operation and Maintenance Manual. Wauconda Landfill Remediation, Wauconda, Illinois.

2 Conestoga-Rovers & Associates. 1991. Remedial Design/Remedial Action Work Plan. Wauconda Landfill Remediation, Wauconda, Illinois.

landfill. The Site was operated as a sanitary landfill from the mid-1950's until its closure in 1978. A Site Plan which depicts the Site boundary is presented as Figure 1.2.

1.2 HEALTH AND SAFETY REQUIREMENTS

Health and safety requirements for the Site are detailed in the updated Health, Safety and Contingency Plan (HSCP) for the Site.[3] The following paragraphs summarize the items within the HSCP.

Persons working at the Site and any visitors will be required to sign the hard-cover Inspection/Maintenance/Visitor Log on a daily basis. The Log is located in the leachate storage building. Persons entering the Site for the first time will be informed of the potential hazards of the Site by either the Village, the Site Custodian or CRA. Visitors touring the Site (i.e. not conducting work) will be escorted at all times by CRA or the Site Custodian.

All personnel working on the Site where a hazard may be present, or where such persons may be exposed to the hazards of the Site, will have applicable OSHA training and medical monitoring requirements as specified in 29 CFR 1910.120. Training requirements under these standards will not apply to personnel who have no probable likelihood of being exposed to safety hazards or health hazards of the Site.

The Village, the Site Custodian and CRA will be responsible for providing its employees who are performing duties at the Site, with necessary personal protective equipment (PPE) and air quality monitor(s), and will further ensure proper use, cleaning and disposal of such items. Either CRA or the Site Custodian will ensure that Site contractors have appropriate training.

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[3] Conestoga-Rovers & Associates. 1996. Health, Safety and Contingency Plan. Wauconda Landfill Remediation, Wauconda, Illinois.

Any equipment contacting waste or leachate will be decontaminated. Trucks used only for the purpose of delivering imported materials (clay, sand, topsoil, aggregate) will not require decontamination.

A concrete pad and sump, which may be used for equipment decontamination, is located adjacent to the building enclosure. A first-aid kit and emergency eyewash are located inside the building enclosure.

1.3 PUBLIC RELATIONS PROCEDURE

At the request of the WTG, all inquiries, questions or complaints received by Site contractors or the Site Custodian from the media, government agencies, neighbors or the general public are to be directed to CRA.

2.0 LEACHATE COLLECTION SYSTEM

The LCS is designed to intercept and remove leachate from the landfill north slope. A horizontal perforated pipe within a gravel bed along the northern waste limit of the landfill collects leachate and conveys it by gravity flow to Sump 2 where it, in turn, is conveyed to Sump 1 (pumping chamber) via a solid wall pipe. From Sump 1, leachate is pumped via a forcemain to the Village of Wauconda sanitary manhole 12-24, or alternatively, is transferred via a forcemain to the leachate storage building to temporary on-Site storage.

Portions of the LCS were originally constructed in 1987 with an upgrade constructed in 1991. The combined system consists of three operational components, as follows:

- A gravity flow LCS across the north limit of the landfill connecting to a pumping chamber at the west side of the landfill;

- A transfer forcemain from the pumping chamber along the west Site boundary connecting to the Village of Wauconda sanitary manhole 12-24 on Bonner Road; and

- A backup forcemain from the pumping chamber running parallel to the LCS connecting to an aboveground storage facility located at the northeast corner of the landfill.

The general features of the leachate collection system are shown on Figure 2.1. A detailed set of record drawings and approved shop drawings depicting the above are maintained at the Site. The figures provided in this report are for illustration only and may not reflect all aspects of the installation.

Routine operations involve pumping leachate to the Village's manhole 12-24 on Bonner Road. By agreement between the WTG and the Village, the discharge volume is limited to 28,000 gallons measured over a moving 7-day period. In the event that collected volumes would exceed permit limits, leachate may be transferred to the aboveground storage tank

(temporarily) until it can be returned for discharge to the Village's manhole 12-24. As contingency to the above, leachate may be removed from the aboveground storage tank by a licensed liquid special waste haulage vehicle for disposal to the CID Disposal Facility in Calumet City, Illinois. Such an event must be pre-approved by CRA or the WTG and proper Illinois Environmental Protection Agency (IEPA) manifesting must be completed.

A summary of the monthly leachate removal volumes is presented on Table 2.1 for the years 1989-1995, as determined from the custodial records. Leachate collection volumes are precipitation dependent. Based on Table 2.1, typical flows are likely to range from 320 gallons per day (gpd) (dry or frozen months) to 3,000 gpd (wet or snowmelt months). However, the overall average daily collection rate is calculated to be on the order of 1,500 gpd and should decrease in the future due to cap upgrading and maintenance.

2.1 OPERATING PERMITS

The WTG has obtained permits from the IEPA - Division of Water Pollution Control for the discharge of collected landfill leachate to the Village of Wauconda sewage treatment plant via a forcemain connection (Permit #1991-EN-4193). A permit for transporting leachate by truck to the Village sanitary system was also issued to the WTG (Permit #1991-EE-3599). This permit is used as a contingency should the forcemain be shut down for maintenance. Copies of these permits are provided in Appendix A. Both permits will be kept current.

An acceptance permit from the CID Disposal Facility was issued November 20, 1995 for treatment of leachate from the Wauconda Landfill. This acceptance permit expires in November 1998. Leachate will be disposed at CID only in the case that discharge to the Village should cease for any reason. The discharge would be conducted under IEPA Generic Permit #000195. A copy of this CID agreement is provided in Appendix A.

2.2 LEACHATE COLLECTION SYSTEM COMPONENTS

2.2.1 Drain Tile Collection Line

The LCS consists of a 6-inch diameter Schedule 80, perforated PVC pipe, installed in a gravel bed. The collection pipe is buried at a depth of approximately 6 feet below ground surface. The pipe and gravel bedding are wrapped with filter cloth to minimize sedimentation and clogging of the pipe. The length of the entire installation is approximately 1,000 feet, nominally sloped from east to west. The bedding of the collection system is covered with a clay layer to minimize direct infiltration into the LCS. The clay is covered with vegetated topsoil to minimize erosion. A typical cross-section view of the drain tile system is presented on Figure 2.2.

The cover system over the eastern 300 feet of the LCS was improved in 1996 due to reoccurring infiltration directly into the LCS. Portions of the landfill cap near the LCS have settled (one to four feet), which has caused cracking of the clay cover and, subsequently, allowing precipitation runoff to infiltrate through the cap and enter the LCS. The LCS cover system improvements consisted of removing the existing cover, exposing the gravel bedding, and placing a 40 mil thick, linear low density polyethylene (LLDPE) liner over the bedding. The previously excavated cover material was then recompacted over the liner, topsoil placed and seeded. A schematic of the improved cover system is presented as Figure 2.3.

2.2.2 Manhole Chambers

Two, four-foot diameter, cast concrete manholes are located at the eastern end of the LCS. Schematic drawings of Manhole 1 and Manhole 2 are presented as Figures 2.4 and 2.5, respectively. Manhole 2 is located at the beginning of the drain tile line, at the east end of the system. Manhole 1 is located approximately 375 feet west of Manhole 2. These manholes serve as inspection, monitoring and cleanout access points for the leachate collection line. The locations of these manholes are depicted on Figure 2.1.

There are no mechanical installations in either manhole. These manholes are completed with standard 30-inch diameter manhole frame and cover, and ladder rungs cast into the concrete.

2.2.3 Leachate Collection Sump 2

Approximately 780 feet of the 800 foot perforated pipe system along the north slope is located upgradient of Sump 2. Sump 2 was the original terminus of the LCS, prior to upgrade of the LCS in 1991. The original pump installations remain in Sump 2 which are capable of pumping to either the forcemain or to the leachate storage tank and are used as a back-up system. A schematic of Sump 2 is presented as Figure 2.6.

The Sump 2 installation is completed with the following appurtenances::

Item	*Quantity*	*Function*
2-inch diameter ball valve	1	Allow manual return of leachate from the aboveground storage tank or manual pumping from the sump.
Slide-away coupling and seal/vertical dual rail guide	1	Allow auxiliary pump installation into the sump without entry into the sump.
Mercury float switches	3	To start/stop auxiliary pump upon preset leachate level and alarm at high level (normally de-energized).
Access hatch cover	1	Personnel-entry, double-door, sampling and pump removal.

Also included in Sump 2 are ladder rungs, steel pipe vent and pipe seals at subsurface entry points. The specifications for the auxiliary pump are presented in Appendix B.

The pump in Sump 2 is wired to operate only if Sump 1 west pump is powered. The Sump 2 pump has both manual and float level controls.

2.2.4 Leachate Collection Sump 1

All leachate from the LCS enters Sump 1 which serves as the primary pumping station. The first 20-foot section of 6-inch diameter PVC pipe leading from Sump 2 to Sump 1 is perforated. The remaining section of pipe between Sump 1 and Sump 2 is a 6-inch diameter solid wall pipe. A 40-foot section of perforated pipe also extends south from Sump 1 and serves as a localized collection drain. A schematic of Sump 1 is presented as 2.7.

Sump 1 is equipped with the following appurtenances:

Item	*Quantity*	*Function*
Effluent pumps	2	Operate upon demand (or manually switched on) by float level switch; function as lead and lag system.
Interior piping and fittings	--	Threaded and coupled for removal if required.
Slide away coupling and seal/dual vertical rail guide	2	Allow pump(s) removal from the sump without personnel entry into the sump.
Pump check valves	2	Prevent backflow of leachate through pumps upon shut-off.
Isolation ball valves	2	Routing of discharge.

Gate valves	2	Allow removal of pump from operating system.
Mercury float switches	4	To start and stop pumps upon preset leachate levels and alarm at high-high level.
Access hatch cover	1	Personnel-entry, double-door, sampling and pump removal.

Miscellaneous components include: ladder rungs, pipe supports, pump lifting chain, 2-inch diameter, schedule 10 steel vent pipe, valve handle extensions to operate valves from above and pipe seals at subsurface pipe entry points.

The configuration of the discharge forcemain from Sump 1 to the Village manhole 12-24 comprises total dynamic head (TDH) requirements of approximately 100 feet. The configuration of the back-up forcemain from Sump 1 to the storage tank comprises TDH requirements of approximately 120 feet.

From pump performance data supplied by the manufacturer, the Metropolitan Hydromatic SKHD150 rated capacities include:

GPM	*Total Dynamic Head*	*Notes*
26	100 ft (45 psi)	single pump to MH 12-24
30	90 ft (41 psi)	single pump to storage tank

The SKHD150 pumps operate as a lead and lag system with provision to designate (key set) the lead pump. It is expected that the pumps will be regularly alternated by key switch settings to perform the lead pumping function. This procedure should create relatively equal pumping time for both pumps as indicated by their respective elapse time meters. The pumps are activated automatically based on the leachate level within Sump 1.

A total of four float level switches within Sump 1 activate or deactivate the lead sequenced pump or indicate high level within the sump which functions to start the lag pump in tandem with the first. The float switches are adjustable externally at ground surface, and operate as follows:

Low Level Switch

- Disengages operating pump when low liquid level is reached and switch is in down (off) position;
- Installed above pump intakes to prevent pumps from running dry; and
- Must be in the up (on) position when high level is reached to allow pump to be activated by intermediate level switch.

Intermediate Level Switch

- Activates lead pump when specified level is reached and switch is in the up (on) position. (Note: low level switch must also be in up position for pump to engage);
- Installed 3 feet above low level switch to allow sufficient pump run time and reduce pump cycling; and
- If activated by the operator during pumping to the storage tank, the high level switch in storage tank will override the starter circuit and prevent the pump from engaging.

High Level Switch

- Starts the lag (second) pump for tandem operation;
- Maintains both pumps in operation until low level switch is triggered; and
- Lights the sump high-level alert light.

High/High Level Alarm

- Activates alarm beacon at control panel to indicate emergency leachate level in sump;

- Activates an alarm signal which is sent by dedicated phone line to the Village of Wauconda police station; and

- Set at two feet below the top of the sump.

The float level switches can be overridden by the manual pump switch located in the electrical junction box adjacent to Sump 1 or at the electrical control panel to run the pump(s) in an "on" condition. The float override will only be activated if the low level switch is on and functioning to prevent the pump(s) from running dry.

Full details and manufacturer's product literature for each of the referenced components is provided in Appendix B.

2.2.5 Forcemain System

As shown on Figure 2.1 (previously referenced), the forcemain system consists of:

- A forcemain located along the west site boundary to Village manhole 12-24 covering approximately 2,640 feet; and

- A forcemain located parallel to the collection system (north landfill boundary) to the aboveground storage tank covering approximately 1,300 feet.

The forcemain consists of a 2-inch diameter high density polyethylene (HDPE) pipe, butt-fuse welded for continuous length and field pressure tested to 100 psi. The 2-inch forcemain is contained in an outer 4-inch

diameter HDPE casing pipe at locations beyond landfilled limits in the event of a forcemain leak or break.

The west side boundary forcemain includes a meter chamber (for flow measurement), a clean-out/drain chamber (to allow maintenance) and an air-release chamber (to expel entrained air). A check-valve in the clean-out/drain chamber functions to prohibit flow reversal from the forcemain into the pumping chamber during routine operational mode.

The north side boundary forcemain connects to the aboveground 10,000-gallon leachate storage tank which is air vented and includes a float level gauge for volume reading. Valve operation can permit directional flow to fill the storage tank or empty it into Sump 2.

2.2.6 Forcemain Metering Chamber

The forcemain metering chamber consists of a 6-foot diameter precast concrete manhole which is located approximately 20 feet west of Sump 1. The flow meter records the total volume of leachate which is pumped through the forcemain. The equipment present within the metering chamber includes:

Item	*Quantity*	*Function*
2-inch diameter flow meter, submersible	1	Complete with remote readout at ground surface to record total gallons pumped and flow rate (gpm); flange bolts are stainless steel.
Isolation ball valves	3	Allow meter removal and use of meter by-pass pipe.
Pressure gauge	1	Measures pump discharge pressure in psi.

By-pass piping	--	Allow meter removal and continued pumping.
Air nipple	1	Pipe stub connected to by-pass pipe to allow airline connection to blow-out forcemain.
Access hatch	1	Personnel entry, double-door, meter removal.
Electric sump pump	1	Plug-in connection and discharge hose to pump out accumulated liquid in chamber.
Sump pump float level switch	1	Operate pump automatically.

Metering at this location will record the quantity of leachate which has been pumped to the Village's manhole. The flow meter utilizes an obstructionless sensor with a non-conductive ceramic flow tube and measuring transmitter (known as magnetic flow measurement) and includes remote readout such that personnel entry in the sump for routine inspection is not required. Manufacturer's information for the flow meter is provided in Appendix B.

The by-pass piping is provided for contingency use in the event the flow meter is removed from service. The by-pass piping includes a 2-inch diameter galvanized steel nipple for an air-line connection to blow out the west boundary forcemain for cleaning and maintenance. A portable automatic electric sump pump and 1/2-inch discharge hose is located in the meter chamber to allow the operator to pump out accumulated groundwater/rainwater to Sump 1 on an as-needed basis. A schematic of the metering chamber is presented as Figure 2.8.

2.2.7 Forcemain Clean-Out Chamber

The forcemain clean-out chamber consists of a 4-foot diameter precast concrete manhole which is located at a low point in the system 810 feet south of Sump 1. A schematic of the clean-out chamber is presented as Figure 2.9. The following equipment are located in the clean-out chamber:

Item	*Quantity*	*Function*
2-inch diameter ball valves	2	Allows directional draining of leachate from forcemain (both sides of check valve) if required.
Check valve	1	Prevent flow reversal from the upstream forcemain which is at higher elevation.
Flange pipe assembly	1	Check valve may be removed from forcemain for cleaning/flushing.
Access hatch	1	Personnel entry, double-door, cleaning and check valve maintenance.

The volume of leachate in the forcemain which would flow to the clean-out chamber is on the order of 168 gallons per 1,000 feet of length. All liquids which accumulate in the clean-out chamber will require management on an as-needed basis, which may include transfer to Sump 1 via portable pump/flexible hose or mobile vacuum tank should such liquids be suspected or known to contain leachate.

2.2.8 Forcemain Air Release Chamber

The forcemain air release chamber consists of a 4-foot diameter precast concrete manhole which is located at the highest elevation in the system, 1,985 feet south of Sump 1. A schematic of the air release chamber is

presented as Figure 2.10. The following equipment is included as part of the air release chamber:

Item	*Quantity*	*Function*
1-inch diameter ball valve	1	Drain liquids from local pipe.
Flange x flange pipe assembly	1	May be removed for forcemain cleaning/flushing.

Air pockets in the forcemain developed by pump start-up or line filling which could potentially limit flow capacity should be expelled automatically by the universal air valve.

If the forcemain is being drained by the operator, the clean-out chamber check valve must be deactivated and air will automatically enter the line through the air valve and prevent pipe collapse. Manufacturer's information for the universal air valve is provided in Appendix B. Periodic adjustment of the air valve is recommended to ensure that minimal liquids are expelled with any air during operation.

The air release valve in this chamber was recently removed from the system and replaced with piping to allow cleanout of the forcemain. Based upon past performance of the system, it was determined that the air release valve was not needed for the system. Should it be determined that entrained air is affecting the system, the air release valve will be reinstalled.

2.2.9 Village of Wauconda Manhole 12-24

The Village of Wauconda sanitary manhole 12-24 is located on the north side of Bonner Road in the landscaped portion of the right-of-way. Bonner Road is maintained by Lake County. The Village of Wauconda has been granted a permanent easement for placement and maintenance of the sanitary manhole and gravity sewer.

The manhole is a 4-foot diameter precast concrete chamber with a standard 30-inch frame and cover and includes an 8-inch diameter gravity sewer flowing west to Karl Court lift station No. 12. A schematic of the sanitary manhole is presented as Figure 2.11. The manhole is the eastern termination (upstream limit) of the gravity sewer on the Bonner Road tributary to the Karl Court lift station.

2.3 LEACHATE STORAGE SYSTEM

The leachate storage system consists of an aboveground storage tank (nominal capacity 10,000 gallons), a concrete containment dike, a cat-walk inspection/storage platform and weatherproof enclosure. A general truck turnaround pad and concrete spill containment pad are also included to facilitate loading of tanker vehicles from the storage tank.

All aboveground portions of piping leading into and out of the tank are electrically heat traced and insulated. Heater pads and insulation are also installed on the tank to prevent freezing.

The concrete containment dike has a holding capacity of approximately 11,000 gallons. A concrete sump is provided in the northwest corner of the containment dike. A level switch in the containment sump activates an alarm light in the control panel to indicate to the operator that liquids have accumulated in the sump and a leak may have occurred. In the event of a tank leak or overflow, the floor sump grate should be removed and a suction pump placed in the sump to allow complete dewatering of the containment dike. The general layout of the storage tank and dike are illustrated on Figures 2.12 and 2.13. Further details associated with the storage tank, metering and control system and the enclosure building are provided in Appendix B.

2.3.1 Leachate Storage Tank Appurtenances

Fittings and appurtenances provided on the tank and associated piping are as follows:

High Level Switch

- Mounted in nozzle installed on roof manhole;
- Manually key set by the operator when pumping to the tank to activate alarm light in control panel and deactivates (overrides) sump pumps when high liquid level in tank is reached; and
- Set 3 inches below top rim of tank to prevent overflow of tank.

Gauge Hatch

- Mounted on roof of tank; and
- Used for manually gauging liquid level in tank and for collection of leachate samples.

Tank Roof Vent and Overflow

- Mounted on south side of roof;
- Vent tank during filling and discharging operations; and
- In the event of an overflow, directs leachate to rear of tank to allow operator access to tank valves.

Forcemain Inlet Piping and Backflow (leachate return) System

- 2-inch mainline piping from sumps which includes 2-inch check valve to prevent loss of tank storage in the event of an upstream malfunction;

- Tank inlet is fitted with gate valve to manually isolate tank from sumps and check valve to prevent loss of tank liquid in the event of a forcemain break; and

- 2-inch by-pass piping tee connected on both sides of the 2-inch check valve which includes two isolation ball valves and one 1-inch ball valve for sampling (known as double block and bleed system).

Discharge Piping to Tank Truck Loading

- 4-inch pipe from tank to truck loading pad for gravity loading of tank trucks, including two in-line isolation gate valves.

Float Level Gauge

- Tape readout in feet and inches which functions via a float level.

Personnel Access Hatch

- 36-inch diameter manway (blind flange connected) for tank access per confined space entry procedures.

Electric Activator Valve and Discharge

- 4-inch diameter flange connection on east side of tank complete with a 4-inch isolation butterfly valve, 2-inch drilled and tapped pipe and electric activator valve (dump valve) to sample or drain the tank into the containment dike by remote operation.

Periodically, leachate transfer to the storage tank may be necessary when conducting maintenance activities to the LCS. Transfer periods are to be temporary and the Village of Wauconda will notify the Site Custodian or CRA of this situation and conduct the transfer.

2.3.2 Transfer of Leachate to Storage Tank

The procedures for leachate transfer to the storage tank to be implemented are summarized as follows:

- Village to notify CRA or the Site Custodian of the need to transfer leachate to the tank and verify available tank storage capacity;
- Ensure tank in-flow system is open and backflow (bypass) system is closed;
- Ensure the storage tank high level switch is activated (key switch setting at the main control panel to "normal");
- Ensure the ball valve at Sump 2 is closed;
- Close ball valve at Sump 1 to terminate flow to the Village manhole 12-24;
- Open the ball valve at Sump 1 to direct flow to the tank; and
- Inspect the system periodically while storage is required to assess when leachate can be returned to Sump 2 for discharge to the Village manhole 12-24.

Note: When the tank high level switch is triggered (i.e. 10,000 gallons storage), the pumps are automatically deactivated ("locked out") and will not respond to the sump level switches. To continue pumping to the Village sewer, for instance, the operator must close the tank inlet valve first and then turn the keyed tank level alarm switch at the main control panel from "normal" to "emergency". In this mode, pumping can continue according to the sump level switches only.

2.3.3 Transfer of Leachate From Storage Tank to Sump 2

To transfer leachate from the tank to Sump 2, the procedures to be implemented are as follows:

- Close the ball valve at Sump 1 to terminate flow to the tank;

- Open the ball valve at Sump 1 to direct flow to the Village manhole 12-24;
- Open the ball valve at Sump 2 to allow transfer of leachate from the holding tank;
- Open the backflow (bypass) system at the holding tank (2 each ball valves);
- Observe backflow to regulate flow and ensure pumping is initiated at Sump 1; and
- When complete, close Sump 2 ball valve and holding tank bypass, record finished tank volume.

2.3.4 Transfer of Leachate from Storage Tank to Haulage Vehicle

In the event that transfer of leachate from the holding tank to a licensed haulage vehicle for off-Site management is required, the following will be implemented:

- Site Custodian to notify CRA or the WTG;
- Site Custodian to provide signed manifest and arrange hauler pick-up time and confirm with Village;
- Pump liquids collected in truck loading pad sump (if any) to truck;
- Record liquid level in holding tank;
- Connect truck suction to tank discharge pipe;
- Open in-line gate valves (2 each) then pump or transfer by gravity to the truck as required;
- Close in-line gate valves on tanker truck prior to disconnecting suction line;

- Record liquid level in holding tank;
- Pump leachate liquid collected in loading pad sump (if any) to tanker truck;
- If tank was full prior to pumpout, ensure sump pumps are operating following removal of leachate from holding tank;
- Complete Leachate Transfer Record and waste manifest (sample copies included in Appendix C); and
- Ensure gate and building is locked when leaving the Site.

The hauling contractor shall take special care to prevent spillage of leachate liquids during tank truck loading.

2.4 ELECTRICAL SYSTEM AND CONTROLS

Electric power for pumping/storage operations, failure alarming, lighting and receptacle outlets at the Site comprises 120/240 Volt, 100 AMP, 3 phase service and is supplied by Commonwealth-Edison.

Power is delivered to and metered at a main electrical control panel adjacent to the tank enclosure building. The electrical controls are maintained on a 4-foot by 8-foot plywood backboard and are arranged as shown on Figure 2.14. A schematic of the main control panel for the LCS is presented on Figure 2.15. Further detailed schematics are provided in Appendix B.

2.4.1 Main Electrical Panel

Power from the Commonwealth-Edison service pole is distributed through the control station as follows:

Item	*Function*
Commonwealth-Edison service meter Service No.: NF910338 Account No.: AS66-UW-1611D	Meter power useage
Square D service entrance switch 100 amp, 3 phase	Disconnect power to the Site
Square D transfer switch 200 amp, 3 phase	Activate generator plug for connection to portable generator
Load center 20 circuit main breaker	Isolate individual panel circuits in use
Duplex outlet receptacle	120 volt AC plug
Chicago switchboard factory main control panel	Operate pumping control panel system
Auxiliary portable generator plug	Operate pumping system following power failure
Alarm beacon	Indicate high-high level at Sump 1
Secondary control panel	Operate pipe heaters, lights, Sump 2 components, other non-pumping components
Junction box	Field wiring connection

The main control panel face includes indicator lights for pump running and alarm situations (pump overload, Sump 1 high-high level and holding tank leakage). All operator controls in the main control panel face are key switched.

2.4.2 Building Enclosure

Electrical power supplied to the building enclosure from the main breaker comprises 120 volt AC for:

- Enclosure light;
- Holding tank high level alarm;
- Tank leakage alarm;
- Tank and pipe heater pad;
- Outlet receptacle;
- 2-inch diameter electric actuator valve on sample port (east side of tank); and
- Piping heat tapes.

2.4.3 Field Operation

Power supplied from the main breaker includes:

- 240 volt AC for pump operation at Sump 1;
- 120 volt AC for float level switches at Sump 1 and Sump 2;
- 120 volt AC for meter operation at meter chamber;
- 120 volt AC for duplex outlet receptacle at Sump 1, Sump 2 and meter chamber;
- 240 volt, single phase AC for Sump 2 pump operation; and

- 240 volt, single phase AC for Sump 1 (not in use).

Pull boxes are located at intermediate locations along the LCS alignment. Junction boxes are provided at Sump 1 and Sump 2 which include weatherproof disconnect switches for isolation purposes.

Electrical field wiring is protected in 2-1/2-inch diameter, Schedule 40 PVC pipe, glued, jointed and buried at an average depth of 18 inches below ground surface.

3.0 LANDFILL CAP SYSTEM

The 60-acre Site includes a 43-acre unpermitted landfill and a 6-acre permitted landfill. Approximately 3.2 million cubic yards of waste was reportedly placed in the landfill. When the landfill was closed in 1978, a clay cover was placed (or existed) over the waste with a typical thickness between 2 and 4 feet. There were several localized areas where the cap thickness was less than 2 feet. These areas were addressed by the cap upgrade program conducted in 1992. As required by USEPA, areas which were part of the 1992 cap upgrade program shall have a minimum of 2 feet of compacted clay and a minimum of 6 inches suitable topsoil and grass cover.

There are four existing leachate monitoring wells (LW501, LW502, LW503 and LW504) and a concrete manhole installed into the waste for monthly measurement of leachate levels. The locations of these installations are depicted on Figure 1.2.

The Site landfill gas vent system consists of passive gas vents which serve as either the central or perimeter gas vent systems. Each vent is equipped with a shut-off valve and a sampling port.

Ten centrally located gas vents (GV-1 through GV-10) were installed in 1992 as part of the cap upgrade construction. These vents were installed through the entire waste thickness (approximately 40 feet). A schematic of these vents is presented on Figure 3.1.

Eight gas vents (GV-11 through GV-18) serve as a perimeter gas vent system in three different locations at the Site, as depicted on Figure 1.2. . These vents are installed approximately 10 feet into the waste and serve as a mitigation to off-Site subsurface gas migration. A schematic of the perimeter gas vents is presented on Figure 3.2.

Three sets of nested soil gas monitoring probes (GV1-A/B, GV2-A/B, GV5-A/B) are located at two areas of the Site, as depicted on Figure 1.2. These probes were installed in areas previously identified with off-Site, subsurface landfill gas. Each nested probe consists of one probe

screened below the surficial clay unit, and a second probe screened at least 2 feet below the shallow screen. A schematic of the nested probe is presented on Figure 3.3

Groundwater monitoring wells have been constructed around the landfill perimeter and off-site to monitor groundwater flow and quality. The locations of the monitoring wells, as well as a description of the monitoring program, is described within the Quality Assurance Project Plan (QAPP).

Eight landfill cap settlement monuments are installed in various areas of the Site. These monuments were surveyed once a year from 1992 until 1996. No significant movement of the settlement monuments were observed, based upon the annual surveys. The locations of these settlement monuments are depicted on Figure 1.2.

The existing surface water drainage system consists of eight drainage swales constructed at various areas of the landfill. Four of these swales are constructed along the north landfill slope and discharge to Mutton Creek. Swale # 1A is constructed on the eastern portion of the unpermitted landfill and discharges into Swale # 1, midway along its reach. Swale #5 is constructed between the permitted and unpermitted landfills, at the southwest side of the site and discharges to the unfilled area. Swale #6 is constructed along the southern boundary of the permitted landfill and discharges to the unfilled area. Swale #7 is constructed along the western boundary of the unpermitted landfill and discharges to Mutton Creek.

As a means to provide positive drainage for the central portion of the landfill, a catch basin was constructed in the east-central portion of the landfill and culverted to discharge to Swale #1. The culvert consists of 24-inch diameter high density polyethylene (HDPE) pipe, with each section butt fusion welded to provide a continuous, leak-proof pipe. The location of this culvert is depicted on Figure 1.2.

The surface drainage flow patterns for the Site are presented on Figure 3.4.

The 24-inch culvert pipe is leak tested every two years by pressurizing the pipe to 3.5 psi and monitoring the pressure loss over a one hour period. If the pressure loss over the one hour period is greater than 0.5 psi, the pipe will be further investigated for possible cracks and leaks.

The perimeter of the landfilled area of the Site has been secured with a 6-foot high industrial-type chain-link fence. Fence fabric comprises No. 9 gauge galvanized steel in a 2-inch diamond pattern. Double opening vehicle access gates have been constructed at four locations: Garland Road north (leachate storage building), Garland Road south (Contractor's entrance) and two gates at the southwest side of the landfill (access to the unfilled area).

The Site is accessed by the main gate on Garland Road (northeast corner) for all routine operation and maintenance functions including inspections. The secondary gates located on Garland Road (southeast corner) and adjacent to the unfilled area (southwest side) are used for heavy construction equipment access. Three personnel access gates are also located along the northern fenceline to access Mutton Creek for inspections.

All gates are kept locked during periods that the Site is unattended. Keys are maintained by the Village of Wauconda, Site Custodian, WTG, CRA and USEPA.

Access roads have been constructed throughout the Site. The principal access road is constructed midway along the north slope and provides access to the LCS and direct access to Sump 1 and the meter chamber. This road is constructed with gravel and is the most commonly used road. Various other roads are located over the Site and are constructed of clay. As a minimum, roads will be repaired and regraded once per year under the direction of the Site Custodian. Snow removal will be conducted, as required, by the Village. Snow falls exceeding 2 inches will require plowing of the road leading to Sump 1.

4.0 INSPECTIONS AND MONITORING

4.1 GENERAL

Operation, maintenance and monitoring requirements for the Wauconda Landfill are summarized in Table 4.1. Operation and maintenance include routine system inspections, scheduled component maintenance, unscheduled maintenance in response to an observed failure and reporting of all such activities. All inspections and maintenance performed at the Site must be entered in the hard-cover Inspection/Maintenance/Visitor Log located in the tank enclosure building.

A list of project contacts including names, addresses and telephone numbers is provided in Appendix D and is maintained at the Site. A telephone is maintained at the Site.

4.2 RECORD KEEPING

Record keeping requirements for operations and maintenance conducted at the Site include written documentation of the following tasks:

- Inspections performed;
- Scheduled and unscheduled maintenance;
- Volume of leachate discharged to the Village of Wauconda sanitary sewer;
- Volume, date and manifest numbers for leachate hauled from the Site;
- Sub-contractor work and invoicing; and
- Visitors to the Site.

Standard forms for specific tasks are provided in Appendix C, as follows:

- Monthly summary of leachate volumes discharged to Manhole 12-24;
- Monthly record and manifests for leachate transfer to haulage vehicles;
- Regular, Quarterly and Annual Inspection and Maintenance Reports; and
- Monthly contractor record and invoices.

Copies of all forms, once complete, shall be submitted by fax and copy mailed to:

1. WTG Technical Coordinator
   Larry Buechel
   WASTE MANAGEMENT OF WISCONSIN, INC.
   W124 N9355 Boundary Road
   Menomonee Falls, Wisconsin 53051
   Fax: 414-255-3798

2. Ron Frehner
   Conestoga-Rovers & Associates
   1801 Old Highway 8, Suite 114
   St. Paul, Minnesota 55112

   Fax: (612) 639-0923

The monthly inspection report forms the basis of the formal quarterly report to be prepared by the Wauconda Task Group and submitted to the USEPA, IEPA and the Lake County Health Department.

The monthly inspection shall be conducted as close to the first day of the following month as possible and submitted by fax to CRA. Copies of all forms will be maintained in a binder at the Site.

4.3 LANDFILL CAP, DRAINAGE AND PERIMETER FENCE INSPECTION

The Site Custodian and CRA will complete monthly inspections of the landfill cover, drainage system, access roads and perimeter Site fence (except during periods of complete snow cover) which will consist of:

- Inspect cover for signs of erosion and to ensure the cover is intact;
- Inspect vegetative cover and identify areas requiring attention;
- Inspect perimeter fence and gates to ensure they are intact;
- Inspect cover for areas of erosion and surface water ponding;
- Inspect cover for evidence of exposed refuse or leachate leaks;
- Inspect cover for evidence of animal burrows; and
- Inspect on-Site access roads to ensure they are driveable.

The person(s) completing the inspection shall complete a standard inspection and maintenance checklist. A sample copy of the checklist is included in Appendix C. Completion of the monthly inspection shall be acknowledged in the specified Maintenance/Inspection/Visitor Log.

Annually, the landfill will be inspected by a thorough walk-over based on a 75-foot by 75-foot grid pattern to identify any deficiencies. An organic vapor analyzer capable of detecting methane will be used to assist in the detection of landfill gas emissions from the cap. Field notes and results will be attached to the inspection report.

4.4 MONITORING WELLS INSPECTION

The groundwater monitoring wells are to be inspected by CRA during the annual groundwater monitoring event. The following will be noted and corrections made if required:

- The casing surrounding the monitoring well is securely in place and is properly locked;
- The bleed hole at the bottom of the casing is clear;
- No blockage down the well;
- The depth to the bottom of the well is not decreasing (decreasing depth may indicate that the well is becoming silted up and should be re-developed);
- The posts surrounding the monitoring well are securely in place and visible; and
- The well code is clearly visible and legible on the well casing.

4.5 LANDFILL GAS VENTS AND SOIL GAS MONITORING PROBES

Personnel should avoid going near gas vents except when required to do so to perform inspections. Inspection should be performed by working upwind of the vents, where possible, or by remaining more than 20 feet from each vent.

Vents should be inspected during the monthly cap inspection to ensure that the vents are properly labeled and locked, that the vent is clear and not obstructed, and that the cap does not leak or allow surface water ponding around the vent. Valving on the vents should be operated at each inspection to assure that they are in working order.

4.6 LEACHATE COLLECTION SYSTEM INSPECTIONS

4.6.1 Regular Inspections

Regular inspections of the landfill systems include a weekly inspection of the leachate storage building area by the Site Custodian and a three-times a week inspection of the LCS by the Village. Specifically, the following items will be inspected:

Aboveground Tank and Enclosure Building

- Record temperature and accumulated amount of precipitation (if any) at time of inspection;
- Inspect containment area floor and sump for accumulated liquids;
- Inspect tank pedestal for signs of leakage from tank;
- Inspect piping, valves and appurtenances for leakage;
- Inspect insulation on tank and piping to ensure it is secure;
- Inspect pipe heat tracing and tank pad heaters to ensure they are operating (during cold weather);
- Inspect backflow system to ensure it is secure and off;
- Check if high level alarm has been activated;
- Check if the tank has been backflowed to sumps since previous inspection; and
- Review Village regular inspection checklist for current week. Follow up with Village on any comments noted.

Truck Turnaround Area

- Inspect gate and lock;
- Inspect aboveground piping for signs of leakage, ensure tank suction line valves are closed, ensure insulation is secure and heat trace is operational; and
- Inspect truck loading pad for accumulated liquids.

Leachate Collection System

- Record temperature and amount of precipitation (if any) at time of inspection;
- Inspect electrical control panel and alarms for proper functioning;
- Switch pumps to manual to ensure that they are operational (green light on control panel will illuminate), then switch pumps back to automatic (note: only if low level float is triggered);
- Open sump hatches to ensure liquid level is below high level switch (liquid may be above high level switch if tank high level switch has deactivated sump pumps), that the valves and pipe are water tight, the pipe inverts and pump suctions are clear (if visible) and inspect for any indication of sump overflow;
- With hatch open and while pump operates, listen for unusual noises or vibrations from pump;
- Inspect the Sump 2 chamber to ensure the chamber and piping are intact and check if the tank has been backflowed to Sump 2 since the previous inspection;
- Inspect the meter chamber to ensure the chamber and piping are intact and dry and the meter is functional; and

- Record the meter reading flow in gallons per minute and the total number of gallons.

Under no conditions should anyone enter the sump to perform the regular inspections and maintenance. If required due to detrimental weather or Site conditions, the Village and the Site Custodian will perform more frequent inspections as is necessary to ensure continuing operation of the system.

The person completing the inspection shall complete a standard inspection checklist (copy to remain in the tank building). A sample copy of the checklist is included in Appendix C.

Completion of the regular inspection shall also be noted in the hard-cover Inspection/Maintenance/Visitor Log which is kept in the tank enclosure building.

4.6.2 Monthly Inspection

The monthly inspection shall consist of the same items as the regular program plus additional items as noted below. The monthly inspection shall be performed in conjunction with a regular inspection.

The monthly inspections include:

Aboveground Tank and Enclosure Building

- Conduct regular inspection program;
- Inspect tank vent to ensure it is clear and open;
- Inspect tank top for signs of overfilling;
- Inspect concrete dike and tank pedestal for cracks or spalling;
- Inspect building for any damage to structure; and

- Check operation of sump liquid level indicator, and record liquid level in tank.

Truck Turnaround Area

- Conduct regular inspection program;
- Inspect turnaround surface and side slopes for erosion;
- Inspect entrance culvert for damage; and
- Inspect truck loading pad, sump and bollards.

Leachate Collection System

- Conduct regular inspection program;
- Inspect level switches in collection sump to ensure they are secure;
- Inspect the sump inlets, if visible, to ensure they are free of debris. Should there be debris present within the sump which is deemed to interfere with operations, the inspector shall undertake to remove the debris using a skimmer/strainer device, held at ground surface. If unable to do so, identify blockage and contact CRA;
- Inspect sump vents to ensure they are clean and open;
- Inspect sumps and manhole for accumulated sludge/solids. If present, remove to 55-gallon steel drums (DOT approved) and stage at truck loading pad. If required, drum disposal shall be conducted by a qualified contractor;
- Inspect Village manhole 12-24 to ensure it is intact;

- Inspect the clay cover in the vicinity of the leachate collection/forcemain system to ensure that there are no cracks that would increase the amount of flow into the LCS;

- Inspect the landfill bank along Mutton Creek to check for leachate seepage;

- Inspect drain chamber, air release chamber and associated components to ensure they are intact and dry;

- Inspect buried pipe alignment to ensure it is free of encumbrances; and

- Note if any servicing was conducted during the month.

Under no conditions should any personnel enter the sump to perform the monthly inspection and maintenance.

The person(s) completing the inspection shall complete a standard inspection checklist. A sample copy of the checklist is included in Appendix C. Completion of the monthly inspection shall be acknowledged in the specified Maintenance/Inspection/Visitor Log.

4.6.3 Annual Inspection

The annual inspection shall consist of the same items as the monthly inspection plus an assessment as to the need to conduct collection pipe and/or forcemain flushing. It is expected that cleaning/flushing would be necessary once a year. To assess the leachate collection pipe, the annual inspection should state whether leachate recharge of the sumps is normal or delayed and whether the liquid elevation in Sumps 1 and 2 are similar since these sumps are hydraulically connected. To assess the forcemains, the annual inspection form should report whether the pumps operate at significantly higher pressure and/or draw more amperage than design conditions and whether solids (deposits are noted in valves, check valves, blow-out liquids).

5.0 SYSTEM MAINTENANCE

5.1 LANDFILL CAP MAINTENANCE

5.1.1 General

Landfill cap maintenance shall be performed as required, based on the results of weekly, monthly or annual inspections.

Maintenance shall be conducted by a qualified earth moving contractor and shall be supervised by the Site Custodian or CRA. Requirements may include: filling depressions due to settlement to eliminate ponding; filling gullies or eroded areas; filling and/or repairs to visible cap cracking in the vicinity of the leachate collection drain; and covering any areas of exposed refuse. Exposed refuse must be covered by at least 24 inches of clay and 6 inches of topsoil. Filled areas should be sloped to prevent ponding and erosion. In conjunction with the filling, some regrading may be required to meet the slope requirements or to fill areas with excessive slopes. In conjunction with cap cracking repairs, some surface preparation may be required. Disturbed areas and other areas of poor vegetative growth will be revegetated.

5.1.2 Performance

All field working locations will be reviewed with the Contractor. All working locations will include a minimum two feet extension distance to allow match grading and integration and blending with adjacent suitable clay thicknesses.

For any cap disturbance larger than one acre, required temporary erosion control fence and/or straw bales will be installed for the period of construction. Temporary erosion control measures should be designed to dissipate and filter runoff as sheet flow and preclude sediment transport from the landfill surface during active work. Straw bales and geofabric fence are proven techniques for these controls.

At all work locations (including the two-foot extension distance), topsoil will be stripped and temporarily stockpiled along the upslope side to divert future surface flow around work areas.

Suitable clay soil will be placed and compacted in six to eight-inch lifts to meet required grades. Soil spreading and compaction will be undertaken with a compactor dozer with multiple passes at low speed to reduce flexural cracking of the cover over the waste.

A minimum of six inches of topsoil comprising replacement of existing and imported material will be placed over all disturbed surfaces and graded for seed and mulch application. A disturbed surface will be defined by removal of vegetation and topsoil layer to expose the clay surface and will not include flattened grass cover.

Seeding will be completed by a qualified seed and mulch contractor using standard equipment within the industry. Seeding will include provisions for watering until grass growth reaches one-inch height.

5.1.3 Material Selection

Clay

Imported clay will consist of less than 50% by weight of sand or gravel passing the No. 4 sieve and a minimum of 5 percent fines passing the No. 200 sieve. The clay shall be free of unsuitable materials which include, and are not limited to, the following:

- Material containing loam, roots or organic matter;
- Frozen material or material containing snow or ice;
- Clays which are classified as inorganic clays of high plasticity;
- Soft and/or organic clays and silts of low strength;

- Frost susceptible silts or clays;
- Swelling clays;
- Rock and lumps of material with dimensions greater than specified layer thickness before compaction;
- Trees, stumps, branches or any other wood or lumber; and
- Hazardous chemical substances.

Topsoil

Topsoil suitable for use shall be good quality, fertile loamy material free from roots, vegetation, weeds, parts of weeds, weed seeds and other debris or foreign matter. The source of topsoil shall be an area free from growth of Japanese Clover, Horsetail, Morning Glory, and other persistent weed plants. Topsoil should be free from lumps, stones and clods over one-inch in diameter. Topsoil shall not contain excess amounts by volume of organic matter, heavy clay or sand.

Topsoil shall not be obtained from swampy areas and shall not be infested with the seeds of noxious weeds. Imported topsoil shall be inspected and approved by the Site Custodian or CRA prior to delivery to the Site.

Topsoil stripped from the working area on-site may be reused if suitable as determined by the Site Custodian or CRA.

Grass Seed

If available, grass seed mixture will include:

90% Kentucky Bluegrass; and
10% Pennant Rye.

The seed application rate shall be approximately 135 lb/acre.

5.2 ROADS AND ACCESS MAINTENANCE

As a minimum, gravel road maintenance is typically performed in late fall (end of rainy season and prior to freezing conditions) and spring (snow melt and thaw conditions). Repairs shall be conducted by a local contractor utilizing proper equipment. Requirements may include: re-grading or backdragging ruts or gullies, filling settled or ponded areas, reconstructing wash-out areas, and new road construction on the landfill cap.

Redressing existing roads can be enhanced by adding approximately 1-1/2 inches of surface aggregate as IDOT Class B, CA6 gradation (maximum diameter 1-inch) as a wearing surface. New road construction will include approximately 8 inches of base gravel compacted on a graded and firm clay surface and 1-1/2 inches of surface aggregate as specified above. In addition, at traditionally soft or wet areas, a non-woven geotextile fabric should be placed beneath the base gravel on the prepared surface to assist support, wheel bearing and subdrainage.

5.3 ANIMAL CONTROL

An animal control program was initiated in 1994 to address animal burrows into the landfill cap. The animal control program was conducted, under permit by the Illinois Department of Conservation, using pesticide pellets placed inside the animal burrows. The animal control program will be continued on an as-needed basis.

5.4 OTHER MAINTENANCE

Other maintenance functions include fence repairs, mowing, weed control and fertilization. These activities will be conducted as determined necessary and under the direction of the Site Custodian or CRA.

5.5 LEACHATE COLLECTION SYSTEM MAINTENANCE

Maintenance includes scheduled preventative maintenance, parts replacement due to wear and tear, and unscheduled maintenance due to malfunction or breakage.

All maintenance functions are the responsibility of the Village of Wauconda. Costs of maintenance shall be according to the terms of the agreement with the WTG. The Village will report all maintenance functions and costs to CRA.

Guidelines for cleaning and maintenance are provided as shown in Table 5.1.

5.5.1 Spare Components

Based upon previous operating history, the following is a list of recommended spare parts and components to be kept on Site:

- Float switch;
- 2-inch diameter PVC check valve for tank inlet;
- 2-inch diameter check valve for pumps;
- Hydraulic seal set for check valve;
- Bulbs for electrical panel;
- Light bulbs for building;
- Electric fuses;
- Electric relay switch;
- Heat tape;
- Locks and keys to match existing;
- 2 inch diameter PVC pipe;
- Electric extension cord; and
- Electric submersible sump pump (0.5 HP)

5.5.2 Leachate Classification

A representative sample of leachate will be collected by CRA and analyzed by a qualified laboratory as required by IEPA permits.

Based upon previous sampling results, Wauconda Landfill leachate is classified as non-hazardous and considered to be a special waste for handling and manifesting purposes.

5.6 TROUBLE SHOOTING PROCEDURES FOR THE LEACHATE COLLECTION SYSTEM

Troubleshooting procedures apply to common or routine problems that may be encountered and are intended to isolate the cause or source of the problem and to present possible solutions to correct the problem. Correction of the problem will depend upon the cause of the problem and/or component(s) which failed. Operators should refer to manufacturer's instructions in Appendix B for specific components once a problem has been identified with that component.

Common problems and symptoms of problems which may be encountered include:

- No flow in system - Indicated by no volume increase in the leachate tank for given time period, or no flow measurement at the meter.;
- Reduced flow in system - Indicated by significant reduction in leachate pumped in given period of time;
- Failure of single pump - Indicated by continued high level in Sump 1 and/or alarm light at the control panel, unusual noise at Sump 1 or by pump elapse time meter; and
- Potential for LCS overflow - Indicated by significant increase in leachate generated in a given period of time.

Procedures for identifying the cause of these problems are presented in the sections which follow.

5.6.1 No Flow or Significantly Reduced Flow in System

A sudden decrease or stoppage of discharge to the Village manhole may be caused by:

- An electrical failure in the system;
- A solid or air blockage in the forcemain;
- A leak or rupture in the forcemain; or
- Closed isolation valve.

Ensure all circuit breakers are turned on, pumps are set to automatic and capacity is available in tank (if directed to the tank). A power outage at the Site will provide an alarm condition via a dedicated phone line to the Village of Wauconda police station. Ensure that isolation valves at Sump 1, forcemain chambers and the tank are open. Proceed as follows:

- Switch pumps to manual "on" position and monitor the meter chamber or inflow into the tank (as proper for the direction of pumping) and pump elapse time meter on the electrical panel. Note whether pumps operate in "on" position; reset pumps to automatic (Note: when pump is on and operating properly it will register approximately 5.6 amps on the electrical panel and 40 to 50 psi discharge pressure at the meter chamber);

- Check Sump 1 to determine whether leachate level is above the high level (on) switch to both pumps;

- If leachate is below high level switch, manually trigger this switch to start both pumps. If manual pump operation works and level switches do not, have electrician check level switches and control circuit. Turn on manually as needed until repaired;

- Turn pumps to "on" position using the push-button switch at Sump 1 and listen for unusual pump noises or vibration. If pumps operate and do not pump down sump, check forcemain for breakage/blockage (i.e. examples include open valve at Sump 2, open clean-out chamber, open meter bypass);

- If no action is observed at the sumps, have electrician check control circuit, tank high level switch and relay; power supply to sumps and Site, and pump leads;

- Check functioning of air release valve at forcemain chamber and/or air vent at storage tank;

- Connect an air compressor to forcemain pipe fitting(s) and blow out the full length of line or isolated segments at an air pressure not to exceed 90 psi;

- Obtain approval from Village of Wauconda - Public Works to inject 20-30 gallons of a domestic cleaning solution to dissolve any potential blockage. Flush with fresh water;

- Back-flow tank storage through the back-up forcemain to drain to Sump 2, observe effluent for solids; and

- Contact qualified contractor to pressure test and/or rod-out forcemains.

5.6.2 Failure of Single Pump

A single pump failure in Sump 1 will not cause a delay or reduction in pumping to the discharge and may be indicated by the elapse run time meter. The second pump will come on when the leachate reaches the high level.

If a delay or reduction in leachate flow is detected:

- Check operation of both sumps by turning pumps to manual and check operation and reset to automatic and trigger the high-high level switch which would start both pumps;

- Operate pumps independently and measure current draw, discharge pressure and net discharge from sump by measuring depth of liquid and recording pump down times for each 1-foot interval;

- If pumps cannot pump down sump, pull pump from sump and check intake screen and impeller for blockage; check impeller for wear; clean or replace the check valve (refer to pump manufacturer's operating and maintenance instructions); and

- If pumps are operational and do not pump down the sump, manually pump out the sump into an on-site tanker or storage tank. Measure inflow into sump following pump out.

5.6.3 Potential for Leachate System Overflow

The potential for a LCS overflow is represented by one or more of the following:

- Failure of both pumps;
- High-high level alarm;
- Disruption of leachate pumping system (or transport by the hauler); or
- Disruption of leachate treatment by receiving facility.

At any time that the potential exists for a LCS overflow, the Village and/or the Site Custodian shall immediately notify Ron Frehner (Alternates: Steven Voss or Larry Buechel). Appropriate action will be determined and subsequent notifications will be made by CRA or WTG as required.

5.7 OPERATION CONTINGENCY PLAN

5.7.1 Mechanical Failure

In the event of a mechanical failure in one or both pumps at Sump 1 or the forcemain breaks or becomes plugged, operation of the system will be maintained on an interim basis by manually pumping leachate from either or both Sumps 1 and 2 to the on-site storage tank or an on-site tanker until the necessary repairs are completed. Interim operation may be maintained with either of these two options:

- A standby 2 HP Peabody Barnes electric submersible pump maintained at the Site may be connected to the forcemain at Sump 2 using the Peabody Barnes slide-away coupling assembly system. Automatic pumping may occur from Sump 2 by turning on disconnect at Sump 2 and the main panel keyed switch in Auto. Otherwise pumping may occur by manual setting. Discharge to either the Village manhole or the storage tank can be effected by valve settings; or

- A portable 0.5 HP electric sump pump complete with attached level switch are maintained at the Site. Use of this option requires flexible discharge hose. (Note: freezing conditions may restrict use of this system in cold periods. Line should be drained immediately after pump is shut off).

5.7.2 Volumes of Collected Leachate Exceeding IEPA Permit Limits

Leachate volume are routinely monitored to assess compliance with the IEPA leachate discharge permitted flowrates. Should these permitted flowrates be exceeded, the following options may be implemented:

- Arrange for mobilization of either tanker trucks or additional temporary storage tanks (such as frac tank) to Site. Arrange for tanker trucks to transport collected leachate as soon as possible. Tanker trucks are required to be IEPA special waste licensed haulers; or

- CRA will call the Village and IEPA with permission to discharge in exceedance of the permit limits.

5.7.3 Electrical Failure

In the event of an electrical failure (i.e. power outage), the Village of Wauconda will supply a portable auxiliary diesel engine-generator (120/240 VAC, 200 AMP) for stand-by power supply to the system. The generator will be connected to the 240 volt, 3 phase receptacle located at the control panel.

An operational telephone as well as a list of contractors' names, addresses and telephone numbers is kept at the building for carrying out emergency and maintenance work.

5.8 MONITORING WELL MAINTENANCE

Monitoring well maintenance will be performed as required, based on the results of the inspection. Maintenance requirements may include:

- Cleaning out wells that have become silted up using water under high pressure;
- Replacing a bent section in the well;
- Repair of concrete collar around well casing;
- Ensuring that the locks on the monitoring wells are well oiled;
- Painting of well casing; and
- Repainting well code on well casing.

6.0 REPORTING

The results of the monthly Site inspections conducted by the Site Custodian and CRA will be reported to the USEPA, IEPA and Lake County Health Department through the quarterly progress reports. The quarterly progress reports are due by the tenth day of January, April, July and October of each year and will cover the previous three months of Site activities.

The Annual Monitoring report for the Site is due on December 1 of each year and presents a summary of the annual groundwater monitoring events, leachate flow summaries and the results of the annual Site inspection.

FIGURES

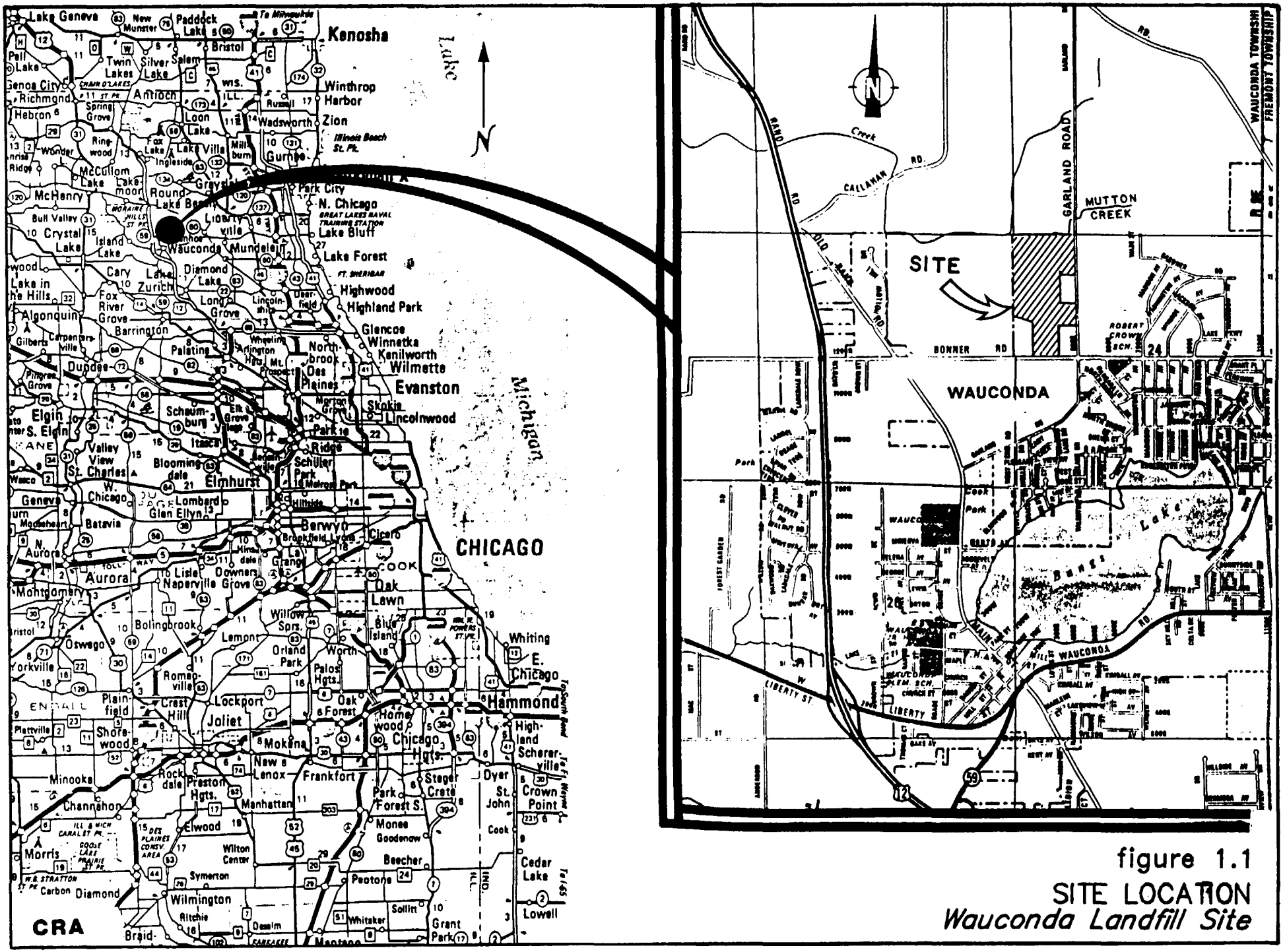
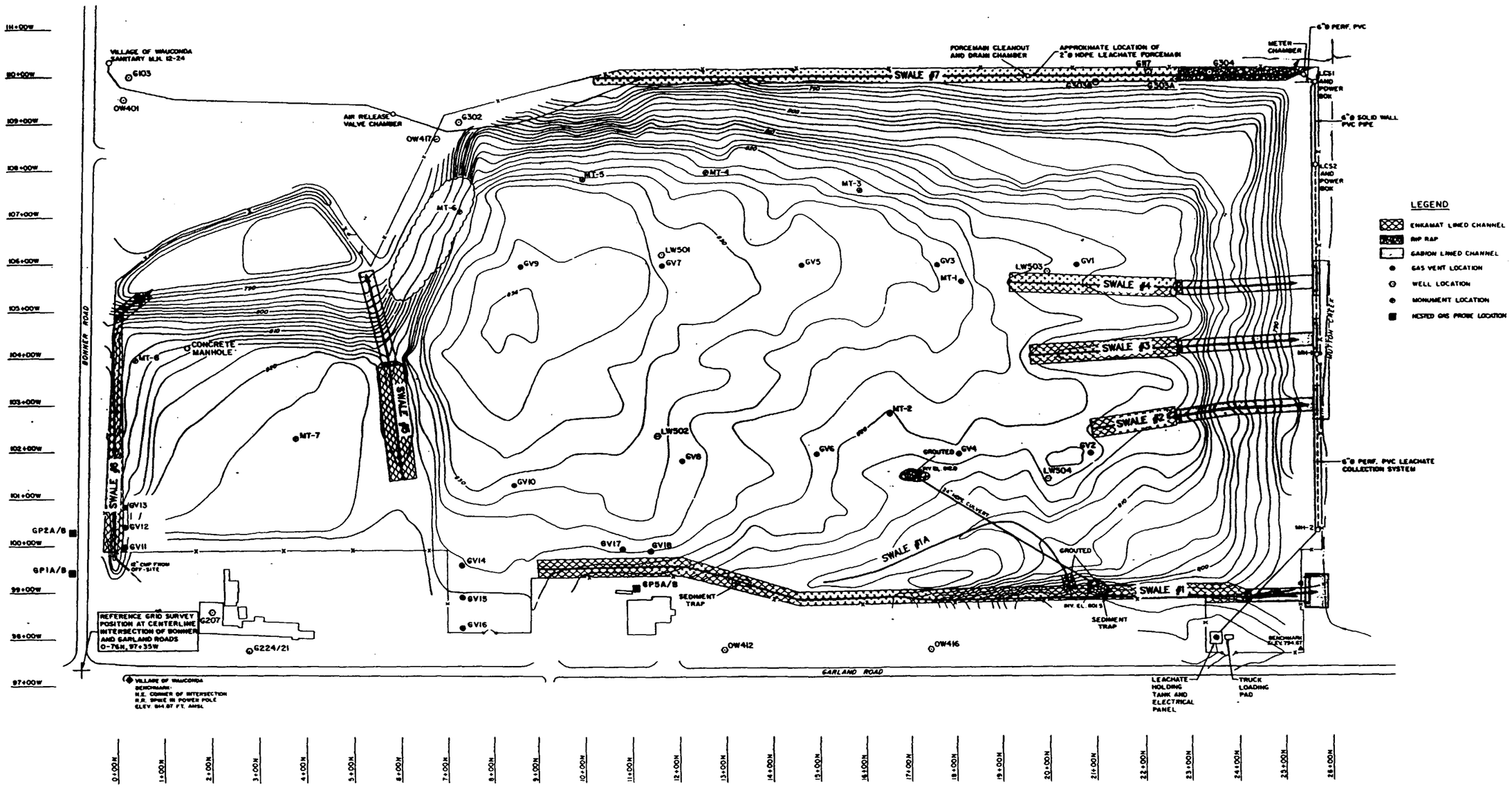


figure 1.1
SITE LOCATION
Wauconda Landfill Site

1449-50-29/03/88-41-D-0



LOCATIONS ARE APPROXIMATE. FIGURE FOR ILLUSTRATIVE PURPOSES ONLY.

		WAUCONDA LANDFILL SITE WAUCONDA, ILLINOIS	**CRA** CONESTOGA-ROVERS & ASSOCIATES
		DETAILED SITE PLAN	Drawn By: CAA; Designed by: SV; Checked by: Scale: Date: NOV. 1995 Field Book: Project No.: 1440 figure 1.2

Approved

No.	Revision	Date	Initial

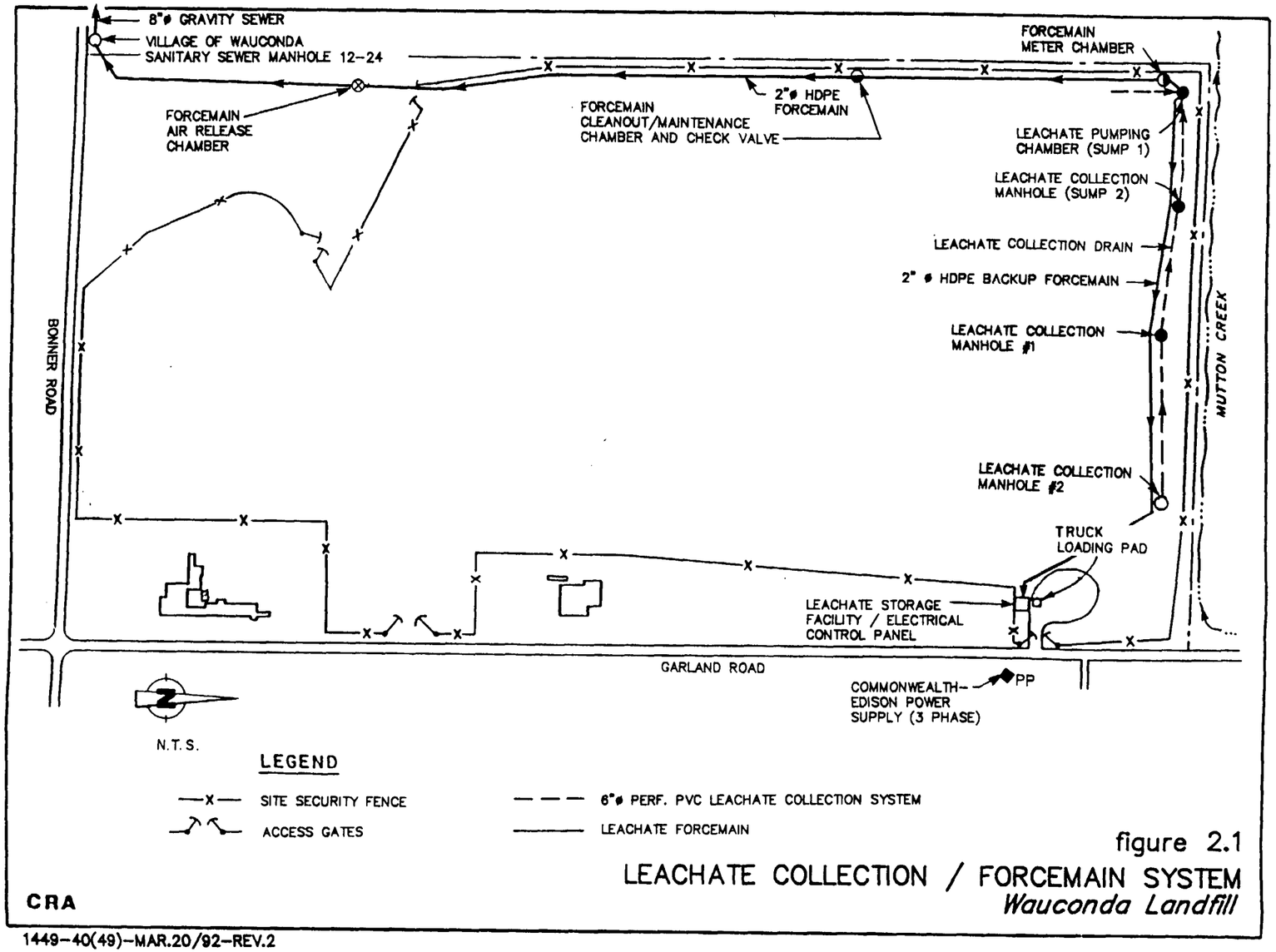


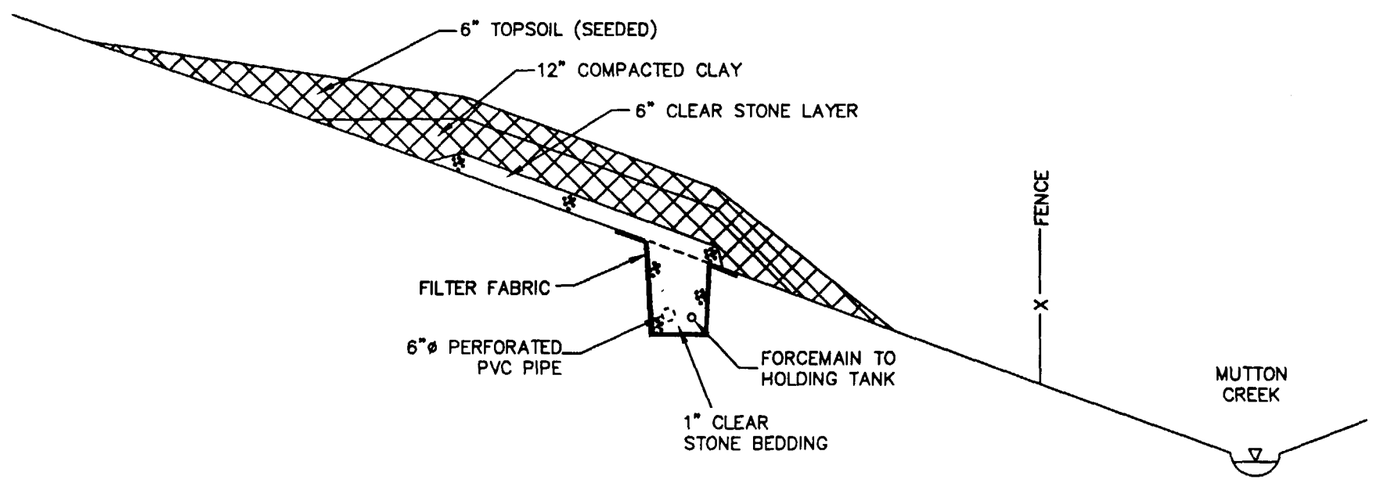
figure 2.1

LEACHATE COLLECTION / FORCEMAIN SYSTEM

Wauconda Landfill

CRA

1449-40(49)-MAR.20/92-REV.2

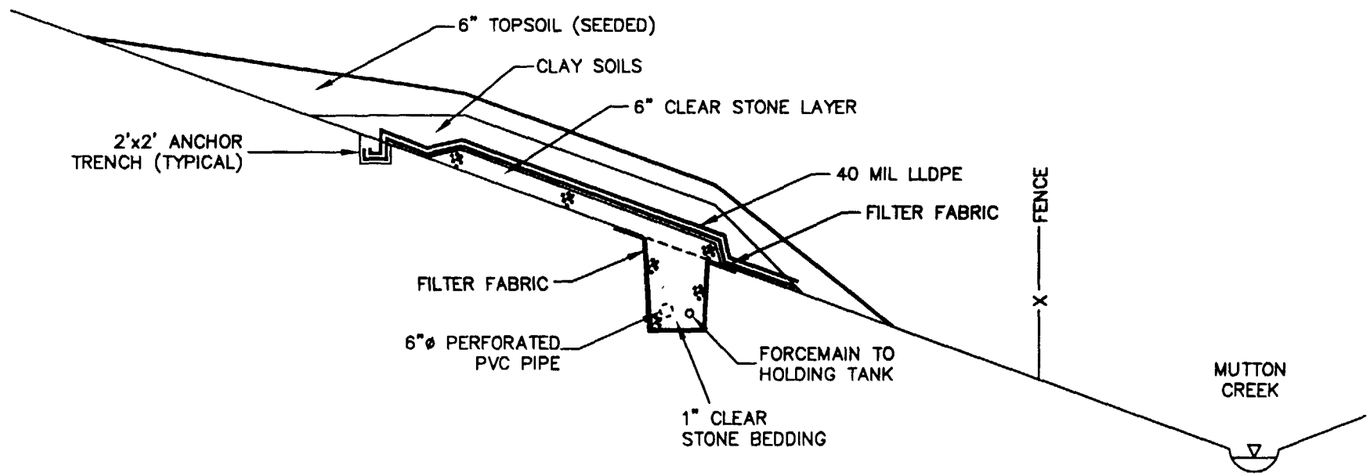


NOT TO SCALE

figure 2.2
CROSS SECTION OF LEACHATE COLLECTION SYSTEM
BETWEEN SWALE 2 AND SUMP 2
Wauconda Landfill Site

CRA

1449(49)–JUNE 21/96–REV.0 (D–03)(MN)



NOT TO SCALE

figure 2.3
CROSS SECTION OF LEACHATE COLLECTION SYSTEM
BETWEEN SWALE 2 AND MANHOLE 2
Wauconda Landfill Site

CRA

1449(49)–JUNE 21/96–REV.0 (D–05)(MN)

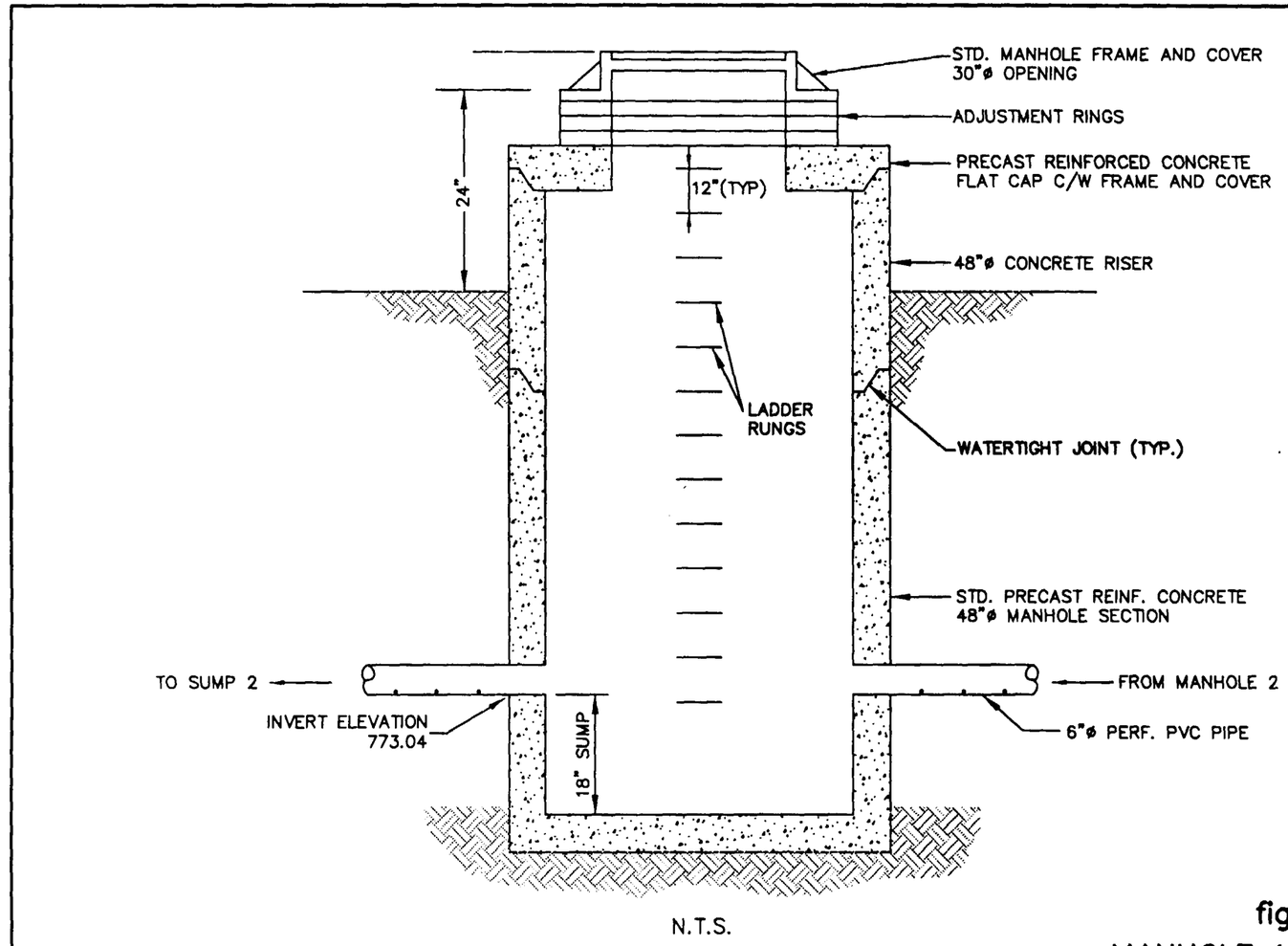


figure 2.4
MANHOLE 1 DETAIL
Wauconda Landfill

CRA

1449(49)–JUNE 21/96–REV.0 (D–17)(MN)

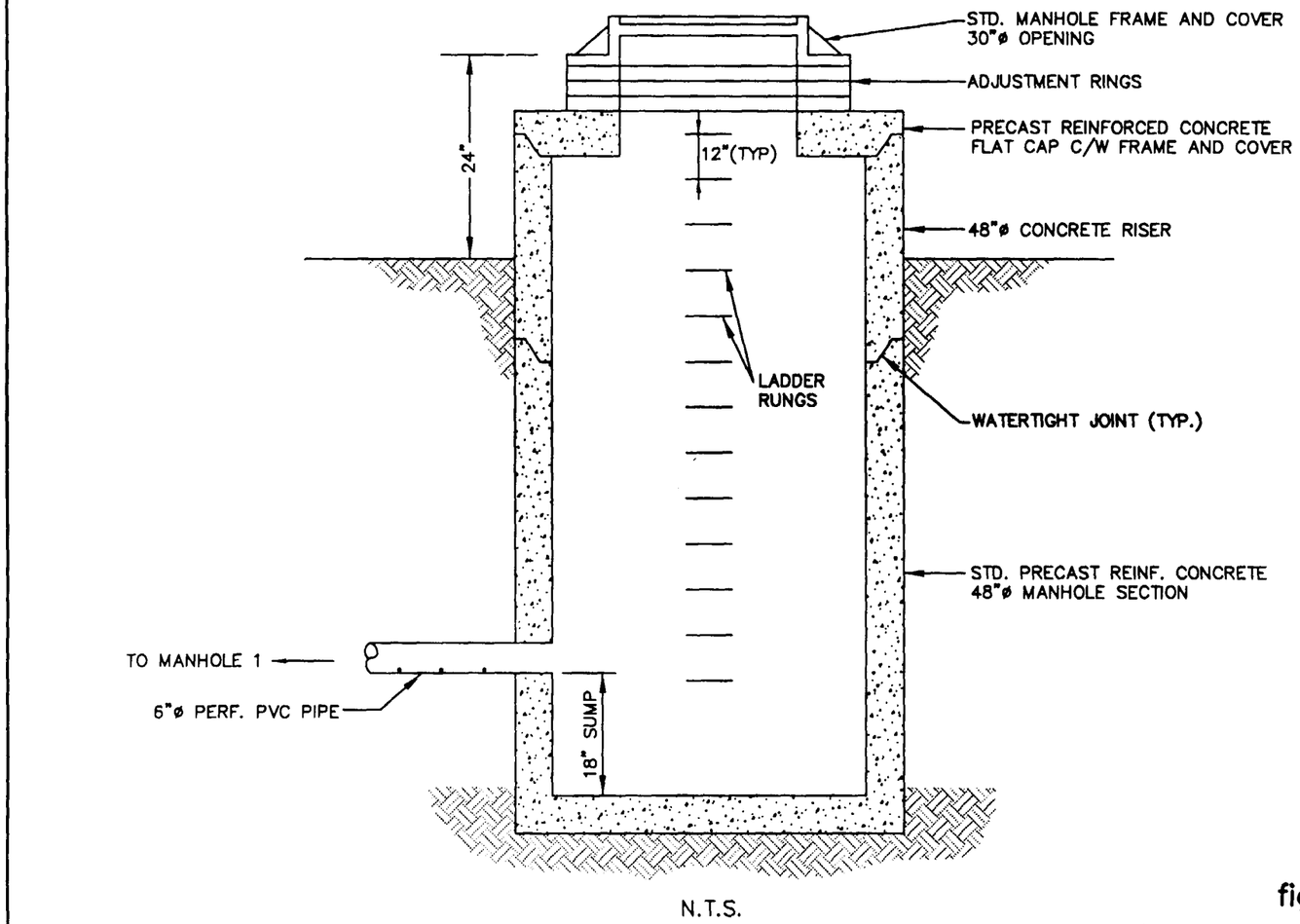


figure 2.5
MANHOLE 2 DETAIL
Wauconda Landfill

CRA

1449(49)-JUNE 21/96-REV.0 (D-27)(MN)

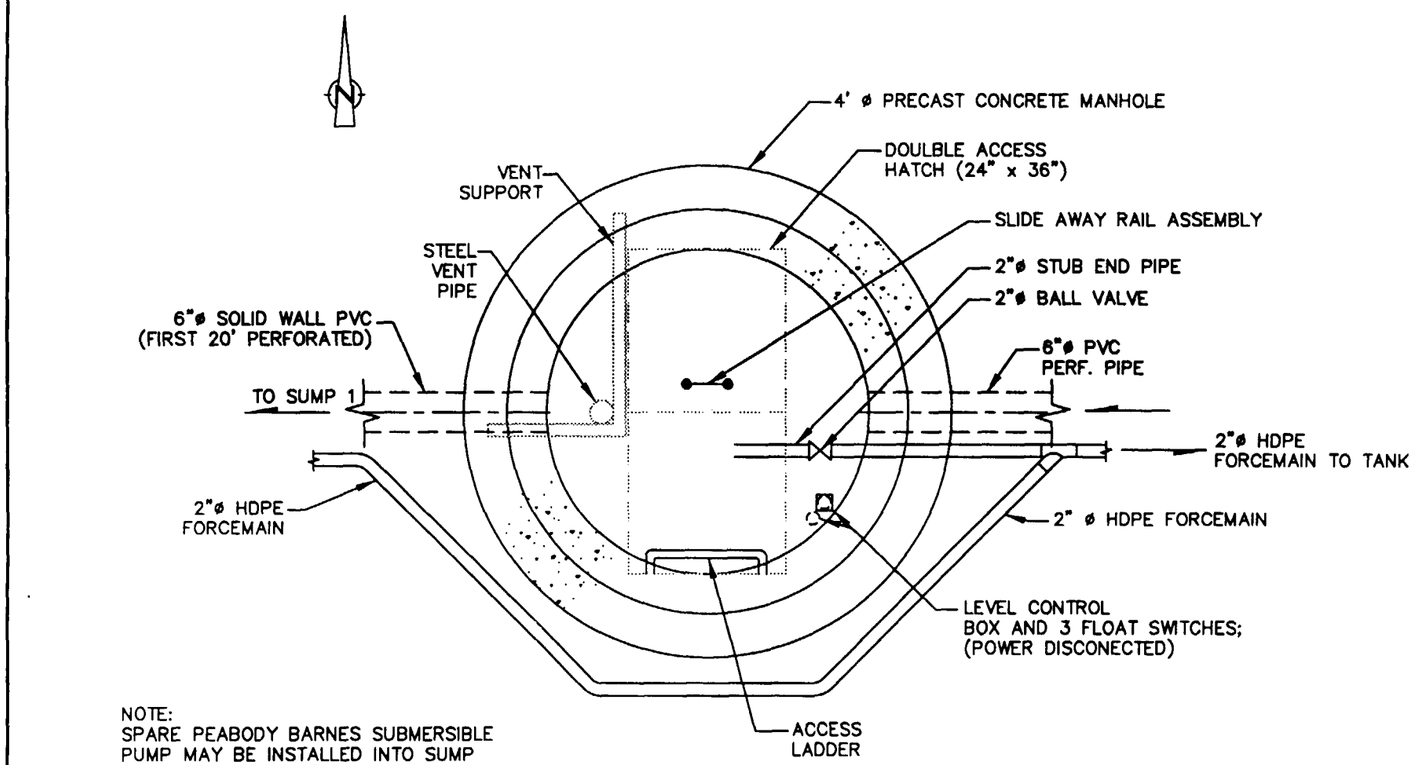


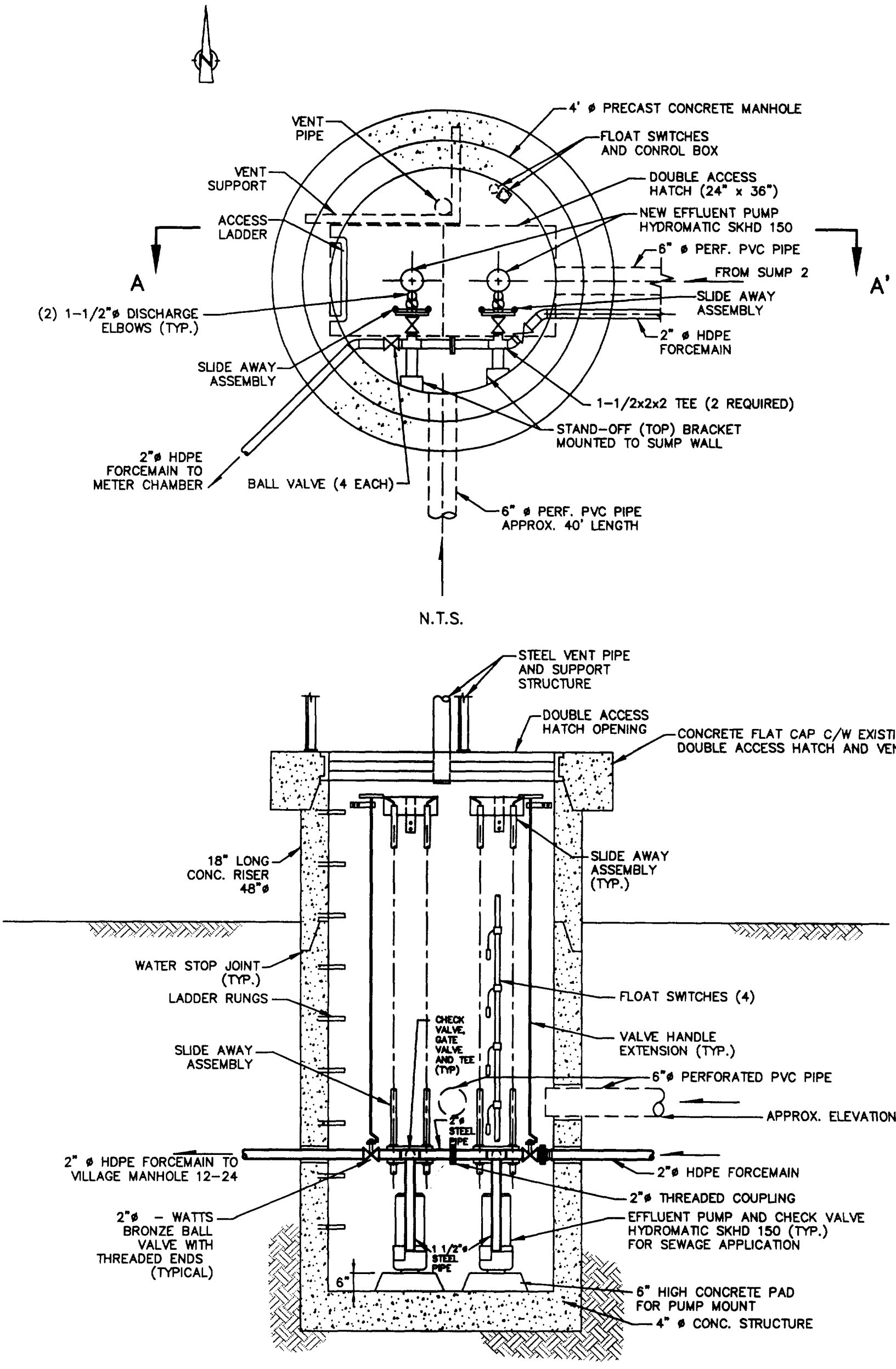
figure 2.6

SUMP 2 DETAIL

Wauconda Landfill

CRA

1449(49)–JUNE 21/96–REV.0 (D–18)(MN)



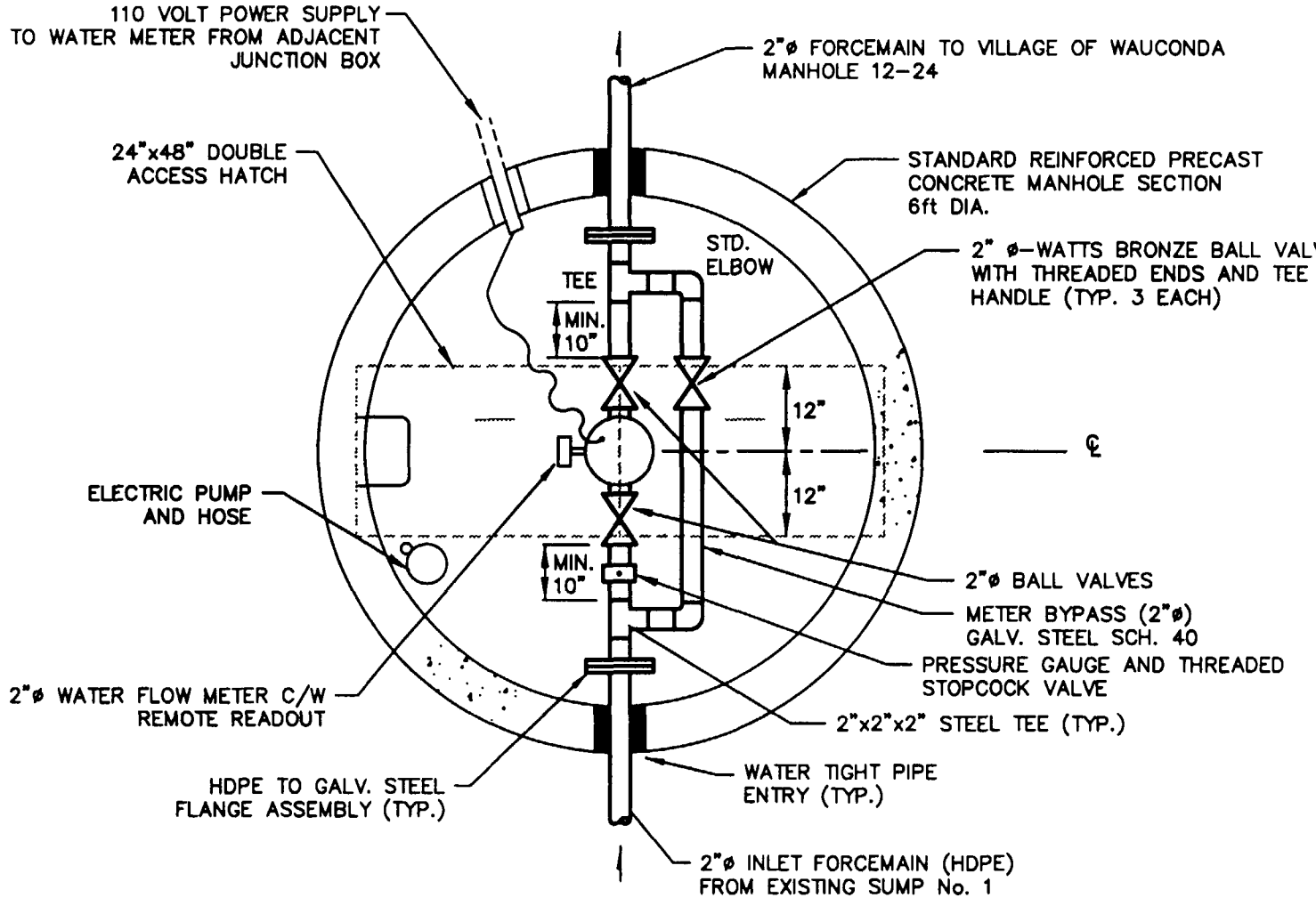
SECTION A-A'
N.T.S.

figure 2.7

SUMP 1 – PUMPING CHAMBER DETAIL
Wauconda Landfill

CRA

1449(49)-JUNE 21/96-REV.0 (D-19)(MN)



NOTE:
- REMOTE READ AT SUMP 1
- COMPLETE WITH PORTABLE ELECTRIC PUMP TO REMOVE LIQUIDS (PIPED BACK TO SUMP 1)

N.T.S.

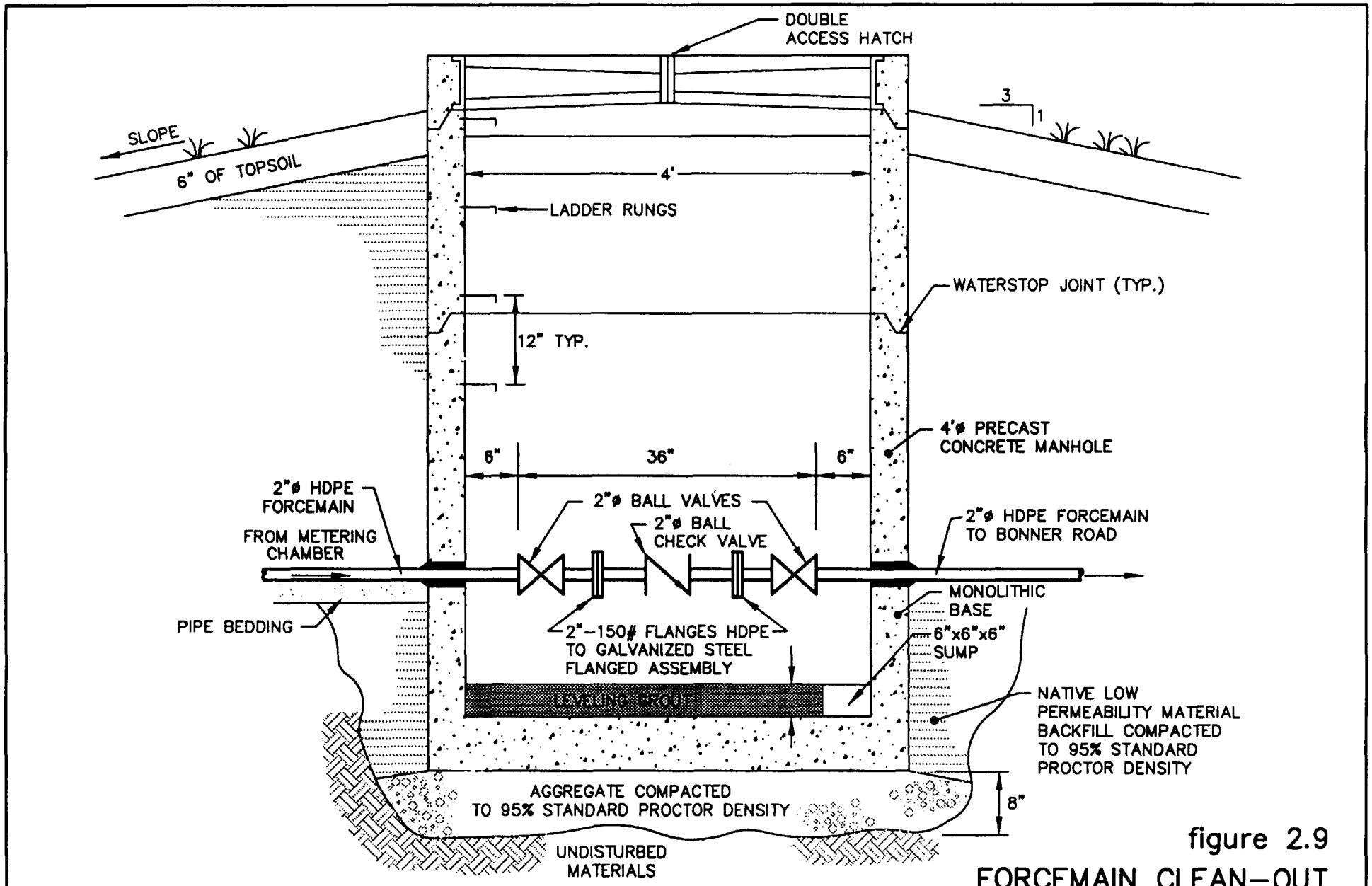
figure 2.8

FORCEMAIN METER CHAMBER DETAIL

Wauconda Landfill

CRA

1449(49)-JUNE 21/96-REV.0 (D-20)(MN)



N.T.S.

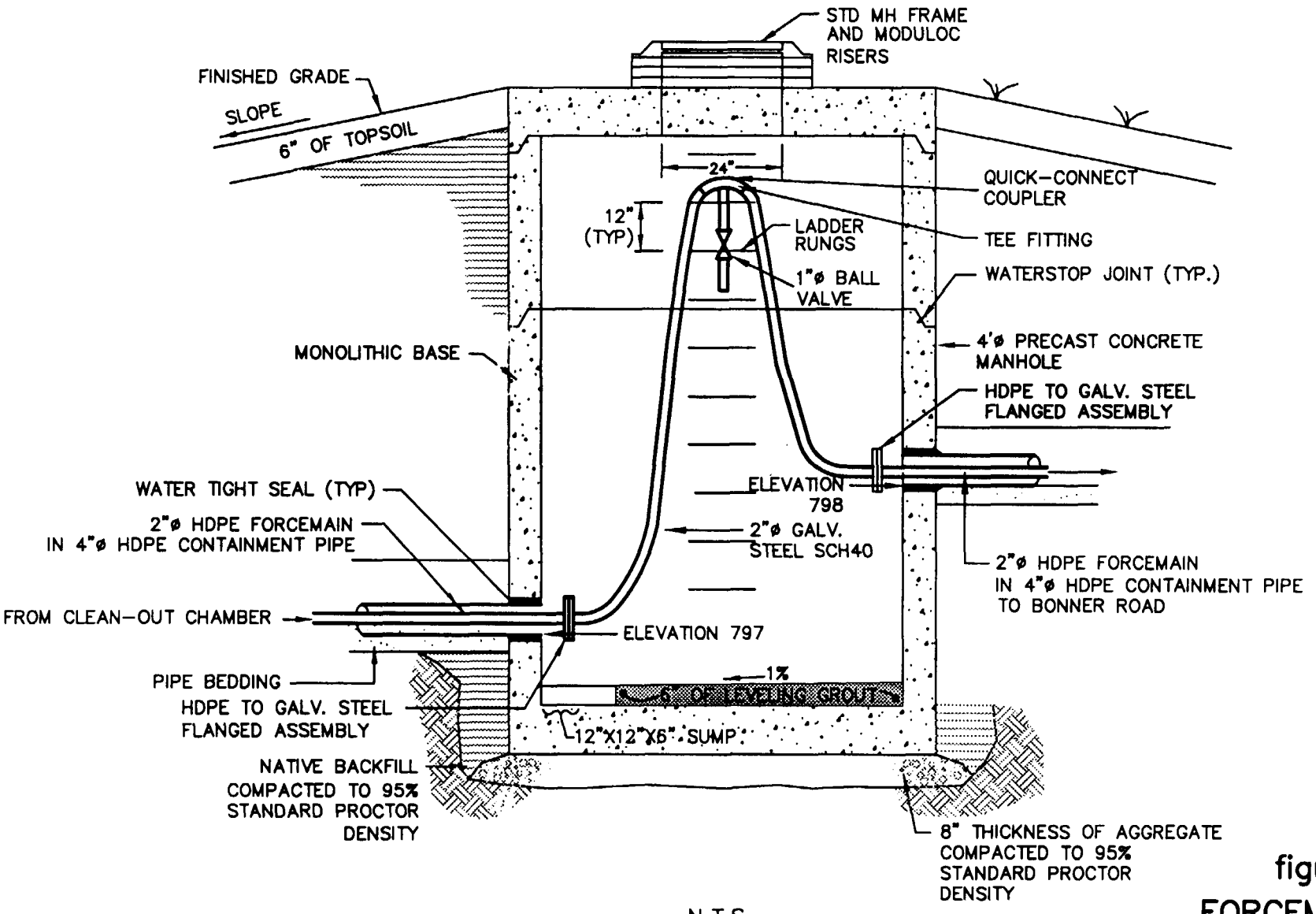
figure 2.9

FORCEMAIN CLEAN-OUT CHAMBER DETAIL

Wauconda Landfill

CRA

1449(49)-JUNE 21/96-REV.0 (D-21)(MN)



N.T.S.

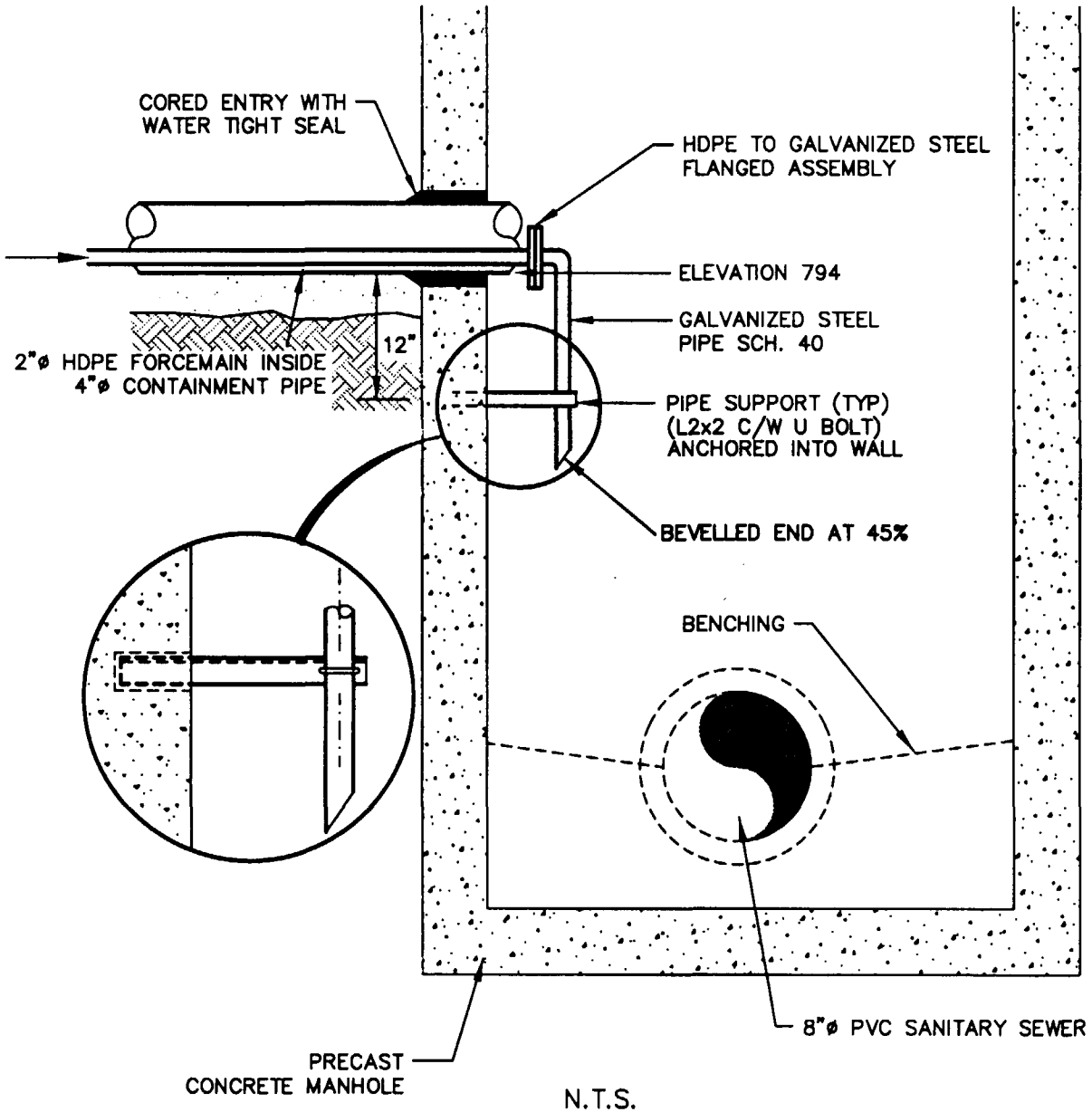
figure 2.10

FORCEMAIN AIR RELEASE CHAMBER

Wauconda Landfill

CRA

1449(49)-JUNE 21/96-REV.0 (D-22)(MN)



N.T.S.

figure 2.11

SANITARY MH 12–24 DETAIL

Wauconda Landfill

CRA

1449(49)–JUNE 21/96–REV.0 (D–23)(MN)

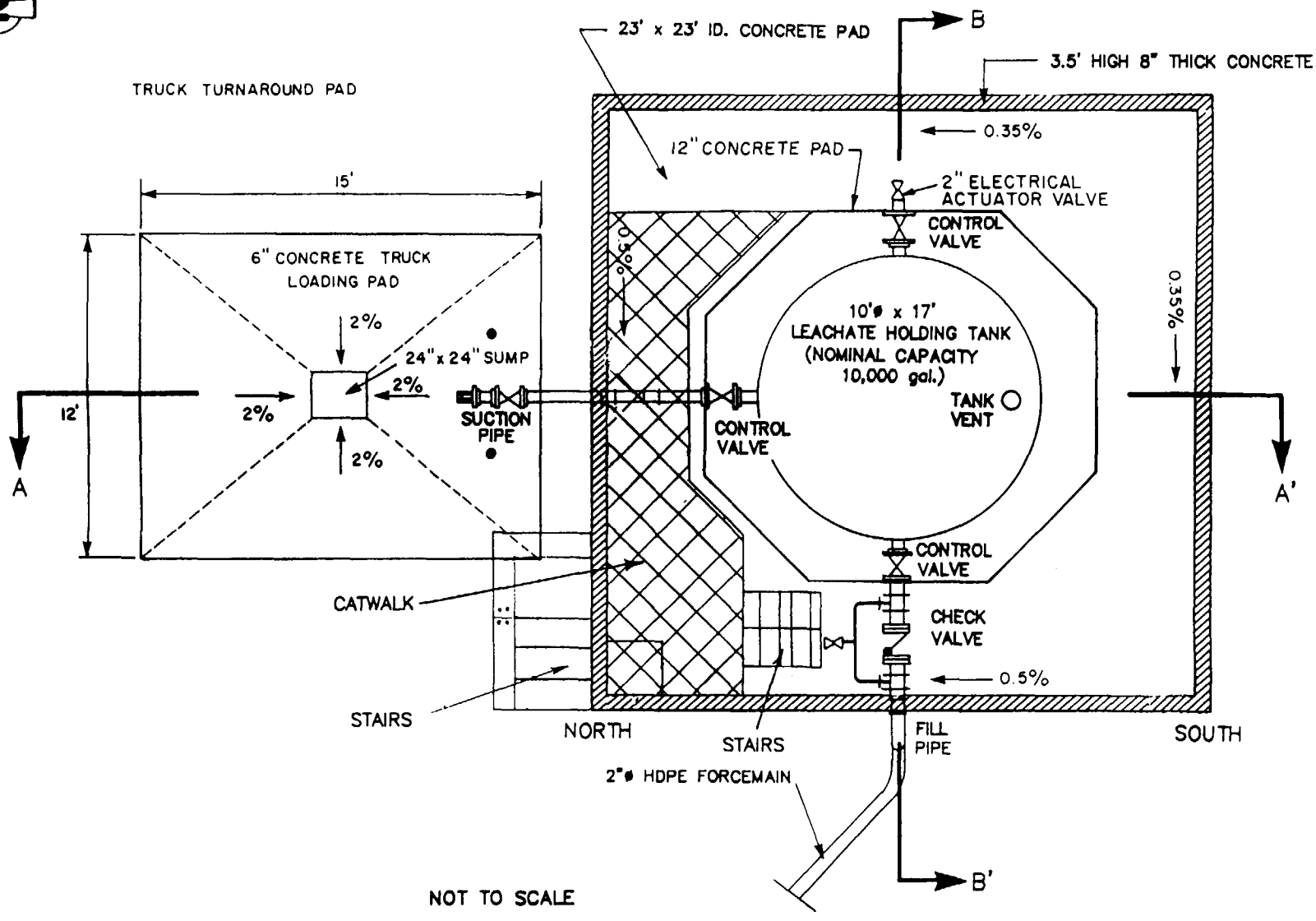


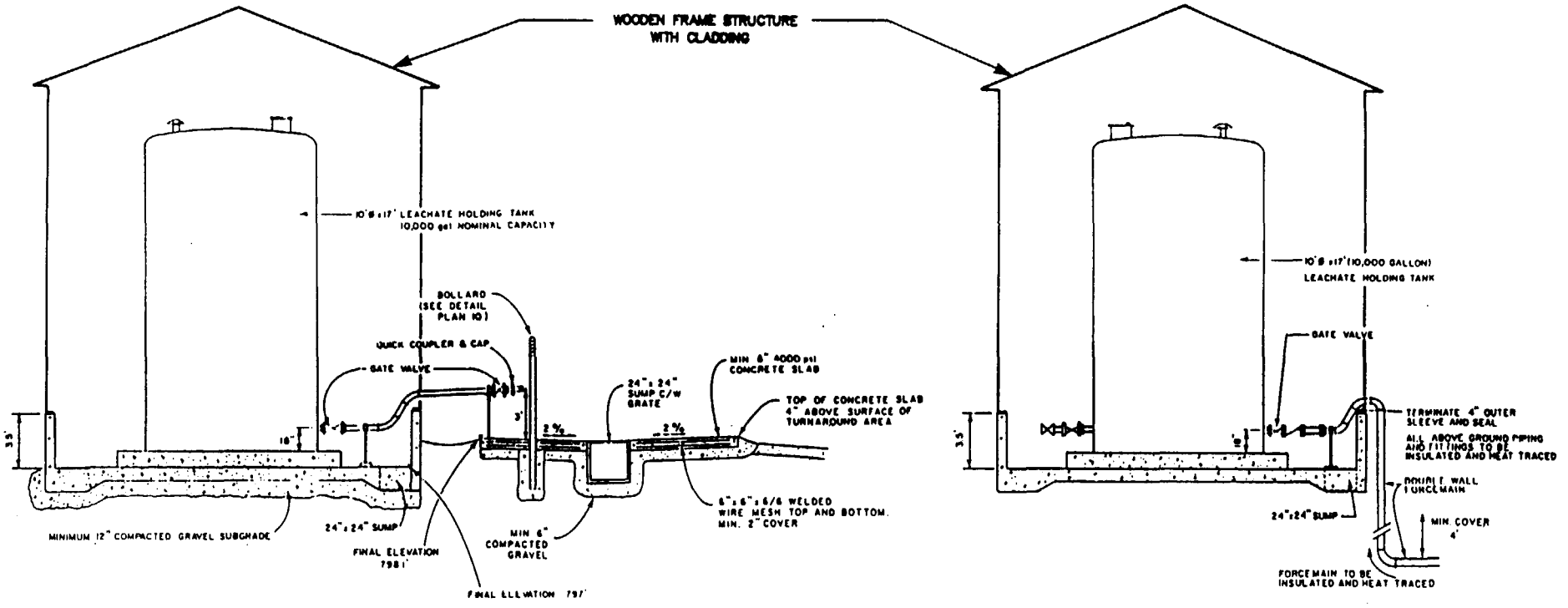
figure 2.12

LEACHATE STORAGE TANK–PLAN VIEW

Wauconda Landfill

CRA

1449–40(49)–MAR.20/92–REV.1



SECTION A'–A

SECTION B–B'

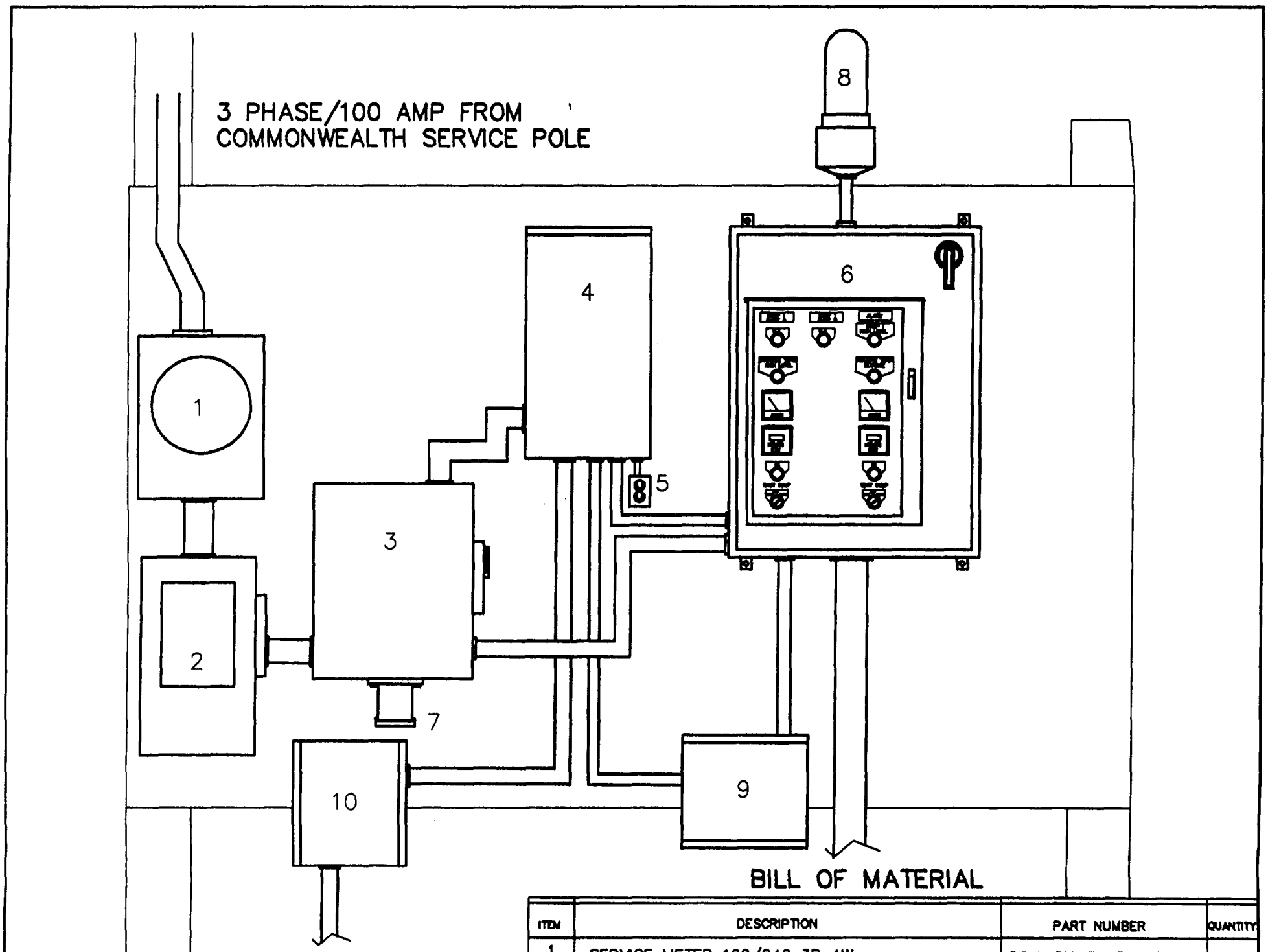
figure 2.13

LEACHATE STORAGE TANK–SECTIONS

Wauconda Landfill

CRA

1449–40(49)–MAR.20/92–REV.1



BILL OF MATERIAL

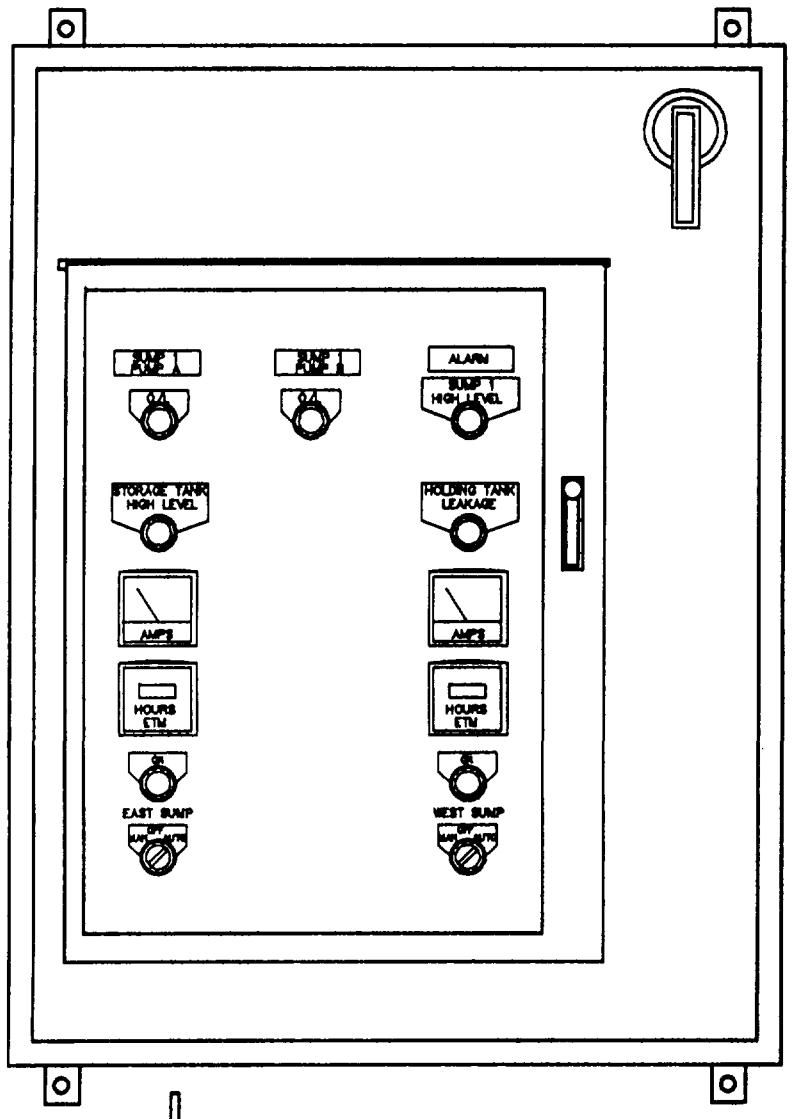
ITEM	DESCRIPTION	PART NUMBER	QUANTITY
1	SERVICE METER 120/240 3P 4W	COMMONWEALTH EDISON	
2	SERVICE ENTRANCE SWITCH 100A 3P 4W	SQ D H323 NRB	1
3	TRANSFER SWITCH 200A 3P S/N	SQ D 82344 RB	1
4	LOAD CENTER 20 CIRCUITS MAIN BRKR		1
5	SERVICE DUPLEX 120 VAC RELOCATED		1
6	MAIN CONTROL PANEL PER SK-2 24X36		1
7	GENERATOR PLUG TO SUIT VILLAGE		1
8	ALARM BEACON C/W FLASHER	HUBBELL BYMB3600 R	1
9	SECONDARY CONTROL PANEL-NON PUMPING EQUIP		
10	JUNCTION BOX TO FIELD WIRING		
11			
12			
13			
14			
15			

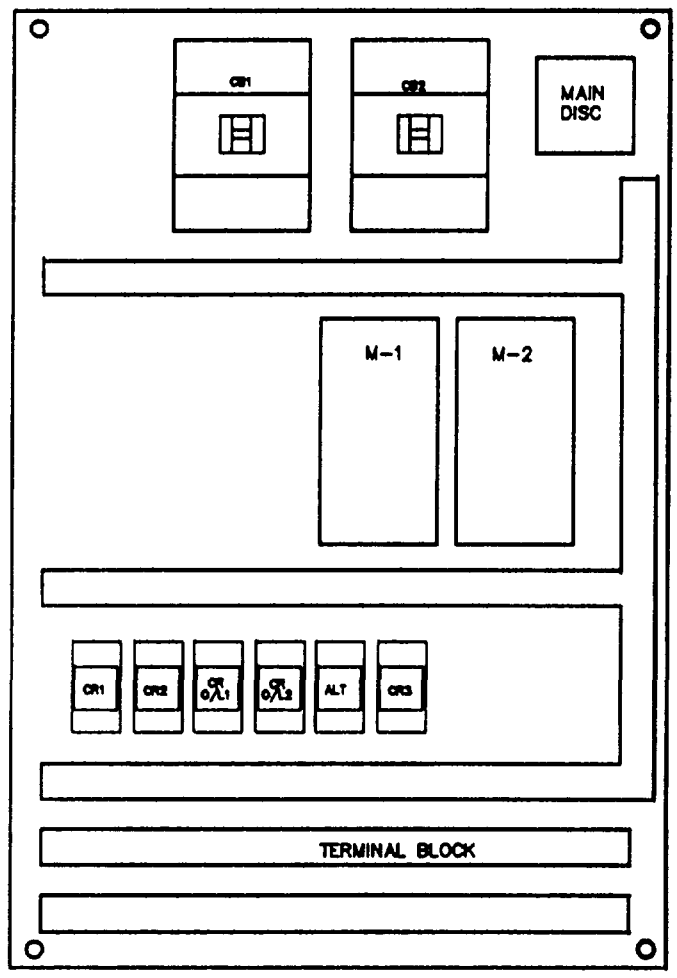
ELECTRICAL CONTROL STATION LAYOUT

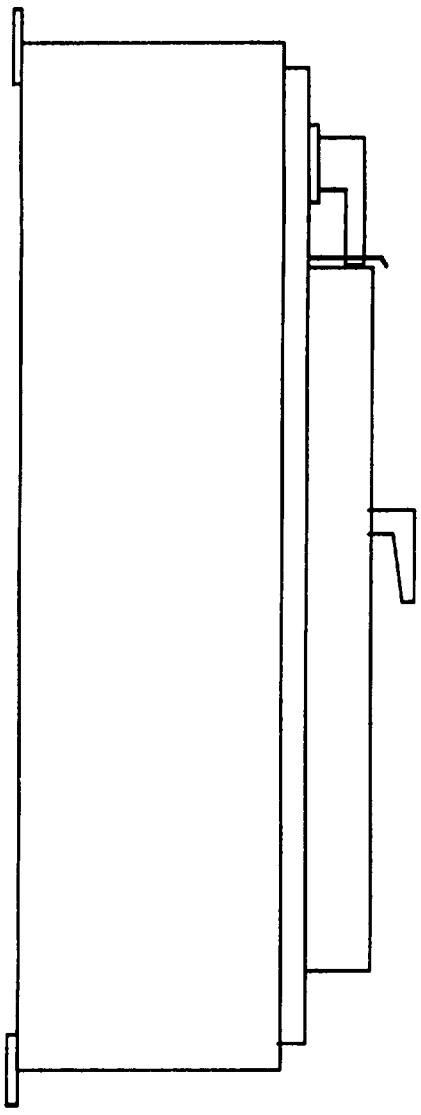
№	Revision	Date	Initial
1	AS RECORDED	FEB. 1992	R.F.
0	ISSUED FOR BID	OCT. 1991	R.F.

CRA Consulting Engineers
CONESTOGA-ROVERS & ASSOCIATES

Drawn by:	Scale:	Date:	File No:	Rev.No:
EFP	NTS	OCT 10 1991		1
Designed by:				
Checked by:		Project No: 1449	Drawing No: figure 2.14	







ENCLOSURE 36X24X8 NEMA 4 CRS WITH GRAY ASA61 2 PART POLY PAINT C/W AUTOMOTIVE STYLE LATCH HINGED OUTER DOOR C/W SAFETY GLASS WINDOW OVER PILOT DEVICES DOOR, DOOR SHALL HAVE RAISED FLANGE FOR TIGHT GASKET FIT AND DRIP SHIELD OVER TOP

BILL OF MATERIAL

ITEM	DESCRIPTION	PART NUMBER	QUANTITY
1	M1 M2 MOTOR STARTERS SIZE 0 3 POLE	SQ-D 8536 SB02	2
2	CIRCUIT BREAKERS 3 POLE 15A	SQ-D FAL34015	2
3	WIRING CHANNEL WHITE SIZED TO SUIT	PANDUIT AS RQD	
4	PILOT LIGHTS TRANSFORMER STYLE GREEN OR RED	SQ-D 9001 KP1-X	7
5	3 POSITION SELECTOR SWITCH	SQ-D 9001 KS-43B	2
6	ELAPSED TIME METERS	CROMPTON 016-156A PNZH	2
7	AMMETERS 0-20AMP AC	CROMPTON 016-02AA-NGNG	2
8	3PDT RELAY PLUG IN 11 PIN C/W SOCKET	P&B KRP14AG	4
9	WESTINGHOUSE SWITCH AND EEMAC 4 OPERATOR	WESTINGHOUSE THRU DOOR OPERATOR PAN MOUNT DISC	1
10	REAR OF PANEL 100A 240VAC 3P DISCONNECT	WESTINGHOUSE	1
11	ALTERNATING RELAY ELECTROMATIC	SG325	1
12	PANEL HEATER 120 W	CHROMALOX	1
13	TERMINALS	SQ-D 9080 SERIES	A/R
14	ENCLOSURE NEMA 4 C/W NEMA 3 AUX DOOR	CUSTOM	1
15			

MAIN CONTROL PANEL DETAILS

Nº	Revision	Date	Initial
1	AS RECORDED	FEB. 1992	R.F.
0	ISSUED FOR BID	OCT. 1991	R.F.

CRA Consulting Engineers
CONESTOGA-ROVERS & ASSOCIATES

Drawn by:	Scale:	Date:	File Nº:	Rev.Nº:
EFP	NTS	OCT 10 1991		1
Designed by:				
Checked by:		Project Nº: 1449	Drawing Nº: figure 2.15	

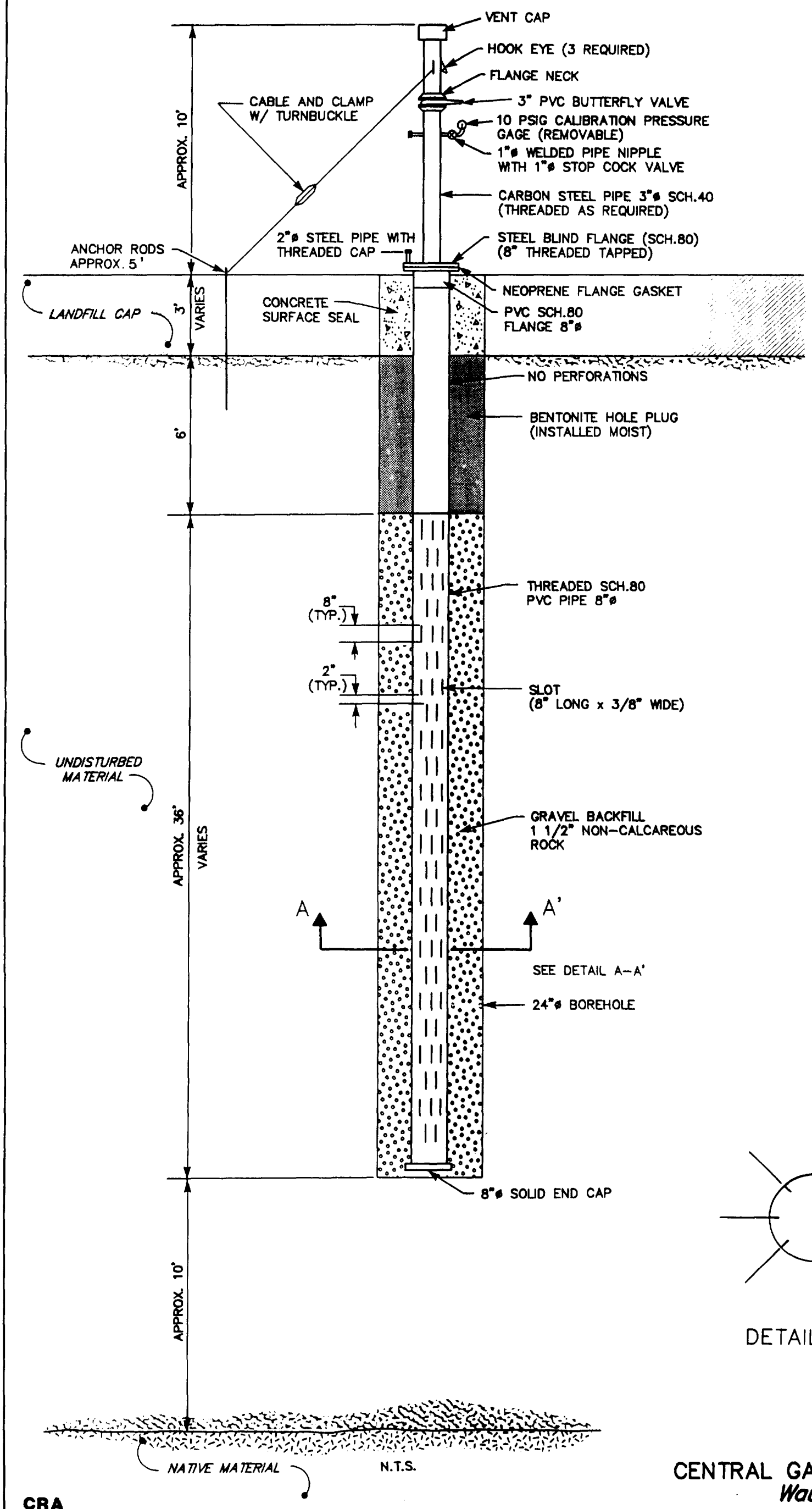


figure 3.1
CENTRAL GAS VENT SCHEMATIC
Wauconda Landfill Site

CRA

1449-40(60)-APR.28/92-REV.1 APPROVED FOR CONSTRUCTION

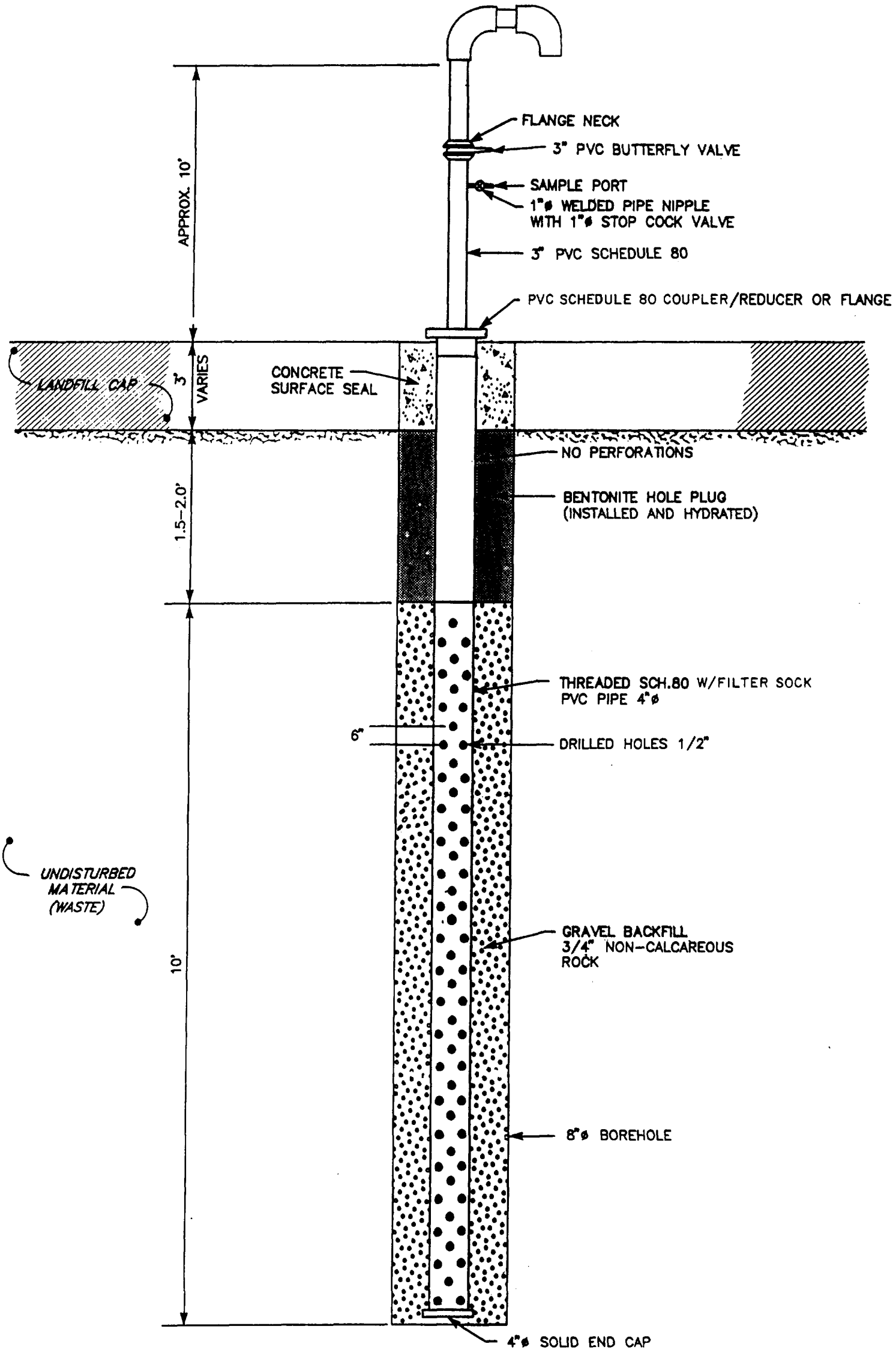


figure 3.2

PERIMETER GAS VENT SCHEMATIC

Wauconda Landfill Site

CRA

1449(L)-SEPT. 28/94-REV.0 (MN)

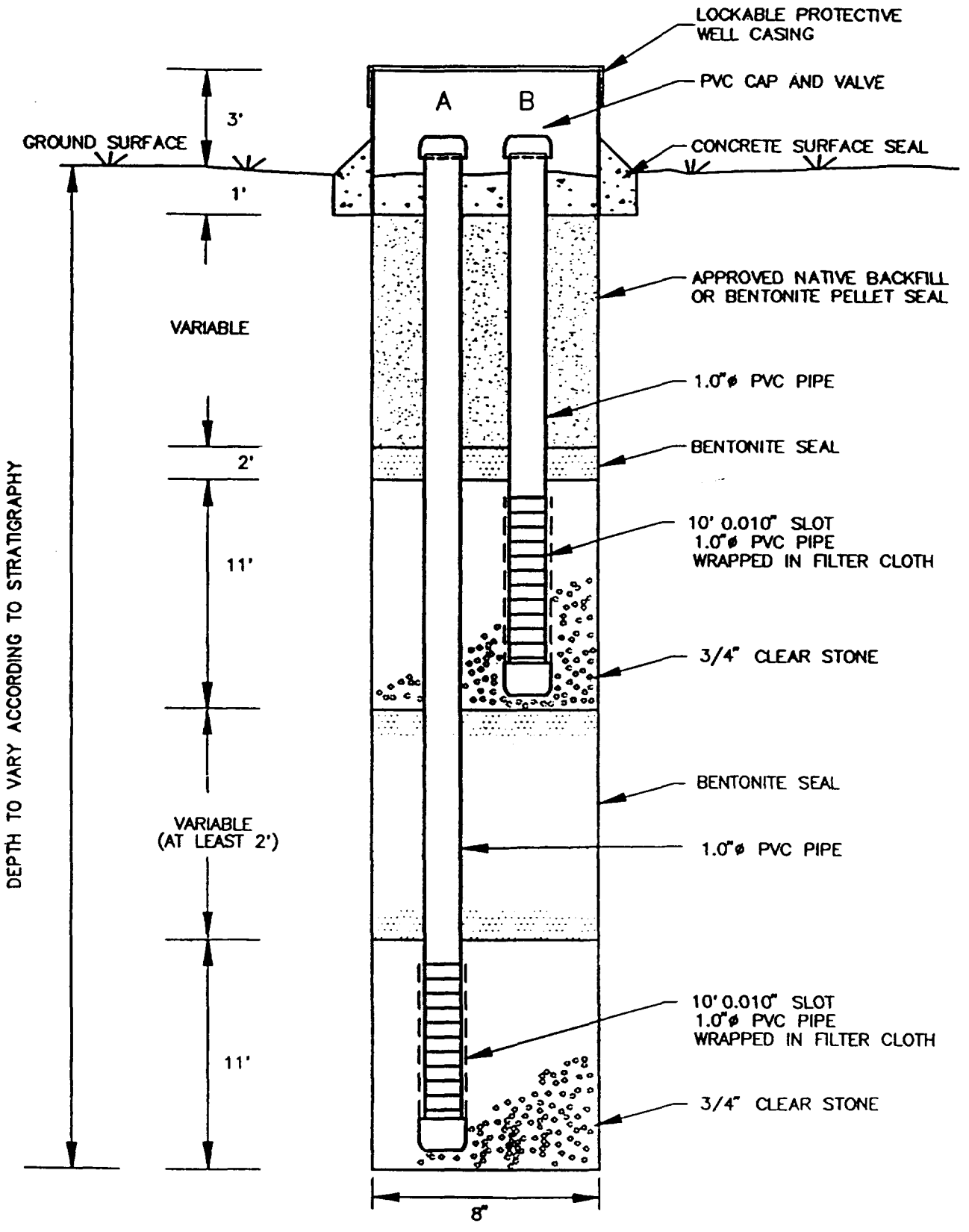


figure 3.3

NESTED SOIL GAS PROBE SCHEMATIC

Wauconda Landfill Site

CRA

1449(L)–SEPT. 28/94–REV.0 (MN)

N

100 0 100 200
scale feet

VILLAGE OF WAUCONDA SANITARY M.H. 12-24
G103
OW401
AIR RELEASE VALVE CHAMBER
G302
OW417
FORCEMAIN CLEANOUT AND DRAIN CHAMBER
APPROXIMATE LOCATION OF 2"Ø HDPE LEACHATE FORCEMAIN
METER CHAMBER
6"Ø PERF. PVC
6"Ø SOLID WALL PVC PIPE
LCS1 AND POWER BOX
LCS2 AND POWER BOX
G303
G303A
G304
GH7
SWALE #1
SWALE #1A
SWALE #2
SWALE #3
SWALE #4
MT-1
MT-2
MT-3
MT-4
MT-5
MT-6
MT-7
MT-8
GV1
GV2
GV3
GV4
GV5
GV6
GV7
GV8
GV9
GV10
GV11
GV12
GV13
GV14
GV15
GV16
GV17
GV18
LW501
LW502
LW503
LW504
GP1A/B
GP2A/B
GP5A/B
SEDIMENT TRAP
GROUTED
24" HDPE CULVERT
INV EL. 682.0
INV EL. 681.9
6"Ø PERF. PVC LEACHATE COLLECTION SYSTEM
MH-1
MH-2
MH-3
CONCRETE MANHOLE
8" CMP FROM OFF-SITE
REFERENCE GRID SURVEY POSITION AT CENTERLINE INTERSECTION OF BONNER AND GARLAND ROADS 0+76N, 97+35W
G207
G224/21
OW412
OW416
BONNER ROAD
GARLAND ROAD
BENCHMARK ELEV 794.47
VILLAGE OF WAUCONDA BENCHMARK N.E. CORNER OF INTERSECTION R.R. SPIKE IN POWER POLE ELEV 844.87 FT AMSL
LEACHATE HOLDING TANK AND ELECTRICAL PANEL
TRUCK LOADING PAD

LEGEND
- ENKAMAT LINED CHANNEL
- RIP RAP
- GABION LINED CHANNEL
- GAS VENT LOCATION
- WELL LOCATION
- MONUMENT LOCATION
- NESTED GAS PROBE LOCATION
- DRAINAGE FLOW

LOCATIONS ARE APPROXIMATE. FIGURE FOR ILLUSTRATIVE PURPOSES ONLY.

			WAUCONDA LANDFILL SITE WAUCONDA, ILLINOIS	CRA CONESTOGA-ROVERS & ASSOCIATES
			SURFACE DRAINAGE FLOW PATTERNS	Drawn by: CAA; Checked by: SV; Date: NOV. 1995; Project No.: 1446
				figure 3.4

TABLES

TABLE 2.1

SUMMARY OF MONTHLY LEACHATE REMOVAL VOLUME
WAUCONDA LANDFILL SITE
1989 - 1995

	Calculated Average Daily Flowrates (GPD)						
	1989	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*
January	887	694	1,474	2,072	994	552	2,028 (3)
February	845	1,954	1,438	3,305	207	(1)	1,142 (3)
March	1,185	1,921	2,663	2,616	123	(1)	2,039 (3)
April	905	2,034	2,781	2,853	1,959	865	5,204
May	782	2,980	2,267	1,681	(1)	696	(1)
June	670	1,182	1,614	1,347	(1)	666	(1)
July	665	1,503	1,247	1,655	(1)	621	(1)
August	1,158	1,439	1,131	1,116	(2)	635	604
September	1,313	1,570	997	2,513	1,140	498	450
October	574	2,437	2,126	797	965	321	1,390
November	963	2,380	3,301	4,243	850	3,922 (3)	3,540 (4)
December	758	2,519	2,518	1,123	1,381	2,319 (3)	1,103 (4)
Daily Average	892	1,884	1,963	2,110	952	1,100	1,944

Notes:
GPD - Gallons per day
(1) Flow meter malfunction resulted in erroneous flow data
(2) Leaking pump seals and check valves resulted in erroneous flow data
(3) Infiltration into the leachate collection system occurred from November 1994 to June 1995 when the landfill cap was repaired.
(4) Infiltration into a different portion of the LCS was observed in November 1995 and repairs to the LCS could not be completed.

TABLE 4.1

OPERATION AND MAINTENANCE
WAUCONDA LANDFILL
1996 - 2000

Task	*Period or Event Complete By:*	*Project Team*
A. Groundwater		
1. 1996 annual groundwater sampling event **(Round 20)**	September 1, 1996	CRA
2. 1997 annual groundwater sampling event **(Round 21)**	September 1, 1997	CRA
3. 1998 annual groundwater sampling event **(Round 22)**	September 1, 1998	CRA
4. 1999 annual groundwater sampling event **(Round 23)**	September 1, 1999	CRA
5. 2000 annual groundwater sampling event **(Round 24)**	September 1, 2000	CRA
B. Air		
1. Air quality monitoring	As Needed	CRA
C. Leachate Management		
1. Operate and maintain Leachate Collection System	Daily	Village
2. Stand-by truck delivery to Village lift station #12.	As needed	Site Custodian/Hauler
3. Stand-by truck delivery to CID Facility	Emergency only (notify CRA)	Site Custodian/Hauler
4. Sample analysis as USEPA required	As required	CRA
5. Sample analysis per IEPA permit for sewer disposal	Before August, 2000	CRA
6. Sample analysis per CID requirements	As required	CID
7. Renew CID disposal permit	November 1, 1998	CRA/WTG
8. Renew IEPA permits for leachate disposal	July 1, 2001	CRA/WTG
D. Cap Maintenance		
1. Mowing, weed control and fertilizing	As needed	Site Custodian
2. Animal Control	As needed	Site Custodian
3. Repair erosion or depressions due to settlement	As needed	Site Custodian/CRA
4. Access roads	Late Fall	Contractor
E. RD/RA Work Plan		
1. Revise QAPP per Unilateral Administrative Order	September 1, 2001	CRA/WTG
2. Revise O & M per Unilateral Administrative Order	September 1, 2001	CRA/WTG
3. Revise HASP per Unilateral Administrative Order	September 1, 2001	CRA/WTG

TABLE 4.1

OPERATION AND MAINTENANCE
WAUCONDA LANDFILL
1996 - 2000

Task	*Period or Event Complete By:*	*Project Team*
F. Site Inspections		
1. Site Custodian regular Site inspection	Once per week, minimum	Site Custodian
2. Village of Wauconda inspection of LCS	3 times per week, minimum	Village
3. Monthly Site inspection	First week of every month	CRA
4. Annual Site inspection	By September 30 of each year	CRA
G. Reporting		
1. Routine inspection by Site Custodian and Village	Weekly, fax to CRA	Site Custodian
2. Monthly inspection by CRA	1st week of following month	CRA
3. Monthly leachate volumes hauled/discharged	1st week of following month	Site Custodian/Village
4. Monthly report to USEPA	10th of following month	CRA/WTG
5. Annual monitoring report	December 1 of each year	CRA/WTG

Note:

* All work described herein is completed on behalf of the Wauconda Task Group (WTG) according to the effective period of the approved RD/RA Work Plan (1992 - 1996).

TABLE 5.1

SCHEDULE OF MAINTENANCE
WAUCONDA LANDFILL SITE

Item	*Description*	*Frequency*	*Notes*
Pumps	Remove from service and conduct overhaul of seals, impeller, motor, check valve	Every 2 years	The pump check valves are self-cleaning. but will require grit removal
Access hatch	Spray with WD/40 or other lubricant/water repellent	Following a heavy rain	Do not use lubricants
Locks	Spray with WD/40 as lubricant	Weekly during winter months	Prevent freezing
Electric boxes	Remove rust, then add one coat of paint	Annually	Conduct in summer
Sump vents and steel supports	Wire brush and add one coat of coat of paint	Annually	Conduct in summer
Sump chamber flushing	Low volume pressure wash with domestic cleaner, use long handle brush to remove scum/ deposits, fresh water flush	Annually	Conduct in summer
Lights	Replace as burned out	As needed	Includes panel and building lighting
Pipe heat tape	Replace with new	Annually (pre-winter)	Remove and re-install pipe insulation
Tank vent	Replace anti-freeze in trap	Annually	Or following tank overflow if occurs
Tank check valve	Clean and remove particles	Every 2 months	Operate on by-pass if required
6" Ø PVC collection pipe	Pressure clean pipe; working upstream from Sump 1 to clean-out; requires 3-inch nozzle	Annually	Fresh water supply 600 gallons per 1,000 feet
2"Ø back-up forcemain tank tank to Sump 2 (1,100 ft)	Air blow forcemain from tank inlet nipple to Sump 2 using maximum 90 psi pressure	Every 2 years	May alternate several sequences with flushing/ pumping to clear deposits

TABLE 5.1

SCHEDULE OF MAINTENANCE
WAUCONDA LANDFILL SITE

Item	*Description*	*Frequency*	*Notes*
2" Ø back-up forcemain Sump 1 to Sump 2	Inject domestic cleaning solution to dissolve potential deposits, alternate with fresh water flushing/pump as required	Every 2 years	No current method to air blow these lines
2" Ø west boundary forcemain meter chamber to MH12-24 (2,620 ft)	Air blow forcemain from meter chamber to MH 12-24 using maximum 90 psi pressure	Every 2 years	May conduct in subsection if required
10,000-gallon storage tank	Specialty contractor to access tank interior to power wash inside walls and vacuum remove sludge	Every 5 years	Confined space entry required; disposal to licensed facility

APPENDICES


A

APPENDIX A

IEPA AND CID PERMITS FOR LEACHATE DISPOSAL

MIDWEST REGION
SPECIAL WASTE MANAGEMENT DECISION

G 94633
Waste Profile Sheet Code

I. **Request For Decision:** ___ Initial ✓ Renewal

GENERATOR NAME Wauconda Sand & Gravel ADDRESS 1213 Garland Road

CITY, STATE/PROVINCE Wauconda, IL 60084

WASTE NAME(S): non hazardous leachate

PROPOSED MANAGEMENT FACILITY CID Biological Treatment Centu

PROPOSED INTERMEDIATE TRANSFER FACILITY: ___ TRANSPORTER: ___

WMNA REQUESTOR: Barbara J. Bowman SIGNATURE: Barbara J Bowman

II. **TECHNICAL MANAGER DECISION:** (circle one) (APPROVED) DISAPPROVED ___ Check if additional information is attached

If Disapproved, Explain: ___

If Approved, Complete A, B, C and D Below:

A Management Method(s): 28-22 - Biological Treatment.

B Precautions, Conditions, or Limitations on Approval: Per IEPA Generic Permit # 000195.

C **Decision Expiration Date:** 11/1/98 rgl

D For Type A Wastes, Laboratory Analysis of a Representative Sample Was: (Check only one)

___ Waived ___ Supplied By Generator ___ From a WMI-Approved Lab ✓ From Both Generator and WMI-Approved Lab

TECH. MGR. SIGNATURE: Tom Grill NAME (Print) Tom Grill DATE 11/17/95

III. **WMI MANAGEMENT FACILITY GENERAL MANAGER DECISION:** (circle one) (APPROVED) DISAPPROVED

If Approved, State any Additional Precautions, Conditions or Limitations: ___

GENERAL MGR SIGNATURE: Gary Schaefers NAME (Print) GARY SCHAEFERS DATE 11/20/95
FOR K. NEBEL

IV. **WMI INTERMEDIATE TRANSFER FACILITY GENERAL MANAGER DECISION:** (circle one) APPROVED DISAPPROVED

If Approved, State any Additional Precautions, Conditions or Limitations: ___

GENERAL MGR SIGNATURE ___ NAME (Print) ___ DATE ___

Printed on recycled paper

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
WATER POLLUTION CONTROL PERMIT

LOG NUMBERS: 0797-96 **PERMIT NO.:** 1996-EO-0797

FINAL PLANS, SPECIFICATIONS, APPLICATION AND SUPPORTING DOCUMENTS **DATE ISSUED:** July 12, 1996
PREPARED BY: Arthur Kurzydlo, P.E. of Conestoga-Rovers & Associates

SUBJECT: WAUCONDA TASK GROUP -- Wauconda Landfill Leachate Discharge -- Tributary to Wauconda Sewage Treatment Plant

PERMITTEE TO OWN AND OPERATE

Wauconda Task Group
% Neil Everett
Dearborn Chemical Company
300 Genesee Street
Lake Zurich, Illinois 60047

Permit is hereby granted to the above designated permittee(s) to construct and/or operate water pollution control facilities described as follows:

A sewer connection consisting of 180-feet of 6-inch PVC sewer pipe having one concrete manhole. A force main consisting of 2,640-feet of 2-inch high density polyethylene flexible plastic pipe inside of 4-inch containment pipe. All fittings and appurtenances. A daily average flow shall be 4,000 gpd (467 P.E.) which is an average over any 7 day period with total discharge not to exceed 120,000 gallons per month and a daily maximum not to exceed 10,000 gpd.

This operating permit expires on July 1, 2001.

This Permit renews and replaces Permit Number 1991-EN-4193 which was previously issued for the herein permitted facilities.

This Permit is issued subject to the following Special Condition(s). If such Special Condition(s) require(s) additional or revised facilities, satisfactory engineering plan documents must be submitted to this Agency for review and approval for issuance of a Supplemental Permit.

SPECIAL CONDITION 1:

a. Liquids, solids, or gases which by reason of their nature or quantity may cause fire or explosion; or be injurious in any other way to sewers, treatment works, or cause a safety hazard to the personnel operating the treatment works, or cause the effluent from the treatment works to violate applicable effluent standards are prohibited;

THE STANDARD CONDITIONS OF ISSUANCE INDICATED ON THE REVERSE SIDE MUST BE COMPLIED WITH IN FULL. READ ALL CONDITIONS CAREFULLY.

TGM:BAK:96071204.psj

DIVISION OF WATER POLLUTION CONTROL

Thomas G. McSwiggin, P.E.
Manager, Permit Section

cc: EPA - Maywood FOS
Conestoga - Rovers & Associates
Records - Industrial
Binds
Village of Wauconda

READ ALL CONDITIONS CAREFULLY:
STANDARD CONDITIONS

The Illinois Environmental Protection Act (Illinois Revised Statutes, Chapter 111-1 2, Section 1039) grants the Environmental Protection Agency authority to impose conditions on permits which it issues.

1. Unless the construction for which this permit is issued has been completed, this permit will expire (1) two years after the date of issuance for permits to construct sewers or wastewater sources or (2) three years after the date of issuance for permits to construct treatment works or pretreatment works.

2. The construction or development of facilities covered by this permit shall be done in compliance with applicable provisions of Federal laws and regulations, the Illinois Environmental Protect Act, and Rules and Regulations adopted by the Illinois Pollution Control Board.

3. There shall be no deviations from the approved plans and specifications unless a written request for modification of the project, along with plans and specifications as required, shall have been submitted to the Agency and a supplemental written permit issued.

4. The permittee shall allow any agent duly authorized by the Agency upon the presentation of credentials:

   a. to enter at reasonable times, the permittee's premises where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit.

   b. to have access to and copy at reasonable times any records required to be kept under the terms and conditions of this permit.

   c. to inspect at reasonable times, including during any hours of operation of equipment constructed or operated under this permit, such equipment or monitoring methodology or equipment required to be kept, used, operated, calibrated and maintained under this permit.

   d. to obtain and remove at reasonable times samples of any discharge or emission of pollutants.

   e. to enter at reasonable times and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring, or recording any activity, discharge, or emission authorized by this permit.

5. The issuance of this permit:

   a. shall not be considered as in any manner affecting the title of the premises upon which the permitted facilities are to be located;

   b. does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the proposed facilities;

   c. does not release the permittee from compliance with other applicable statutes and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances and regulations;

   d. does not take into consideration or attest to the structural stability of any units or parts of the project;

   e. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liability, directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.

6. Unless a joint construction/operation permit has been issued, a permit for operating shall be obtained from the Agency before the facility or equipment covered by this permit is placed into operation.

7. These standard conditions shall prevail unless modified by special conditions.

8. The Agency may file a complaint with the Board for suspension or revocation of a permit:

   a. upon discovery that the permit application contained misrepresentations, misinformation or false statement or that all relevant facts were not disclosed; or

   b. upon finding that any standard or special conditions have been violated; or

   c. upon any violation of the Environmental Protection Act or any Rule or Regulation effective thereunder as a result of the construction or development authorized by this permit.

LOG NUMBERS: 0797-96 **PERMIT NO.:** 1996-EO-0797

FINAL PLANS, SPECIFICATIONS, APPLICATION AND SUPPORTING DOCUMENTS **DATE ISSUED:** July 12, 1996
PREPARED BY: Arthur Kurzydlo, P.E. of Conestoga-Rovers & Associates

SUBJECT: WAUCONDA TASK GROUP -- Wauconda Landfill Leachate Discharge -- Tributary to Wauconda Sewage Treatment Plant

b. Solid or viscous wastes which cause obstruction to the flow in sewers or other interference with the proper operation of any sewer or treatment works are prohibited.

SPECIAL CONDITION 2: This Permit is issued with the expressed understanding that there shall be no surface discharge from these facilities. If such discharge occurs, additional or alternate facilities shall be provided. The construction of such additional or alternate facilities may not be started until a Permit for the construction is issued by this Agency.

SPECIAL CONDITION 3: Issuance of this permit does not release the Permittees from any liability for prior violations of the Act or Rules and Regulations promulgated thereunder.

SPECIAL CONDITION 4: The issuance of this permit does not relieve the permittee of the responsibility of complying with any limitations and provisions imposed by the Village of Wauconda.

SPECIAL CONDITION 5:

A. The discharge from a representative leachate holding tank shall be sampled and analyzed prior to discharge to the Wauconda Waste Water Treatment Plant for the following parameters once per calendar year quarter (4 times per year).

Arsenic	pH
Barium	Phenols
Boron	Selenium
Cadmium (total)	Silver
Copper	Zinc
Cyanide	BOD
Iron (total)	COD
Lead	Oil and Grease
Manganese	Ammonia (as N)
Mercury	Total Dissolved Solids
Nickel	Total Suspended Solids

The discharge shall also be sampled semi-annually (2 times per year) for organic toxic pollutants (Volatiles, Acid Compounds, Base/Neutrals and Pesticides as defined in 40 CFR 122).

B. Test methods as described in 40 CFR 136 shall be used when analyzing wastewater.

C. Sampling results shall be submitted within 30 days of your receipt to the Agency at the following addresses:

READ ALL CONDITIONS CAREFULLY:
STANDARD CONDITIONS

The Illinois Environmental Protection Act (Illinois Revised Statutes, Chapter 111-1 2, Section 1039) grants the Environmental Protection Agency authority to impose conditions on permits which it issues.

1. Unless the construction for which this permit is issued has been completed, this permit will expire (1) two years after the date of issuance for permits to construct sewers or wastewater sources or (2) three years after the date of issuance for permits to construct treatment works or pretreatment works.

2. The construction or development of facilities covered by this permit shall be done in compliance with applicable provisions of Federal laws and regulations, the Illinois Environmental Protect Act, and Rules and Regulations adopted by the Illinois Pollution Control Board.

3. There shall be no deviations from the approved plans and specifications unless a written request for modification of the project, along with plans and specifications as required, shall have been submitted to the Agency and a supplemental written permit issued.

4. The permittee shall allow any agent duly authorized by the Agency upon the presentation of credentials:

   a. to enter at reasonable times, the permittee's premises where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit;

   b. to have access to and copy at reasonable times any records required to be kept under the terms and conditions of this permit;

   c. to inspect at reasonable times, including during any hours of operation of equipment constructed or operated under this permit, such equipment or monitoring methodology or equipment required to be kept, used, operated, calibrated and maintained under this permit;

   d. to obtain and remove at reasonable times samples of any discharge or emission of pollutants;

   e. to enter at reasonable times and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring, or recording any activity, discharge, or emission authorized by this permit.

5. The issuance of this permit:

   a. shall not be considered as in any manner affecting the title of the premises upon which the permitted facilities are to be located;

   b. does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the proposed facilities;

   c. does not release the permittee from compliance with other applicable statutes and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances and regulations;

   d. does not take into consideration or attest to the structural stability of any units or parts of the project;

   e. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liability, directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.

6. Unless a joint construction/operation permit has been issued, a permit for operating shall be obtained from the Agency before the facility or equipment covered by this permit is placed into operation.

7. These standard conditions shall prevail unless modified by special conditions.

8. The Agency may file a complaint with the Board for suspension or revocation of a permit:

   a. upon discovery that the permit application contained misrepresentations, misinformation or false statement or that all relevant facts were not disclosed; or

   b. upon finding that any standard or special conditions have been violated; or

   c. upon any violation of the Environmental Protection Act or any Rule or Regulation effective thereunder as a result of the construction or development authorized by this permit.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
WATER POLLUTION CONTROL PERMIT

LOG NUMBERS: 0797-96 **PERMIT NO.:** 1996-EO-0797

FINAL PLANS, SPECIFICATIONS, APPLICATION AND SUPPORTING DOCUMENTS **DATE ISSUED:** July 12, 1996
PREPARED BY: Arthur Kurzydlo, P.E. of Conestoga-Rovers & Associates

SUBJECT: WAUCONDA TASK GROUP -- Wauconda Landfill Leachate Discharge -- Tributary to Wauconda Sewage Treatment Plant

Illinois Environmental Protection Agency
Division of Water Pollution Control
Permit Section
2200 Churchill Road
Post Office Box 19276
Springfield, Illinois 62794-9276

and

Illinois Environmental Protection Agency
DWPC -- Maywood Region
The Inter Continental Center
1701 First Avenue, Suite 200
Maywood, Illinois 60153

SPECIAL CONDITION 6: Any increase in flow above the limits set forth in this permit requires issuance of a supplemental permit including submittal of the proper application forms. Additional information must be provided showing that the increase in leachate flow will not cause interference or pass through at the Wauconda Waste Water Treatment Plant according to 40 CFR 403.5.

READ ALL CONDITIONS CAREFULLY:
STANDARD CONDITIONS

The Illinois Environmental Protection Act (Illinois Revised Statutes, Chapter 111-1 2, Section 1039) grants the Environmental Protection Agency authority to impose conditions on permits which it issues.

1. Unless the construction for which this permit is issued has been completed, this permit will expire (1) two years after the date of issuance for permits to construct sewers or wastewater sources or (2) three years after the date of issuance for permits to construct treatment works or pretreatment works.

2. The construction or development of facilities covered by this permit shall be done in compliance with applicable provisions of Federal laws and regulations, the Illinois Environmental Protect Act, and Rules and Regulations adopted by the Illinois Pollution Control Board.

3. There shall be no deviations from the approved plans and specifications unless a written request for modification of the project, along with plans and specifications as required, shall have been submitted to the Agency and a supplemental written permit issued.

4. The permittee shall allow any agent duly authorized by the Agency upon the presentation of credentials:

   a. to enter at reasonable times, the permittee's premises where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit

   b. to have access to and copy at reasonable times any records required to be kept under the terms and conditions of this permit

   c. to inspect at reasonable times, including during any hours of operation of equipment constructed or operated under this permit, such equipment or monitoring methodology or equipment required to be kept, used, operated, calibrated and maintained under this permit.

   d. to obtain and remove at reasonable times samples of any discharge or emission of pollutants.

   e. to enter at reasonable times and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring, or recording any activity, discharge, or emission authorized by this permit

5. The issuance of this permit:

   a. shall not be considered as in any manner affecting the title of the premises upon which the permitted facilities are to be located;

   b. does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the proposed facilities;

   c. does not release the permittee from compliance with other applicable statutes and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances and regulations;

   d. does not take into consideration or attest to the structural stability of any units or parts of the project;

   e. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liability, directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.

6. Unless a joint construction/operation permit has been issued, a permit for operating shall be obtained from the Agency before the facility or equipment covered by this permit is placed into operation.

7. These standard conditions shall prevail unless modified by special conditions.

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   c. upon any violation of the Environmental Protection Act or any Rule or Regulation effective thereunder as a result of the construction or development authorized by this permit.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
WATER POLLUTION CONTROL PERMIT

LOG NUMBERS: 0798-96 **PERMIT NO.:** 1996-EO-0798

FINAL PLANS, SPECIFICATIONS, APPLICATION AND SUPPORTING DOCUMENTS **DATE ISSUED:** July 12, 1996
PREPARED BY: Arthur Kurzydlo, P.E. of Conestoga-Rovers & Associates

SUBJECT: WAUCONDA TASK GROUP – Transport of Landfill Leachate – Discharge to Village of Wauconda Wastewater Treatment Plant

PERMITTEE TO OWN AND OPERATE

Wauconda Task Group
% Neil Everett
Dearborn Chemical Company
300 Genesee Street
Lake Zurich, Illinois 60047

Permit is hereby granted to the above designated permittee(s) to construct and/or operate water pollution control facilities described as follows:

Transporting landfill leachate by truck from the Wauconda landfill to a nearby lift station tributary to the Wauconda Wastewater Treatment Plant. Transport of landfill leachate is to occur during periods when the force main servicing the landfill is not operating due to maintenance or repairs. Flow during these periods is 4,000 gpd DAF (467 P.E.) the 4,000 gpd average flow shall be an average over any 7 day period with total discharge not to exceed 120,000 gallons per month and a daily maximum of 10,000 gpd.

This operating permit expires on July 1, 2001.

This Permit renews and replaces Permit Number 1991-EE-3599 which was previously issued for the herein permitted facilities.

This Permit is issued subject to the following Special Condition(s). If such Special Condition(s) require(s) additional or revised facilities, satisfactory engineering plan documents must be submitted to this Agency for review and approval for issuance of a Supplemental Permit.

SPECIAL CONDITION 1: The issuance of this permit does not relieve the permittee of the responsibility of complying with 35 Ill. Adm. Code, Part 307 and/or the General Pretreatment Regulations (40 CFR 403) and any guidelines developed pursuant to Section 301, 306, or 307 of the Federal Clean Water Act of 1977.

THE STANDARD CONDITIONS OF ISSUANCE INDICATED ON THE REVERSE SIDE MUST BE COMPLIED WITH IN FULL. READ ALL CONDITIONS CAREFULLY.

TGM:BAK:96071206.psj

DIVISION OF WATER POLLUTION CONTROL

Thomas G. McSwiggin, P.E.
Manager, Permit Section

cc: EPA - Maywood FOS
Conestoga - Rovers & Associates
Records - Industrial
Binds
Village of Wauconda

READ ALL CONDITIONS CAREFULLY:
STANDARD CONDITIONS

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1. Unless the construction for which this permit is issued has been completed, this permit will expire (1) two years after the date of issuance for permits to construct sewers or wastewater sources or (2) three years after the date of issuance for permits to construct treatment works or pretreatment works.

2. The construction or development of facilities covered by this permit shall be done in compliance with applicable provisions of Federal laws and regulations, the Illinois Environmental Protect Act, and Rules and Regulations adopted by the Illinois Pollution Control Board.

3. There shall be no deviations from the approved plans and specifications unless a written request for modification of the project, along with plans and specifications as required, shall have been submitted to the Agency and a supplemental written permit issued.

4. The permittee shall allow any agent duly authorized by the Agency upon the presentation of credentials:

   a. to enter at reasonable times, the permittee's premises where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit.

   b. to have access to and copy at reasonable times any records required to be kept under the terms and conditions of this permit.

   c. to inspect at reasonable times, including during any hours of operation of equipment constructed or operated under this permit, such equipment or monitoring methodology or equipment required to be kept, used, operated, calibrated and maintained under this permit.

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5. The issuance of this permit:

   a. shall not be considered as in any manner affecting the title of the premises upon which the permitted facilities are to be located;

   b. does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the proposed facilities;

   c. does not release the permittee from compliance with other applicable statutes and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances and regulations;

   d. does not take into consideration or attest to the structural stability of any units or parts of the project;

   e. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liability, directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.

6. Unless a joint construction/operation permit has been issued, a permit for operating shall be obtained from the Agency before the facility or equipment covered by this permit is placed into operation.

7. These standard conditions shall prevail unless modified by special conditions.

8. The Agency may file a complaint with the Board for suspension or revocation of a permit:

   a. upon discovery that the permit application contained misrepresentations, misinformation or false statement or that all relevant facts were not disclosed; or

   b. upon finding that any standard or special conditions have been violated; or

   c. upon any violation of the Environmental Protection Act or any Rule or Regulation effective thereunder as a result of the construction or development authorized by this permit.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
WATER POLLUTION CONTROL PERMIT

LOG NUMBERS: 0798-96 **PERMIT NO.:** 1996-EO-0798

FINAL PLANS, SPECIFICATIONS, APPLICATION AND SUPPORTING DOCUMENTS **DATE ISSUED:** July 12, 1996

PREPARED BY: Arthur Kurzydlo, P.E. of Conestoga-Rovers & Associates

SUBJECT: WAUCONDA TASK GROUP – Transport of Landfill Leachate – Discharge to Village of Wauconda Wastewater Treatment Plant

SPECIAL CONDITION 2: This permit is being issued with the expressed understanding that the transportation of leachate to the Village of Wauconda WWTP for treatment will be done in accordance with the following IEPA Bureau of Land requirements:

These regulations as identified in 35 Ill. Adm. Code 809, state that the generator may not give the waste to a hauler unless the hauler has obtained an Illinois special waste haulers license; the hauler may not accept the waste unless it is accompanied by the required manifest; and the receiving facility can not accept the waste unless it is delivered by a licensed special waste hauler or exempt hauler, accompanied by the required manifest and the receiving facility has obtained the required permits to receive the waste.

The authorization number is no longer issued by this Agency. Therefore, you will no longer be required to identify the authorization number on the manifest when shipping waste as authorized by this permit.

SPECIAL CONDITION 3: The issuance of this permit does not relieve the permittee of the responsibility of complying with any limitations and provisions imposed by the Village of Wauconda.

READ ALL CONDITIONS CAREFULLY:
STANDARD CONDITIONS

The Illinois Environmental Protection Act (Illinois Revised Statutes, Chapter 111-1 2, Section 1039) grants the Environmental Protection Agency authority to impose conditions on permits which it issues.

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   c. does not release the permittee from compliance with other applicable statutes and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances and regulations;

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   a. upon discovery that the permit application contained misrepresentations, misinformation or false statement or that all relevant facts were not disclosed; or

   b. upon finding that any standard or special conditions have been violated; or

   c. upon any violation of the Environmental Protection Act or any Rule or Regulation effective thereunder as a result of the construction or development authorized by this permit.

B

APPENDIX B

MANUFACTURERS' INFORMATION -

LEACHATE COLLECTION, TRANSFER AND STORAGE SYSTEM

Specifications, operating criteria and local suppliers for the major components and mechanical/electrical equipment are summarized herein.

Item	*Component*	
B.1	Submersible Pumps	
B.2	Flow Meter and Remote Read-Out	
B.3	Float Control Switches	
B.4	Slide-away Coupling Devices	
B.5	Air Release Valve	
B.6	Isolation Valves	- swing check - ball - gate
B.7	Pressure Gage	
B.8	Sump Chambers and Access Covers	
B.9	Storage Tank	
B.10	Tank Level Indicator	
B.11	Heat Tracing	
B.12	Enclosure Building Construction	
B.13	Electrical	
B.14	Miscellaneous Components	

APPENDIX B

WAUCONDA LANDFILL
LEACHATE COLLECTION AND STORAGE SYSTEM
SYSTEM COMPONENTS

	Item	Location	Description	Function	Suppliers	Notes
B.1	• effluent pumps	Sump 1	Cast iron submersible effluent pumps. Hydromatic SKHD150 1-1/2 Hp, 240 Volt, 3"Ø, 3450 RPM	Pump leachate to forcemain upon demand.	Metropolitan Pump Co. Romeoville, IL (708) 972-9400	Rated for 26 gpm at 100 ft. total dynamic head
	• auxiliary pumps	Stored in tank enclosure building, and Sump 2	Cast iron submersible effluent pumps. Peabody Barnes Model E202 2HP, 230 V, 1"Ø, 3450 RPM	Contingency system to pump leachate from collection system sump through forcemain. Must be hand-operated.	Gasvoda & Assoc. Inc. Calumet City, IL (312) 891-4400	Rated for 30 gpm at 80 ft. total dynamic head
B.2	• submersible flow meter	Meter chamber	2"Ø, obstructionless, magnetic remote read out, submersible casing	Record total volume and flow rate of leachate discharge to Village Manhole 12-24	Sparling-Tiger Mag El Monte, CA	Stainless steel bolts, flanged, 110 V DC
B.3	• sump level switches	Sumps 1, 2	Roto-float normally open Suspended mercury float switches Model No. S30N0	Switch pump on or off based on leachate level in sump and activate high level alarm.	Gasvoda & Assoc. Inc. Calumet City, IL (312) 891-4400	Sump 1 low level shut off, intermediate as pump on, high as tandem pump operation
	• sump pump float level switch	Forcemain Meter Chamber	SJE vertical master pump switch	Operate pump automatically	S.J.E. Electro Systems, Inc. Detroit Lakes, MN. (218) 847-1317	
B.4	• slide-away couplings	Sump 1	Metropolitan Pump Company	Removal and installation of effluent pumps from top of sump without entering.	Metropolitan Pump Co. Romeoville, IL (708) 972-9400	
	• slide-away couplings	Sump 2	Cast brass with teflon coated O-ring. Peabody-Barnes Model BAF1-1/4M	Removal and installation of effluent pumps from top of sump without entry.	Gasvoda & Assoc. Inc. Calumet City, IL (312) 891-4400	Back-up pumping location

APPENDIX B

WAUCONDA LANDFILL
LEACHATE COLLECTION AND STORAGE SYSTEM
SYSTEM COMPONENTS

	Item	*Location*	*Description*	*Function*	*Suppliers*	*Notes*
B.5	• air release valve	Air release chamber	1" threaded, universal	Expel pumped air, allow air entry while draining pipe	Crispen-Multiplex Berwick, PA	Air release chamber installed at forcemain high point
B.6	• check valve #1	Mounted to pumps	Neoprene ball	Prevent backflow of leachate to sump.	Metropolitan Pump Co. Romeoville, IL	Horizontal mount, self cleaning
	• check valve #2	Inlet to tank, drain chamber	2-inch, Brass swing check	Prevent leachate in storage tank or forcemain from draining back to collection sumps.		
	• ball valve	Sumps 1, 2 Meter chamber Drain chamber	2-inch brass ball valves	Prevent draining of forcemain when removing components.		
	• gate valves	Tank inlet, outlet piping	2-inch gate inlet, (2) 4-inch gate outlet	Control flow out of tank both inside building and at truck loading pad.		
	• actuator valve	tank outlet	2-inch, electric	Automatic open, close to drain tank into containment dike		Mounted with 4-inch gate valve
B.7	• pressure gauge	Meter chamber	P500, 3-1/2" dial LM, 60 psi	Measure pump discharge pressure	Amatek	Mounted on 1/4"Ø NPT
B.8	• access hatch	Sumps 1, 2, meter chamber	24" x 48"	Personnel-entry, pump removal	Halliday	Aluminum and stainless steel
B.9	• storage tank	Enclosure building	10,000 gal., 17 ft. high 10 ft. dia.	Temporary leachate storage, staging for haulage		Steel construction, on concrete pad with concrete containment
B.10	• tank level measure	Tank side	Moorman Bros. Model 75-SS	Indicate volume of leachate in storage tank.		

APPENDIX B

WAUCONDA LANDFILL
LEACHATE COLLECTION AND STORAGE SYSTEM
SYSTEM COMPONENTS

	Item	*Location*	*Description*	*Function*	*Suppliers*	*Notes*
	• tank high level alarm	Tank	Moorman Bros. Model 75-SS	Indicate tank filled to high level set point, stop pump operation to prevent tank overflow.		
	• tank leak indicator	Building sump	Moorman Bros. Model 75-SS	Indicate if leachate leaks from tank to containment area.		
B.11	• heat trace	Tank inlet, outlet piping	Cooperheat	Keep piping from freezing in cold weather if pumps not operating.	Andcor	
	• tank heating panels	Tank walls	Cooperheat EGL-500 tank heating panels 500-watt rating	Keep storage tank from freezing in cold weather	Andcor	
B.12	• control panel contractors	Main panel	Square D Size 0 Type 509-A01	Indicate status of pumps and leachate levels in sumps and storage tanks. Allow remote pump control.		
	• pilot lamps		6 watt, 115 Volt			
	• control relay		120V KRPA-14AG720(5)		Potter & Brumfield	
	• key auto switch	Main panel	Type KS43K5 Class 9001	Set operating components	Square D	
	• thermostat			Activate tank heating panels.		
	• thermostat			Activate heat trace.		
	• pump circuit breakers	Main panel	15 amp, 240V, 3Ø		Square D	

APPENDIX B

WAUCONDA LANDFILL
LEACHATE COLLECTION AND STORAGE SYSTEM
SYSTEM COMPONENTS

	Item	*Location*	*Description*	*Function*	*Suppliers*	*Notes*
	• Fuses	Main panel service disconnect	FRN-R-100(3) little fuse FNLR - 100(3)			
B.13	• building enclosure	–	Wood frame and fiberglass cladding	House tank and concrete containment		not heated, lockable door, telephone, file storage
Misc.	• flexible pipe connector	Tank inlet piping		Prevent transmission of forcemain movement to downstream joints and fittings and relieve stresses on upstream joints/fittings.		
	• quick coupler	Tank outlet piping		Connection to tanker truck hose for removing leachate from storage tank.		

B.1 SUBMERSIBLE PUMPS

PROJECT LEACHATE PUMP STATION

LOCATION WAUCONDA, ILLINOIS

ARCHITECT

ENGINEER CONESTOGA-ROVERS & ASSOCIATES

~~XXXXXXX~~ CONTR. HERITAGE REMEDIATION, INC.

REPRESENTATIVE ROBERT L. WEDELL

DATE JANUARY 9, 1992

SUBMITTED BY

METROPOLITAN
PUMP COMPANY
1400 Bluff Road
Romeoville, IL 60441

METROPOLITAN PUMP COMPANY

- PUMPS
- CONTROLS
- PUMP SYSTEMS

1400 BLUFF ROAD ROMEOVILLE, ILLINOIS 60441 PHONE: AREA 708-972-9400
FAX: 708-972-9594

SPECIFICATIONS

JOB: LEACHATE PUMPS
FOR THE LANDFILL
WAUCONDA, ILLINOIS

DUPLEX LEACHATE PUMPS

MODEL: (2) SKHD150M3 pumps with 2" discharge

CAPACITY: 25 GPM @100' TDH (3/4" solids)

MOTOR(S): 1½ HP, 3450 RPM, 240 volt, 3 PH, 60 HZ, 1.2 service factor

CONTROL: [illegible] BY OTHERS

CONTROL PANEL: [illegible] BY OTHERS

ALARM: BY OTHERS

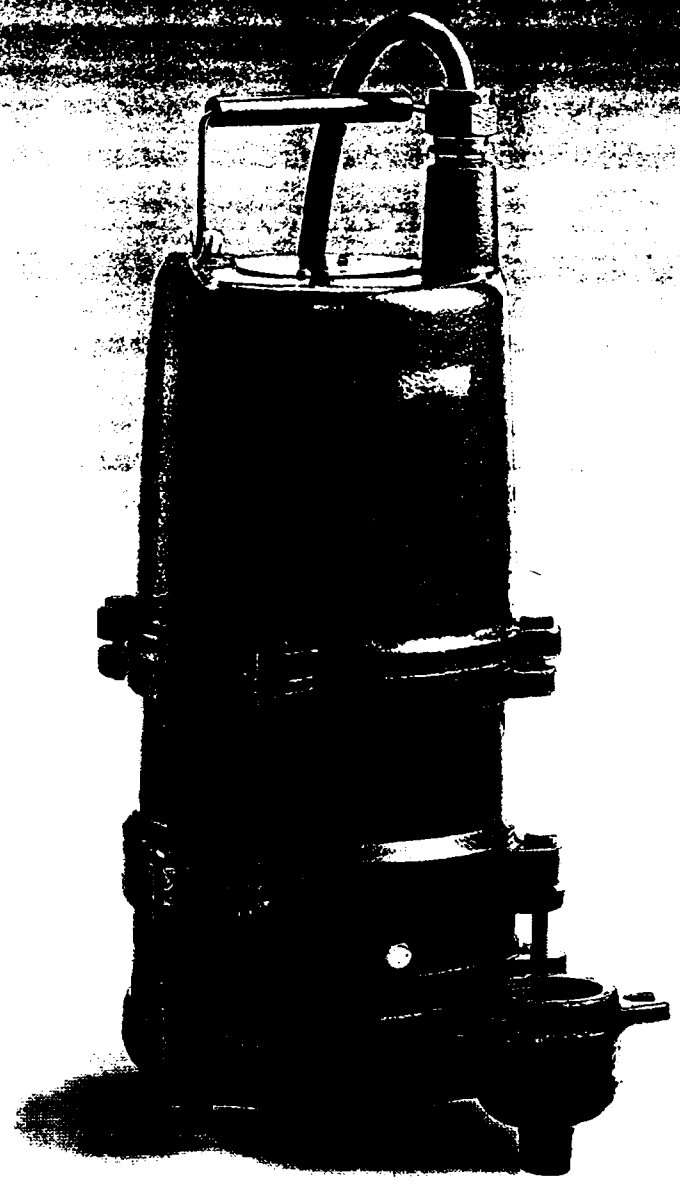
BASIN: BY OTHERS

ACCESSORIES:

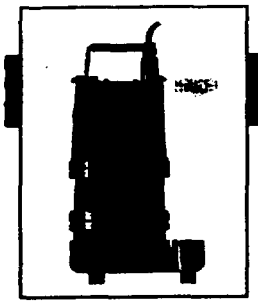
20' power cord
(2) * Discharge piping with ball check valve 2"
(2) * gate valve assemblies - 2"
(2) * pump guide kits
(2) - Pump base plates
(2) * 15' lengths, 3/16 galvanized lifting chains

* Material mounted to pumps

HYDROMATIC SKHD150
Submersible Effluent Pump



AURORA PUMP
A UNIT OF GENERAL SIGNAL



SKHD150 SUBMERSIBLE EFFLUENT PUMP

The Hydromatic SKHD150 submersible pump is specifically designed to meet the demands of septic tank effluent and industrial sump applications that require a "high-head," dual-sealed pump. The 1-1/2 inch NPT discharge pump is available with a powerful 1-1/2 horsepower motor, which provides maximum starting torque.

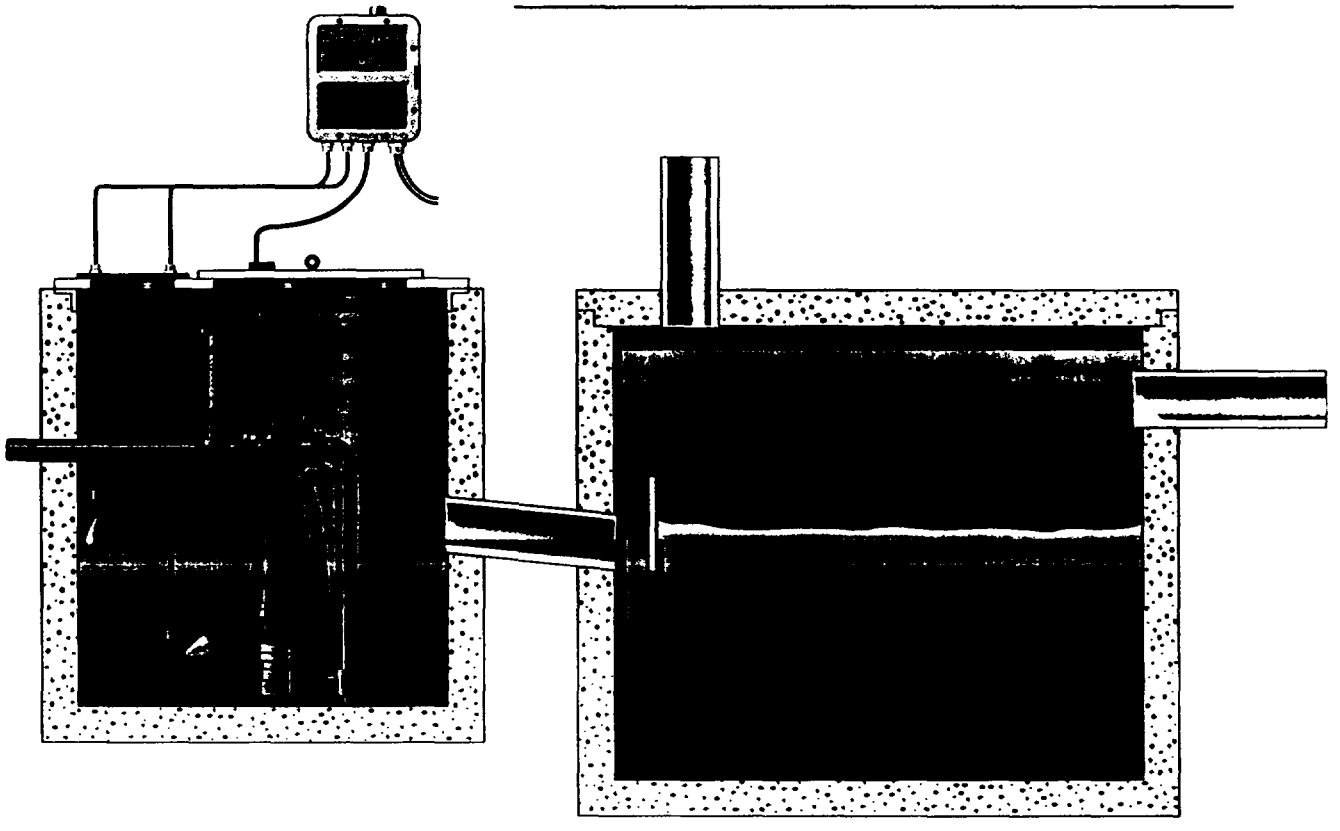
Available in single- and three-phase configurations — the single-phase , 230 volt motor features a start capacitor, solid-state start switch and automatic reset thermal overload protection, while the three-phase motors, 200, 230, 460, or 575 volt, require a magnetic starter with overload protection located in the accessory control panel. The SKHD150 can handle capacities up to 53 gallons per minute and heads to 130 feet.

The SKHD150 features a high-quality cast iron pump volute, motor housing and seal housing construction that help to ensure a long service life. The pump's semi-open thermoplastic impeller, which is threaded to a stainless steel shaft, is capable of handling up to 3/4 inch spherical solids — providing long life in demanding applications. In addition, the SKHD150 utilizes two carbon- and ceramic-faced mechanical shaft seals – mounted in tandem – to provide double protection against water entry.

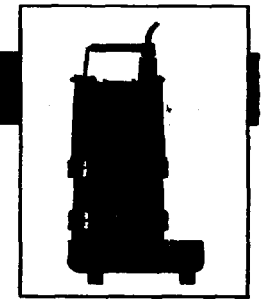
The oil-filled motor of the SKHD150 provides superior cooling characteristics, allowing the motor to run cool and quiet for years. This oil-filled design also provides permanent lubrication of the shaft bearings, minimizing maintenance and extending the service life of the pump.

For applications requiring a seal failure alarm, the SKHD150 is available with a seal failure sensor, which is optional on single-phase models and standard on three-phase models.

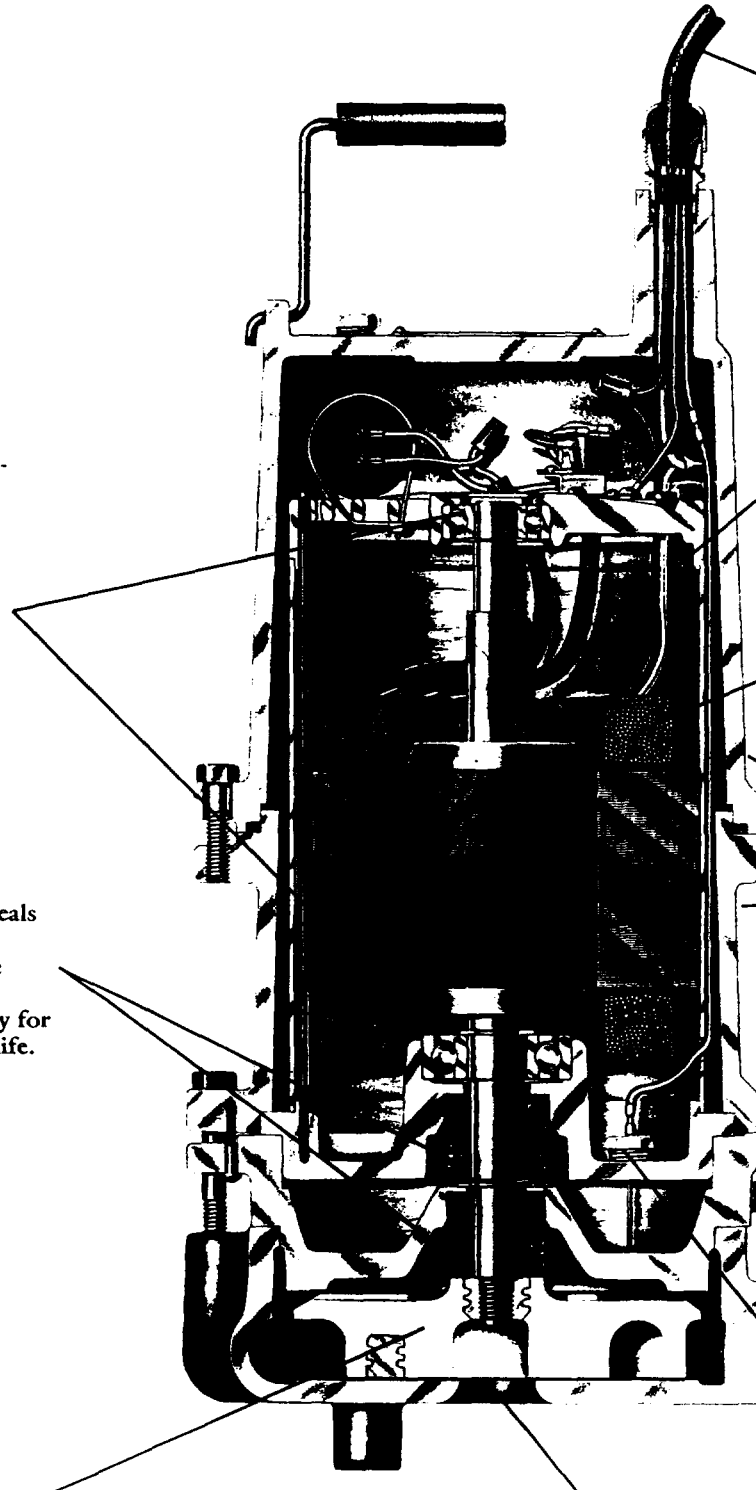
SKHD150 TYPICAL INSTALLATION



FEATURES/BENEFITS



The SKHD150 is a completely submersible, "high-head", dual-sealed pump for use in septic tank effluent applications.



Water-resistant, 20 foot powe cord has a compression-fit connection and an epoxy potting for double protection against water entry.

Oil-filled motor provides superior cooling and permanent lubrication of bearings, minimizing maintenance and extending service life.

Upper radial- and lower thrust-bearings are heavy-duty, single-row ball bearings that are permanently lubricated for service-free life.

1-1/2 HP capacitor-start motors provide maximum starting torque. Motor windings contain automatic thermal overload protection (1ø).

Two carbon- and ceramic-faced mechanical shaft seals are mounted in tandem to provide double protection against water entry for a long, leakproof life.

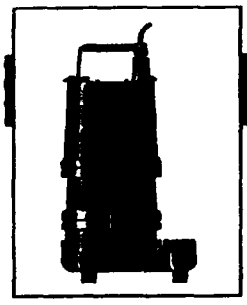
High-quality cast iron construction of pump volute, motor housing and seal housing provide long life.

Discharge is standard 1-1/2 inch NPT.

The semi-open, non-corrosive, thermoplastic impeller, which is threaded to a stainless steel shaft, efficiently handles up to 3/4 inch spherical solids — providing long life in demanding applications.

Bottom inlet has no screen to become clogged, providing optimum pump performance and minimal maintenance.

A seal-failure sensor probe (for connection to a seal failure alarm) is standard on three-phase units and availat as an option on single phase models.



ENGINEERING DETAILS - SKHD150

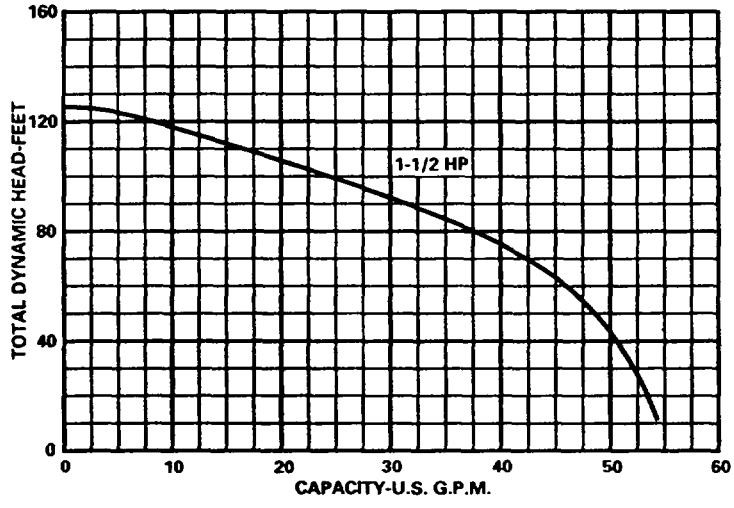
Pump Characteristics

Pump/Motor Unit	Submersible				
Manual Models	M2	M6	M3	M4	M5
Horsepower	1-1/2				
Full Load Amps	12.0	6.1	5.7	2.9	2.7
Motor Type	Capacitor Start	Three-Phase			
R.P.M.	3450				
Phase Ø	1	3			
Voltage	230	200	230	460	575
Hertz	60				
Operation	Intermittent				
Temperature	140°F Ambient				
NEMA Design	B				
Insulation	Class B				
Discharge Size	1-1/2" NPT				
Solids Handling	3/4"				
Unit Weight	75 lbs.				
Power Cord	16/3, STWA, 1ø, 230V = 20' std. 16/4, STWA, 1ø, 230V = 20' std. (S.F.) 18/5, STWA, 3ø, 200V, 230V, 460V, or 575V = 20' std. (S.F.)				

Materials of Construction

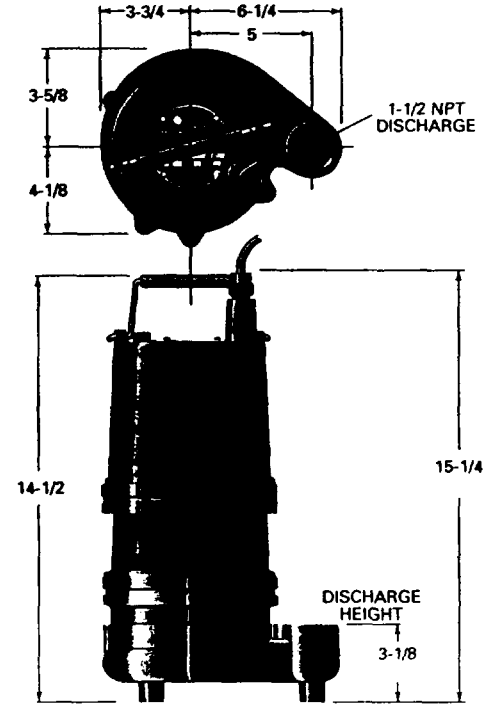
Handle	Steel
Lubricating Oil	Dielectric Oil
Motor Housing	Cast Iron
Pump Casing	Cast Iron
Shaft	Stainless Steel
Mechanical Shaft Seal	Seal Faces: Carbon/Ceramic Seal Body: Brass Spring: Stainless Steel Bellows: Buna-N
Impeller	Thermoplastic
Upper Bearing	Brass Sleeve Bearing
Lower Bearing	Single Row Ball Bearing
Fasteners	Stainless Steel

Performance Data



Total Head (feet)		40	60	80	100	120	125
GPM	1-1/2 HP	51	45	36	24	9	0

Dimensional Data

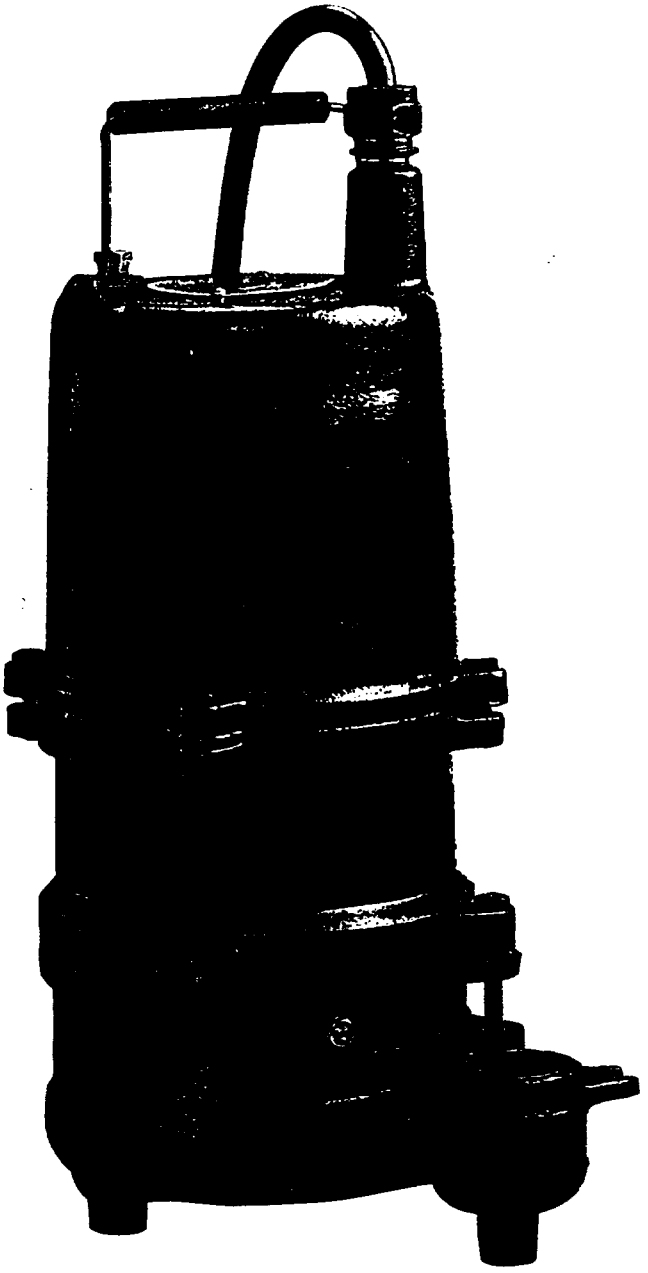


1. All dimensions in inches
2. Component dimensions may vary ± 1/8 inch
3. Not for construction purpose unless certified
4. Dimensions and weights are approximate
5. We reserve the right to make revisions to our products and their specifications without notice

AURORA/HYDROMATIC Pumps, Inc.
1840 Baney Road, Ashland, Ohio 44805
(419) 289-3042

Installation and Service Manual

HYDROMATIC SKHD150
Submersible Effluent Pump



NOTE!
To the installer: Please make sure you provide this manual to the owner of the pumping equipment or to the responsible party who maintains the system.

GS AURORA PUMP
A UNIT OF GENERAL SIGNAL

Table of Contents

1 Introduction

Before operation, read the following instructions carefully. Reasonable care and safe methods should be practiced. Check local codes and requirements before installation. Servicing should be performed by knowledgeable pump service contractors or authorized service centers.

Warning:
Read all instructions before starting any operation on pump. Always disconnect the pump and controls from its power source before handling or making any adjustments. Always wear rubber boots when there is water on the floor and unplug the pump before making any adjustments or repairs.

Warning:

Risk of Electrical Shock — This pump has not been investigated for use in swimming pool areas.

To Reduce Risk of Electrical Shock:

1. **Risk of Electrical Shock** — Connect only to a properly grounded receptacle.
2. Septic tank to be vented in accordance with local plumbing codes.
3. Do not smoke or use sparkable electrical devices or flame in a septic (gaseous) or possible septic sump.
4. A septic sump condition may exist and if entry into sump is necessary, then (a) provide proper safety precautions per OSHA requirements and (b) do not enter sump until these precautions are strictly adhered to.

   Do not install pump in location classified as hazardous per N.E.C., ANSI/NFPA 70 - 1984.

   Failure to heed above cautions could result in injury or death.

2 Installation

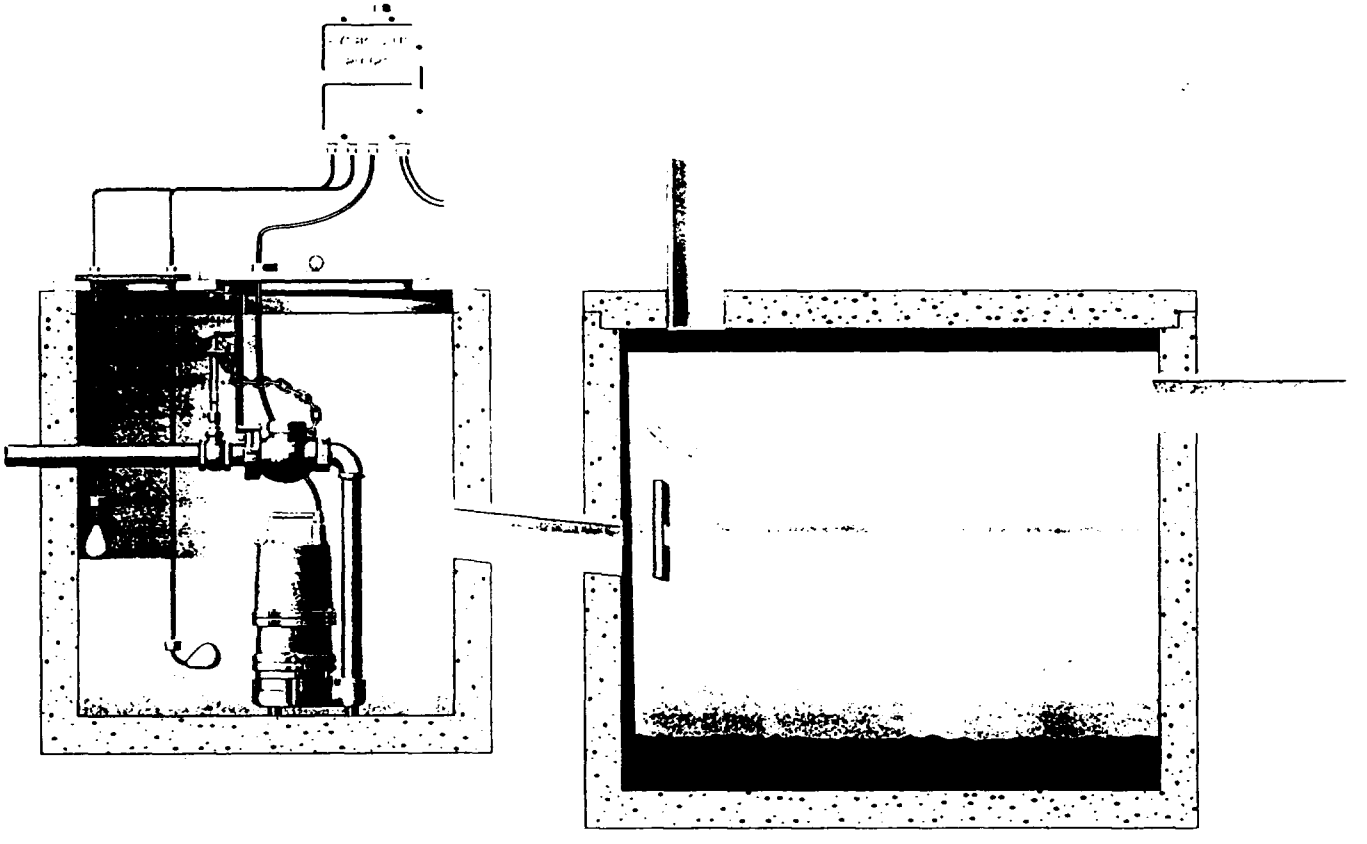
These important instructions must be followed for satisfactory performance of your pump. Before installation, check your local electrical and plumbing codes.

1. Provide proper basin or tank size to ensure pump operates without restriction. A two to five minute run time is recommended.
2. Make sure sump is free of string, cloth, nails, gravel, etc. before installing pump.
3. Do not set pump directly on the bottom of sump pit if it is not solid. Raise the pump by placing bricks or concrete blocks underneath it.
4. Use steel or plastic pipe for all connecting lines between pump and sewer outlet.

   Note: Some city regulations do not allow installing a pump with plastic pipe. Check local regulations.
5. In applications where the pump may sit idle for months at a time, it is recommended that the pump(s) be cycled every month to insure the pumping system is working properly when needed.
6. A check valve should be installed in discharge pipe.
7. An audible alarm system, such as the Q Alert, for high water conditions should be installed for greater protection.

   Note: The Q Alert is for indoor use only. Contact your Hydromatic distributor for additional control and alarm panels applications.
8. Use pump partially or completely submerged for pumping waterlike liquids (temperature to 140° F). The SKHD150 will pump solid materials up to ¼" (spherical) in diameter.
9. **Caution:** Do not pump flammable liquids, strong chemicals or salt water.
10. For added protection an optional seal failure probe is available as well as the control and alarm panel. Contact your Aurora/Hydromatic distributor or the factory for more information.

3 Typical Installation



SKHD 150

4 Service

Warning: Before handling these pumps and controls, always disconnect the power first.

Do not smoke or use sparkable electrical devices or flames in a septic (gaseous) or possible septic sump.

Before removing the pump from its installation for repairs, check first to see if the trouble is caused by:

1. Miswiring of the pump into the terminal block.
2. Miswiring of the float level controls into the panel.
3. Miswiring inside the control panel.
4. Tripped circuit breaker. If the breaker is manually reset and then trips off again, the problem could be:
   a. short circuit in motor or control panel
   b. water in the motor housing
   c. insufficient amp capacity of wiring or breakers
   d. improper panel wiring
5. Tripped overload. If overload is manually reset and then trips off again, the problem could be:
   a. pump or piping clogged
   b. pump motor or bearings may be defective
   c. start capacitor in motor may have failed
   d. pump may be miswired to terminal block
   e. head lower than rating, pumping too much liquid
6. Air locked pump. A sump pump is said to be air locked if air traps in the pump and it cannot get out, thus preventing pump from operating. As a precaution, a ⅛" hole should be drilled in the discharge pipe below the check valve. The check valve should be 12 to 18 inches above pump discharge. Do not install check valve directly into pump discharge opening.

   Note: In sumps where the pump is operating daily, air locking rarely occurs.
7. Wrong impeller rotation. Rotation should be counterclockwise when looking at the impeller. Correct improper rotation on three phase pumps by reversing any two line leads. Rotation check is not necessary on single phase pumps.
8. Closed discharge gate valve.
9. Plugged impeller or pipeline.
10. Discharge head may be too high. Check elevation against design point of pump.
11. Floats not hanging free in the sump.
12. Malfunctioning floats.

Checking Power Cord

To be sure wires are not burned off or broken in cord, use ohmmeter for check. Set ohmmeter scale pointer to R X 1 scale and attach one meter lead to white cord wire and one meter lead to black cord wire, then place a screwdriver blade across terminals of plug. If cord is O.K., meter needle will go to zero and stay there. If meter needle does not move, this will indicate an open wire and cord must be replaced.

Repair – Motor

Warning: Be certain power to pump is off! Disconnect pump power cord from terminals and remove pump from sump pit.

1. Clean any dirt or trash from the outside of the pump before dismantling.
2. If motor does not run when the pump is tested, the capacitor and/or stator must be checked. See Step 5. Remove plug (#9) from top of housing (#2) and pour oil into container, preferably glass, so that oil can be observed.
3. If oil is clear, it will indicate motor is not burned and there has been no water leak into the motor. If oil is cloudy, it will indicate water in motor, or, if oil is black, it will indicate a burned stator. If water is in the oil, all seals should be replaced.
4. After draining oil, carefully loosen the power cord assembly from the motor housing. With power cord loose, remove the four screws (#6) and carefully lift off the motor housing (#2) exposing the capacitor (single phase [1o] only) and the motor assembly.
5. On single phase units, check capacitor (#3) using ohmmeter. With ohmmeter scale set at R X 1000, attach meter leads to capacitor. The meter needle should go to zero and come back slowly. If it does not, the capacitor should be replaced.
6. To check motor stator, remove power cord leads from terminal bushings on top of motor. If stator is visibly burned, motor assembly must be replaced.
7. **Ground check** on stator should be performed using ohmmeter with scale set at R X 100 and checking meter by putting both meter leads together and adjusting the needle knob until meter reads zero. If meter cannot be adjusted to zero, it will indicate that batteries in meter must be replaced. Always make this test with the meter when scale pointer is set to a new scale before making any checks on the motor. Now connect one meter lead to one terminal of stator and touch and other meter lead to motor stator shell. If needle on ohmmeter goes

4 Service Continued

completely to zero, the motor probably has a wire touching the stator at some point and the motor assembly will have to be replaced.

8. **Winding Resistance Test** should be performed if the ground test is satisfactory. Use ohmmeter with scale pointer set on R X 1 scale. On this scale, meter reads directly on ohms. Always check the meter with leads together as described above under Ground Check Test before making a reading of the winding.

   Connect one motor lead to the white wire terminal and the other meter lead to the black wire terminal. This reading is for the main winding (1ø). If the readings obtained do not agree with those given below, the stator is defective and the motor assembly must be replaced.

Resistance

	1ø Main	1ø Start	3ø Bal.
230V	1.78	3.53	6.65
460V	—	—	6.65
200V	—	—	3.4
575V	—	—	27.97

9. For three phase pumps, remove the power cord assembly (#27) by cutting the butt connections and removing the power cord from the pump.

10. Twist the three leads of one end of the power cord together. Then at the other end, with an ohmmeter, check any two leads. Also check the third lead with either of the first two. If a zero reading is indicated for any wire, the wire is broken and a new power cord assembly must be installed.

Seal Housing

The pump is equipped with two mechanical seals mounted in tandem. The lower seal (#20) and the upper seal (#8) consist of a ceramic stationary seat and a carbon rotating ring.

As noted, if water is detected in the motor housing, inspect the power cord connection, pipe plug connections, O-rings, the motor housing itself, and the two mechanical seals.

There are two quarts of oil in the motor housing. This is a paraffinic "SE-40" process oil. The same oil is used in the seal housing (#13) between the two mechanical seals. To check the seals, remove the lower housing pipe plug (#11) and pour the oil out into a clean, preferably glass, container. Look for the milky color as noted previously.

If the oil is clear, the lower seal is still good. If this seal is damaged, water will seep in and continue to stain the oil, changing it from clear, to slightly discolored, to cloudy, and finally to a milky white.

Except for very rare instances, the motor will continue to be protected by the upper mechanical seal. If seal probe is used the pump will not shut off when water in the oil is sensed. However, if connected to a control panel, an alarm or light will be activated. The panel alarm will show failure. The lower seal and oil must be replaced.

Lower Seal

If water is found in the seal chamber, the lower seal must be replaced. Separate the volute by removing the three cap screws (#7) holding the volute case (#10) to the upper volute.

Insert a large screwdriver in the slotted pump shaft and strike the impeller sharply with a plastic or rubber headed hammer. The impeller should spin free. The impeller holds the rotation carbon ring of the lower mechanical seal against the stationary ceramic seat by compressing a stainless steel spring.

When the impeller is removed, the spring will relax, allowing the carbon ring to be removed. There is a rubber sleeve (bellows) inside the spring which grips the pump shaft. This often restricts the spring and must be pried or pulled loose.

With the carbon ring, spring, and rubber sleeve removed, wedge the ceramic seat out of the housing. Be sure not to scratch or mar the pump shaft.

Upper Seal

1. To remove and replace the upper mechanical seal (#8), the base (#10), impeller (#16), lower mechanical seal (#20), and volute must be removed first. Drain the seal oil from the housing by removing pipe plug (#11).

2. The rotating carbon ring and stainless steel spring are held in place by a snap ring (#21) and washer (#15). Remove these.

3. Remove the four hex head stator bolts(#32) and lift the stator (#5) from the seal plate (#14). A screwdriver can be inserted under the stator shell in order to remove the stator.

4. Bump the end of the shaft with a plastic hammer. This will push the rotating half of the mechanical seal from the shaft and also push the lower bearing from the seal plate. Now remove the shaft, rotor, and bearing assembly from the seal plate.

5. If water was found in the oil, the rotating and stationary halves of the mechanical seal must be replaced. Remove the stationary seal half by inserting a screwdriver into seal plate from the top and tapping lightly with a hammer.

6. Turning the bearing(#33, #34) by hand: if it feels rough when turned or looks rusted, it should be

4 Service Continued

replaced. Obtain a bearing puller to remove the bearing. If a puller cannot be replaced over the bearing, remove the outer race by cracking in a vise. Now the outer race and balls can be removed, allowing the inner race to be pulled.

Reassembly

1. Thoroughly clean the seal plate, particularly the seal and bearing pockets. All sand and dirt must be removed.
2. If the stationary seal half was removed, use a plastic pusher to press it into the housing. Make sure the rubber ring goes in first. Do not use any sharp objects that may damage the seal.
3. When installing a replacement bearing press only on the inner race and make sure the bearing is flush against the snap ring. If a press is not available, the bearing can be tapped onto the shaft using a sleeve that bears only on the inner race. Pressing on the outer race will ruin the bearing.
4. Push the shaft, rotor and ball bearing assembly into the seal plate, being careful not to chip the ceramic of the stationary seal half.
5. Replace the stator if it is visibly burned or if the ground resistance test or the winding resistance test has failed. Note that the replacement stator must be of the same manufacture as the existing rotor, or vice versa. Replace the four stator bolts (#32).
6. Remove the old O-ring (#24), regardless of condition, and replace. Place the new O-ring over the seal plate shoulder.
7. Clean the motor housing (#2) thoroughly, then position it onto the seal plate.
8. Press the rotating seal half (#13) onto the shaft with the rubber ring facing the impeller.

   Caution: Mixing old and new seal parts will cause immediate seal failure. When replacing seal, replace both the rotational and the stationary seal halves.
9. Reassemble the lower seal as described.

   Note: If seal probe is used, go to Step 16.
10. Add a drop of Locktite 277* to the impeller threads and screw the impeller (#16) on hand tight. The impeller will force the rotating seal half (#20) into position.
11. Set the seal housing and motor housing assembly into the volute case (#10) and secure with four hex head screws (#7).
12. To replace the power cord on single phase pumps, as determined on page 5, first slip the stator lead wires through the holes in the wire seal assembly. Coat the cord grip threads with pipe dope or apply teflon tape and screw the new power cord assembly into the motor housing. Referring to wiring diagrams in this manual, secure wires together.

    Note: Do not tape leads together as the hot oil will deteriorate the tape and cause failure.
13. Before filling the motor housing with oil, an air test should be performed. Apply 7 to 8 pounds of air pressure in the ¼" NPT tap (#9) on the top of the motor cover and seal chamber. (**Note:** Too much pressure will damage the seal.)

    Then submerge the pump in water and check for leaks. If a leak occurs, isolate where it is coming from and correct the problem by replacing the sealing part. If there are no leaks, fill the motor and seal housing with high grade transformer oil, such as Factopure SE40 or equivalent, to at least one inch below top of housing.

    Do not fill the motor housing completely – allow air space for expansion. Replace oil plug (#9).
14. Check for proper sealing of lower seal assembly by adding 7–8 lbs. air pressure at (#11) tap oil fill hole.

    Note: Too much pressure will cause seal failure. Seal would have to be replaced.

    Submerge in water. If air bubbles appear, isolate the source of the leak and correct the problem. If there are no leaks fill lower seal chamber fill with high grade transformer oil. Lay pump on side and fill to ½" below fill plug. Replace plug (#11).
15. Connect power cord wires to terminals, connect power, and check pump running. Motor should run smoothly and be free of vibration.
16. To check seal probe, use an ohmmeter to measure resistance and check continuity. If meter reads zero then replace probe (#23). Check probe sensor wire (#22) for opens using the ohmmeter. If reading is zero the wire is OK. For shorts place on lead on the motor housing, making sure bare metal surface is used. Place the other lead on the bared end (#26) of the probe lead (#22). Reading should be infinity (∞). If reading is zero then replace seal probe lead. Return to Step 10.

*Loctite 222 is a registered trademark of Loctite Corp.

Warning: Before handling these pumps and controls, always disconnect the power first.

Do not smoke or use sparkable electrical devices or flames in a septic (gaseous) or possible septic sump.

Pump does not run or hum.

1. Check line voltage for proper power.
2. Line circuit breaker may be off, or fuse may be blown or loose.
3. Water level in sump may be too low. Run in more water to activate switch. It will turn on when 90" has been achieved.
4. Pump cord plug may not be making contact in receptacle.
5. If pump is using the series cord plug, the two plugs may not be plugged tight together.
6. Float may be stuck. Be sure float operates freely in basin.
7. If all symptoms check OK, motor winding may be open; take pump to an authorized service center.

Pump runs but does not deliver water.

1. Check valve may be installed backwards. Arrow in valve points in direction of flow.
2. Discharge gate valve, if used, may be closed.
3. Pump may be air locked. Start and stop several times by plugging and unplugging cord. Check vent hole in pump case for plugging.
4. Pump head may be too high. Pump cannot deliver water over 100 ft. vertical. Horizontal distance does not affect pumping, except loss due to friction.
5. Inlet in pump base may be clogged. Remove pump and clean out openings.
6. Impeller or volute openings may be plugged or partially plugged. Remove pump and clean per maintenance instructions.

Pump runs and pumps out sump but does not stop.

1. Float is stuck in up position. Be sure float operates freely in basin.

Pump runs but delivers only small amount of water.

1. Pump may be air locked. Start and stop several times.
2. Pump head may be too high. Pump cannot deliver water over 100 ft. vertical. Horizontal distance does not affect pumping, except loss due to friction.
3. Inlet in pump base may be clogged. Remove pump and clean out openings.
4. Impeller or volute openings may be plugged or partially plugged. Remove pump and clean per maintenance instructions.
5. Pump impeller may be partially clogged causing motor to run slow, resulting in motor overload. Clear obstruction from volute and impeller.

Fuse blows or circuit breaker trips when pump starts.

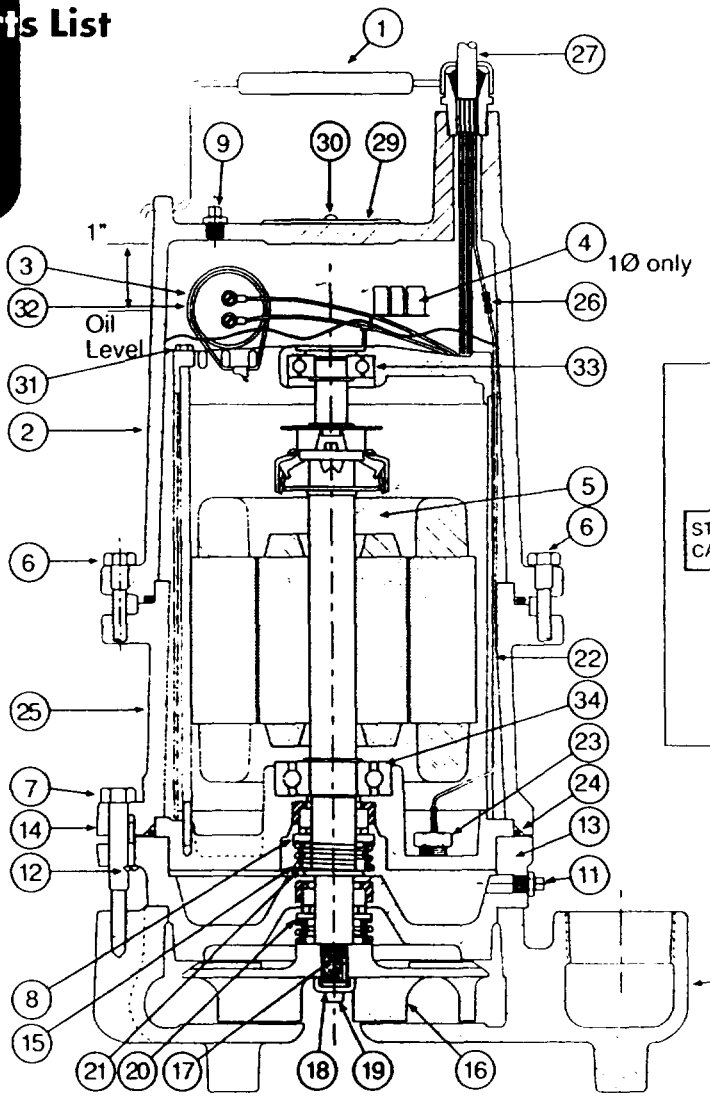
1. Inlet in pump base may be clogged. Remove pump and clean out openings.
2. Impeller or volute openings may be plugged or partially plugged. Remove pump and clean per maintenance instructions.
3. Pump impeller may be partially clogged causing motor to run slow, resulting in motor overload. Clear obstruction from volute and impeller.
4. Fuse size or circuit breaker is too small.
5. Defective motor stator: return to Hydromatic service center for verification of failure.

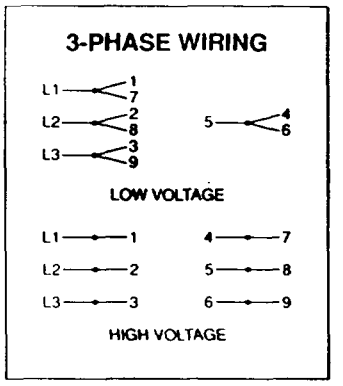
Motor runs for short time then stops. Then after short period starts again. Indicates tripping overload caused by symptom shown.

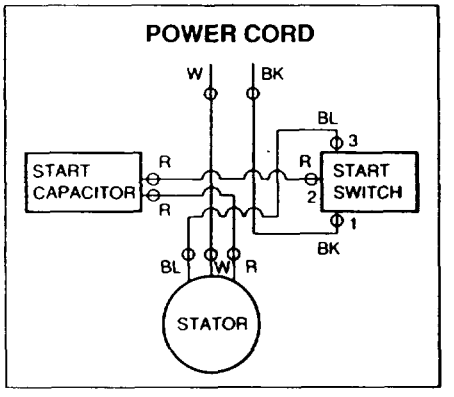
1. Inlet in pump base may be clogged. Remove pump and clean out openings.
2. Impeller or volute openings may be plugged or partially plugged. Remove pump and clean per maintenance instructions.
3. Pump impeller may be partially clogged causing motor to run slow, resulting in motor overload. Clear obstruction from volute and impeller.
4. Defective motor stator: return to Hydromatic service center for verification of failure.

If symptom not found call Hydromatic distributor or repair center for assistance.

6 Parts List







Ref. No.	1ø Part No.	3ø Part No.	Description	Qty.	Ref. No.	1ø Part No.	3ø Part No.	Description	Qty.
1	60-000-5	60-000-5	Handle	1	19	n/a	111-007-1	Screw, Impeller (3ø only)	1
2	56-006-2	56-007-2	Housing, Motor	1	20	83-002-1	83-002-1	Shaft Seal-lower	1
3	13208-001-1	n/a	Capacitor (1ø, 230V)	1	20	83-007-1	83-007-1	Shaft Seal-lower	1
4	13209-003-1	n/a	Solid State Switch (1ø, 230V)	1	21	975-001-1	975-001-1	Snap Ring	1
5	12690-000-1	12691-000-1	Motor Assembly	1	22	6000-056-5	6000-056-5	Wire Termonal Assembly	1
6	101-008-1	101-008-1	Screw, Hex Hd.	4	23	8472-006-5	8472-006-5	Seal Failure Sensor	1
7	101-013-1	101-013-1	Screw, Hex Hd.	3	24	77-003-1	77-003-1	O-Ring	2
8	17048-000-1	17048-000-1	Shaft Seal-Upper	1	25	12709-000-2	12709-000-2	Adapter	1
9	119-002-1	119-002-1	Pipe Plug, 1/4 NPT	1	26	282-001-1	282-001-1	Splice Connector	1
10	9641-000-2	9641-000-2	Volute Case	1	27	13216-002-5	n/a	Power Cord Assembly, 20' w/plug, 1ø only	1
11	87-004-1	87-004-1	Pipe Plug, 1/8 NPT	1	27	11644-008-5	11644-018-5	Power Cord Assembly, 20' w/S.F.	1
12	25-016-1	25-016-1	Screw Rd. Hd.	3	†28	n/a	73-000-1	Connector (3ømm 230V/460V)	4
13	7579-001-2	7579-001-2	Housing, Bearing/Seal	1	29			Nameplate	1
14	6846-004-2	6846-004-2	Plate, Bearing/Seal	1	30	4580-001-1	4580-001-1	Drive Screw	2
15	156-052-1	156-052-1	Washer	1	31	*	*	Oil	1
16	9640-000-5	9640-000-5	Impeller	1	32			Hex Head Screw – Part of Motor Assembly	4
17	*	*	Locktite Sealant	1	33	00065-001-1	00065-001-1	Upper Bearing	1
18	n/a	518-000-1	Washer, Impeller (3ø only)	1	34	00065-009-1	00065-009-1	Lower Bearing	1

†Not Shown

* Purchase Locally

Aurora/Hydromatic, a Unit of General Signal, warrants to the original purchaser of each of Hydromatic Pump product(s) that any part thereof which proves to be defective in material or workmanship within one year from date of installation or 18 months from manufacture date, whichever comes first, will be replaced at no charge with a new or remanufactured part, F.O.B. factory. Purchaser shall assume all responsibility and expense for removal, reinstallation and freight. Any item(s) designated as manufactured by others shall be covered only by the express warranty of the manufacturer thereof. This warranty does not apply to damage resulting from accident, alteration, design misuse or abuse.

If the material furnished to the Buyer shall fail to conform to this contract or to any of the terms of this written warranty, Aurora Pump shall replace such nonconforming material at the original point of delivery and shall furnish instruction for its disposition. Any transportation charges involved in such disposition shall be for the Buyer's account. The Buyer's exclusive and sole remedy on account or in respect of the furnishing of material that does not conform to this contract, or to this written warranty, shall be to secure replacement thereof as aforesaid. Aurora Pump shall not in any event be liable for the cost of any labor expended on any such material or for any incidental or consequential damages to anyone by reason of the fact that such material does not conform to this contract or to this written warranty.

ALL IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO THE SAME EXTENT AS THE EXPRESS WARRANTY CONTAINED HEREIN. Some States do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply.

MANUFACTURER EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY ARISING IN CONNECTION WITH THIS PRODUCT, INCLUDING WITHOUT LIMITATION, WHETHER IN TORT, NEGLIGENCE, STRICT LIABILITY CONTRACT OR OTHERWISE. Some States do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply.

This warranty gives you specific legal rights, and you may also have other rights which vary from State to State.

NOTE:
PUMP MUST BE REPAIRED BY AUTHORIZED AURORA/ HYDROMATIC REPAIR CENTER OR WARRANTY WILL BE VOID. IF REPAIR CENTER IS NOT AVAILABLE, RETURN PUMP TO PLACE OF PURCHASE.

AS FURNISHED BY

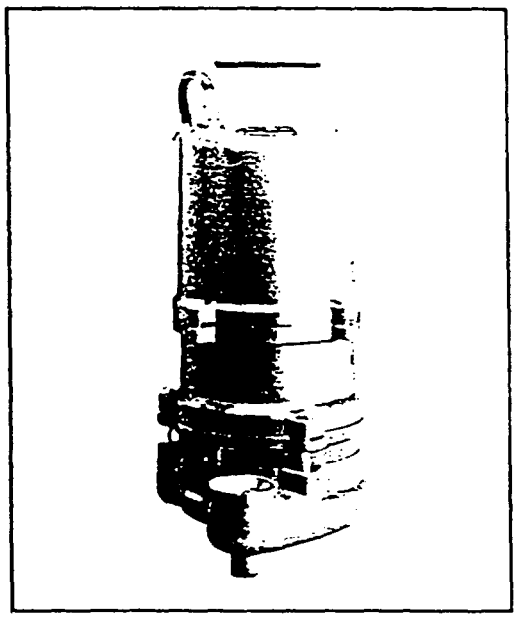
METROPOLITAN PUMP COMPANY

APPLICATION

- Septic tank effluent
- Industrial sump service

SUBMERSIBLE HIGH HEAD EFFLUENT PUMP

SKHD150



FEATURES

✓ Completely submersible. Heavy duty, oil-filled motors with ball bearing design in pure dielectric insulating oil for cooler running, permanent lubrication and long life. Motors are 1-1/2 HP, 3450 RPM. Single phase, 230 volt motor features start capacitor, solid state start switch and automatic reset thermal overload protection. Three phase motors, 200 volt, 230 volt or 460 volt, require magnetic starter with overload protection located in the accessory control panel.

✓ Dual mechanical shaft seals are standard. Seals are long life, carbon and ceramic faced. Seal failure (S.F.) sensor capability (for connection to a seal failure alarm device) available as an option on single phase units, standard on three phase units.

✓ Non-clogging, single vane, engineered thermoplastic impeller, 5-3/8-inch diameter, threaded to stainless steel shaft. No inlet screen to become clogged. Capable of handling 3/4-inch spherical solids.

✓ Pump case and motor housing are heavy cast iron for corrosion resistance. All exposed parts are high grade bronze, cast iron, steel and stainless steel.

✓ Field serviceable.

CAPABILITIES

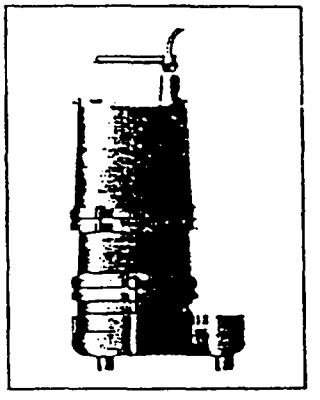
	SKHD150
Capacities to:	53 GPM
Shutoff Head:	130 Feet
Solids Handling:	3/4"
Discharge:	1-1/2" NPT
Horsepower:	1-1/2
Electrical:	Single phase, 60 Hz, 3450 RPM, 230V, 12.0 FLA Three phase, 200V, 6.1 FLA; 230V, 5.7 FLA; 460V, 2.9 FLA
Controls:	Manual
Power Cord:	16/3, STW-A, 1ø, 230V = 20 ft. std. * 16/4, STW-A, 1ø, 230V = 20 ft. std. * 18/5, STW-A, 3ø, 200V, 230V or 460V = 20 ft. std.

* Models with seal failure sensor wire.

1400 BLUFF ROAD ROMEOVILLE, IL 60441
(708)972-9400 ● (800)323-1665 ● FAX(708)972-9594

AS FURNISHED BY

METROPOLITAN PUMP COMPANY



SKHD150

Pump Characteristics

Pump/Motor Unit	Submersible				
Manual Models	M2	M6	M3	M4	M5
Horsepower	1-1/2				
Full Load Amps	12.0	6.1	5.7	2.9	2.7
Motor Type	Capacitor Start	Three-Phase			
R.P.M.	3450				
Phase Ø	1	3			
Voltage	230	200	230	460	575
Hertz	60				
Operation	Intermittent				
Temperature	140°F Ambient				
NEMA Design	B				
Insulation	Class B				
Discharge Size	1-1/2" NPT				
Solids Handling	3/4"				
Unit Weight	75 lbs.				
Power Cord	16/3, STWA, 1o, 230V = 20' std. 16/4, STWA, 1o, 230V = 20' std. (S.F.) 18/5, STWA, 3o, 200V, 230V, 460V, or 575V = 20' std. (S.F.)				

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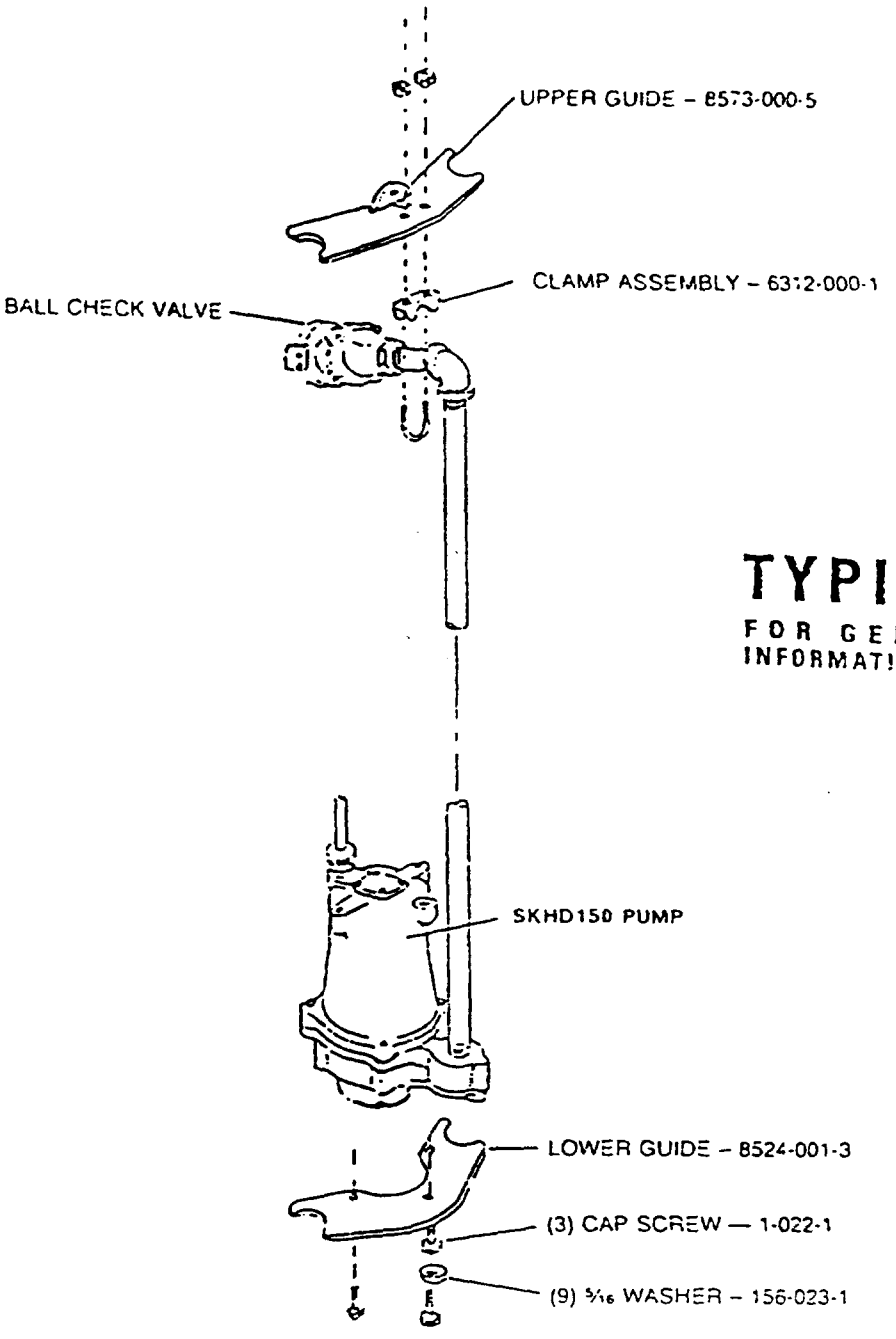


TYPICAL
FOR GENERAL INFORMATION ONLY

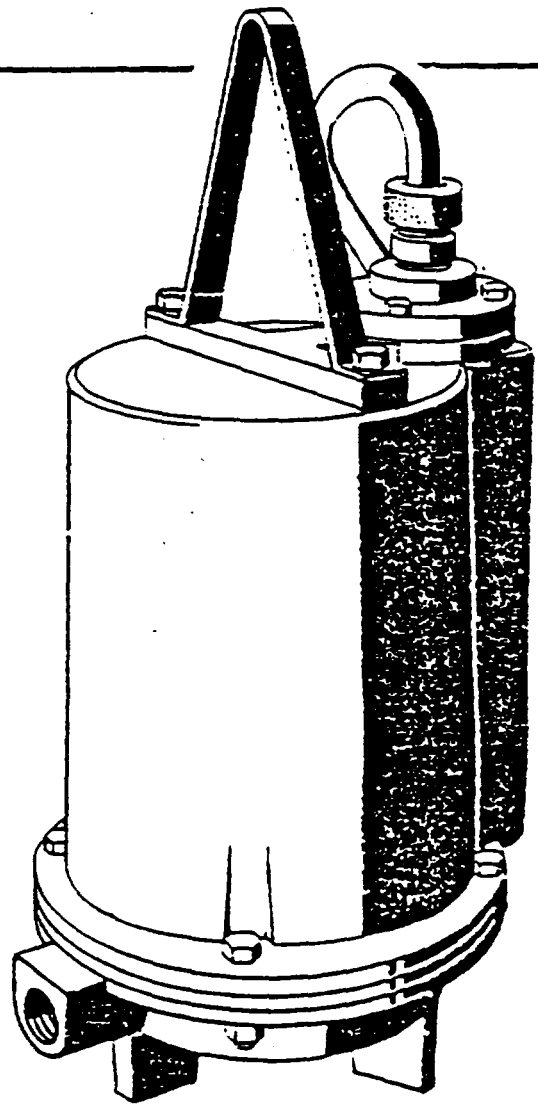
DISCHARGE PIPING AND RAIL GUIDE ASSEMBLY

1400 BLUFF ROAD ROMEOVILLE, IL 60441
(708)972-9400 ● (800)323-1665 ● FAX(708)972-9594

Installation and Operation Manual

Submersible Effluent Pumps

MODEL E202



Peabody Barnes

Mansfield, Ohio

FORM NO. 60982-477

Section A. General Information

A-1 INTRODUCTION – This manual contains Installation, Operating and Service Instructions, plus a list of all parts for Peabody Barnes Model E202 Effluent Pump.

A-2 SPECIFICATIONS and DATA – The effluent pumps are cast iron construction with a 1-inch suction opening and a 1¼-inch discharge. The motor and seal cavity are oil-filled for lubrication and heat dissipation.

Impeller has two non-clog vanes with added back vanes to keep solids from seal area. Pump comes equipped with legs to elevate pump above bottom of sump or basin. The capacitor is easily changed through the capacitor access hole in the top of the motor housing.

Section B. Installation

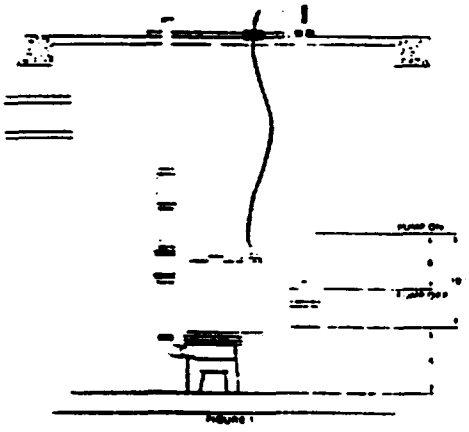
B-1 LOCATION – The pumping unit is self-contained and is recommended for use in a sump or basin for sewage handling only.

B-2 DISCHARGE SYSTEM – Connect discharge pipe to discharge opening of pump, using a 1-inch elbow and nipple.

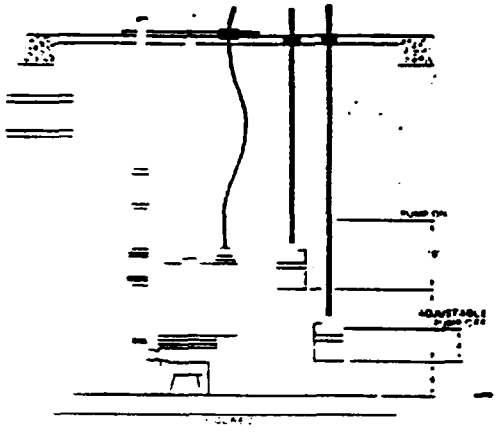
Ball check valves are required for each pump on simplex and duplex installations to prevent back-flow into the system.

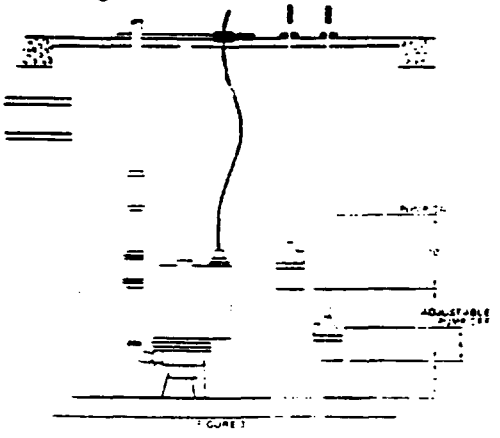
B-3 LIQUID LEVEL CONTROL (HEAD/DIAPHRAGM)

a) SIMPLEX SYSTEM (Fixed Differential) – The liquid level control can be mounted in the basin cover (refer to Figure 1).



b) SIMPLEX SYSTEM (Adjustable Differential) – The liquid level control can be mounted to a pipe between the basin cover and bottom of basin (refer to Figure 2), or may be mounted in the basin cover (refer to Figure 3).





c) DUPLEX SYSTEM (Fixed and Adjustable Differential) – The liquid level control can be mounted to a pipe between the basin cover and the bottom of the basin (refer to Figures 4 and 5), or may be mounted in the basin cover (refer to Figures 6 and 7).

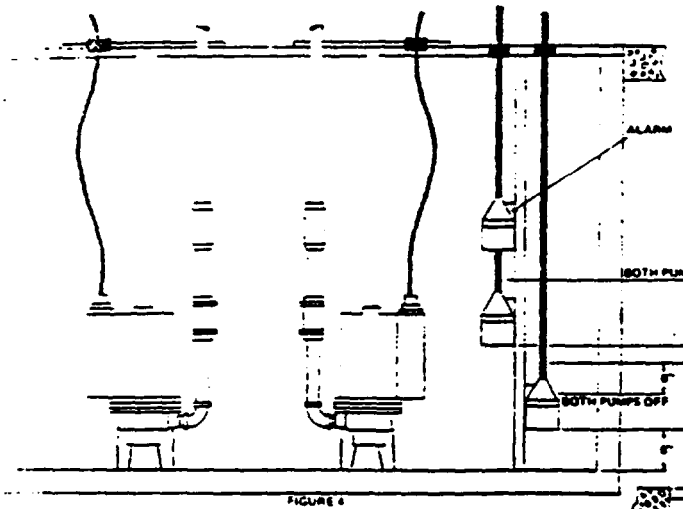


FIGURE 4

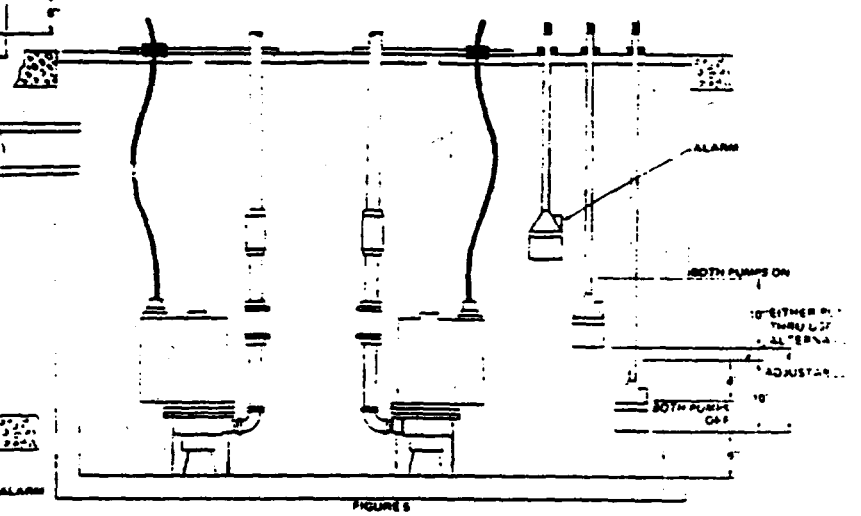


FIGURE 5

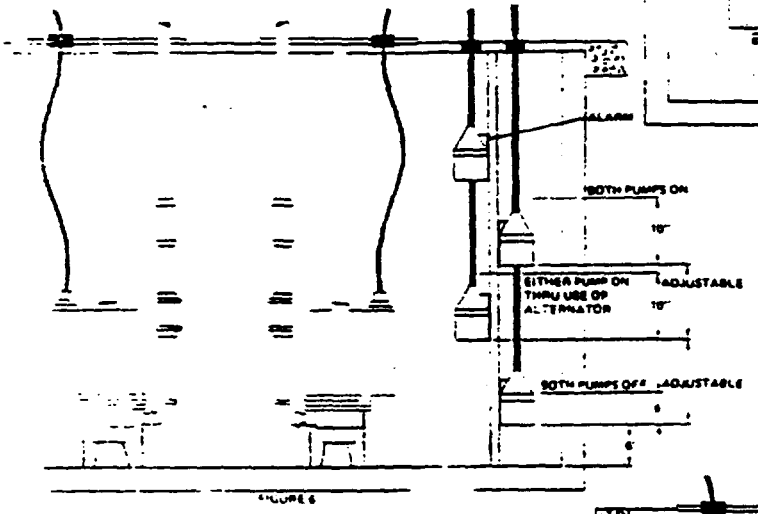


FIGURE 6

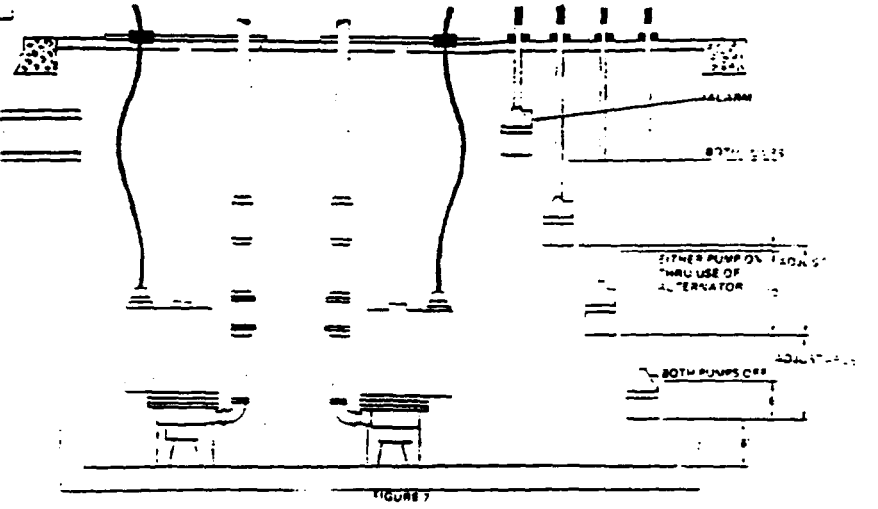


FIGURE 7

B-4 LIQUID LEVEL CONTROL (Mercury Float Switch) – For simplex or duplex operation, the mercury switch should be mounted on a drop pipe which extends down through the basin cover and rests on bottom of basin (refer to Figures 8 and 9).1). NOTE: Always use one more switch than the number of pumps in the system.

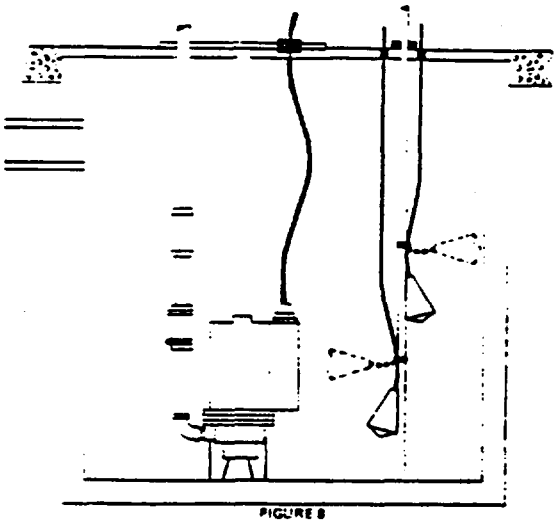


FIGURE 8

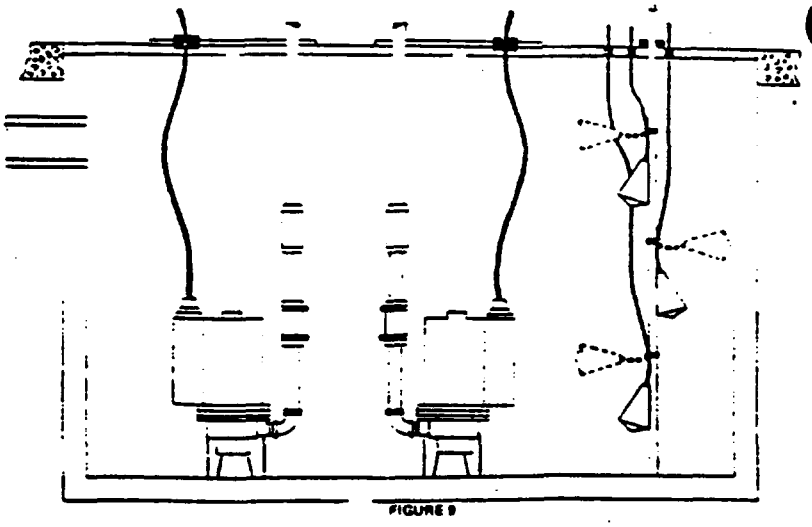


FIGURE 9

B-5 ELECTRICAL CONNECTIONS

a) SIMPLEX SYSTEM (Head/Diaphragm) – For manual or automatic operation, both the pump and level control should be wired into the control system selected as per the instructions included with each control.

b) DUPLEX SYSTEM (Head/Diaphragm) – On all models, when used in a duplex system, the electrical connections should be made as per the instruction included with the control system selected.

c) SIMPLEX and DUPLEX SYSTEMS (Float Rod and Mercury Float) – On all models, when a float rod or mercury float level control is used, the electrical connections for both the pump and level control should be made as per the wiring instructions included with the control system selected.

ELECTRICAL INFORMATION									
MODEL	HP	VOLT	PHASE	MAX RUN AMPS	LOCKED ROTOR AMPS	WINDING RESISTANCE		BREAKERS OR FUSE AMPS	"K" HEATERS
						MAIN	START		
E202	2	230	1	13.5	34.0	1.26	5.53	30	NONE

WIRING GUIDE

To conform to the National Electric Code, all models must be wired with No. 14 AWG. or larger, wire. For runs to 250 feet from main breaker panel to pump, No. 14 AWG is sufficient. For runs greater than 250 feet, consult a qualified electrician or the factory.

Control wiring (not carrying motor current) may be No. 16 AWG.

Section C. Operation

C-1 STARTING – After pump has been properly wired and lowered into sump or basin, it is advisable to check system by filling sump or basin with liquid and allowing pump to operate through its cycle.

C-2 MAINTENANCE – No lubrication is required as the motor is oil-filled.

If pump is idle for long periods of time, it is advisable to start pump occasionally by adding liquid to the sump or basin.

Section D. Trouble Shooting

TROUBLE

POSSIBLE CAUSE	REMEDY
1) PUMP DOES NOT RUN.	
Electrical power off.	Check power supply to control box.
Defective relay in control box.	Check relays and replace if required.
Liquid level control defective.	Switch to manual operation; if pump starts, level control is defective.
2) PUMP RUNS, THEN STOPS.	
Locked impeller causing overload to trip.	Clean out impeller.
Capacitor defective - single phase only.	If impeller is free, capacitor defective. Replace capacitor.
3) PUMP RUNS AT LESS THAN CAPACITY.	
Suction opening or discharge line cloffed.	Clean out suction opening and discharge line.
Impeller clogged.	Clean out impeller.
Incorrect rotation.	Check rotation as per Paragraph B-4. If incorrect, change as per Paragraph B-4.
Impeller worn or damaged.	Check impeller and replace, if required.

Section E. Pump Service And Repair

E-1 BODY and IMPELLER SERVICE – To clean out body (32), or to clean out, or replace, impeller (27), disconnect power and discharge piping and lift the pump from sump or basin. Remove hex nuts (34) and lockwashers (33) and pull motor, seal assembly and impeller from the body (32). Clean out the body, if necessary. Clean and examine impeller (27) and square ting (30); replace, if required.

If the impeller (27) needs replaced, remove hes nut (29) and lockwasher (28). The impeller is keyed onto the shaft and to remove, pull the impeller straight off the shaft. At re-assembly, be sure to use the required number of shims (25 and 26), to insure an impeller-to-body clearance of .010" to .030".

E-2 MOTOR HOUSING – Drain all the oil from the motor housing (5) by removing pipe plug (6). Loosen the gland nut and slide back on the cord set (7). Remove cap screws (9) and lockwashers (10) and pull the cord set assembly (7) and O-Ring (8) from the motor housing (5). Disconnect the wires to the capacitor (2). Remove body (32) as outlined in Paragraph E-1. Remove screw (23) and pull the seal plate (22), together with square ring (21), shaft seal (20) and motor (1) from the motor housing (5). Disconnect the motor (1) from the cord set (7). Flush motor housing (5) with transformer oil and discard the oil. Examine square ring (21) and cover O-Ring (8); replace, if required.

At re-assembly, connect motor (1) to cord set (7) before placing motor into housing. After re-assembling motor and seal plate (22) to housing, re-connect capacitor wires and fill housing (5) with approximately two (2) gallons of transformer oil, such as Standard Oil FACTOPURE SE40, SAE No. 5W or less, or equal. Be sure to use new oil from a closed container.

E-3 MOTOR SERVICE – When the motor is to be replaced, remove body, impeller and motor housing as outlined in Paragraphs E-1 and E-2. Loosen lock nut (16) and motor screws. Pull motor (1) together with lock nut (16), retaining ring (17), washer (18), bearing (19) and rotating member (20B) of shaft seal (20) from the seal plate (22).

Carefully remove rotating member (20B), bearing (19), washer (18), retaining ring (17) and lock nut (16) from the motor shaft.

When the motor (1) or shaft (20) is being examined or replaced, replace the exclusion seal (24), also. Pry the old exclusion seal (24) from the seal plate (22), and press the new one into place using finger pressure only.

E-4 SHAFT SEAL SERVICE – The shaft seal assembly (20) is contained in the seal plate (22). To expose the seal for examination or replacement, remove body, impeller, motor housing and motor as outlined in Paragraphs E-1, E-2 and E-3. NOTE: It is recommended that any time the shaft seal (20) is removed, a complete new seal should be installed.

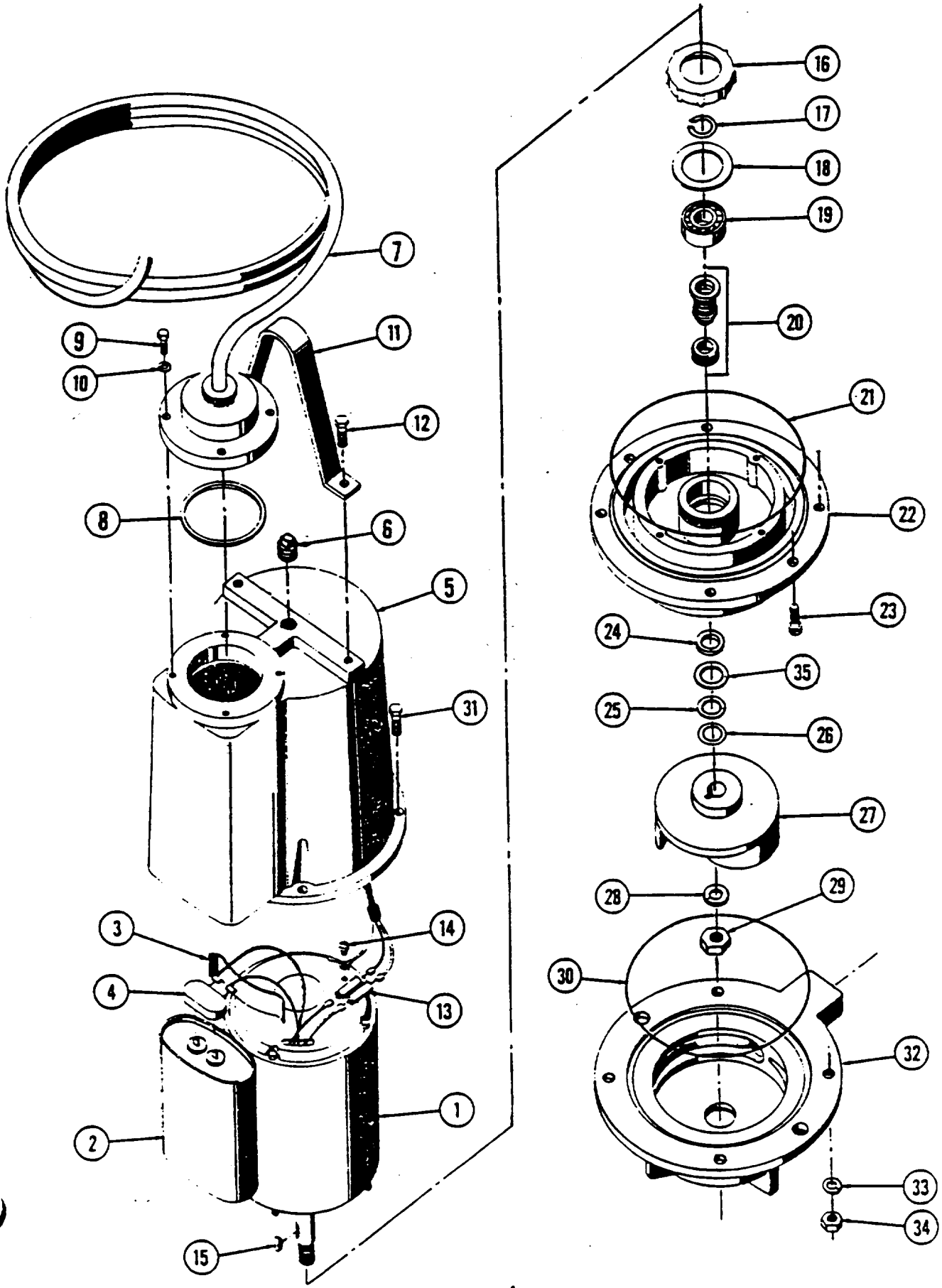
CAUTION: HANDLE SEAL PARTS WITH EXTREME CARE. DO NOT SCRATCH OR MAR LAPPED FACES.

Pull rotating member (20B) from motor shaft. When replacing stationary member (20A), press used member from seal plate (22). Lightly oil new cup of stationary member and press stationary member (20A) into seal plate (22). Lightly oil inner surface of rotating member (20B).

With lapped surface facing away from motor, slide rotating member (20B) onto motor shaft.

Re-assemble seal plate (22) onto motor (1). Tighten lock nut (16) and motor screws.

E-5 SHAFT BEARING – All of the pump parts as outlined in Paragraphs E-1, E-2, E-3 and E-4 must be disassembled in order to effect examination or replacement of the shaft bearing (19). If the bearing (19) is to be replaced, pull the old bearing from the motor shaft, then press the new bearing into place on the shaft.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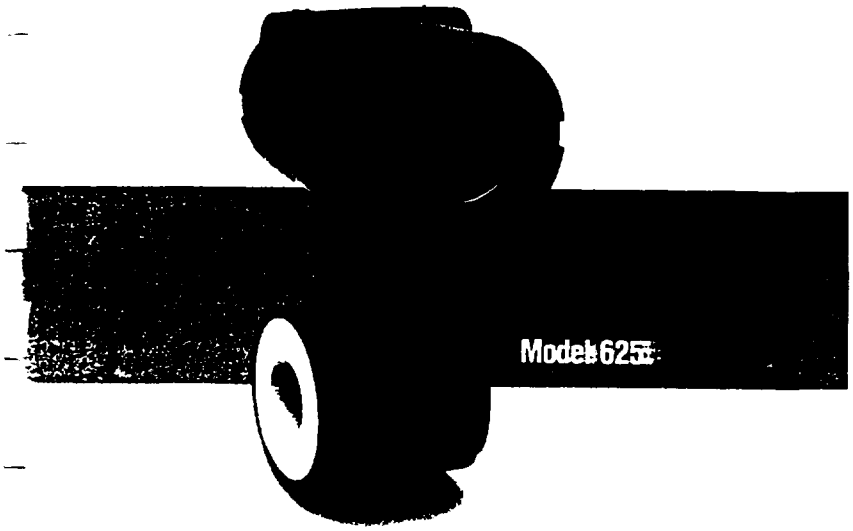
PARTS LIST

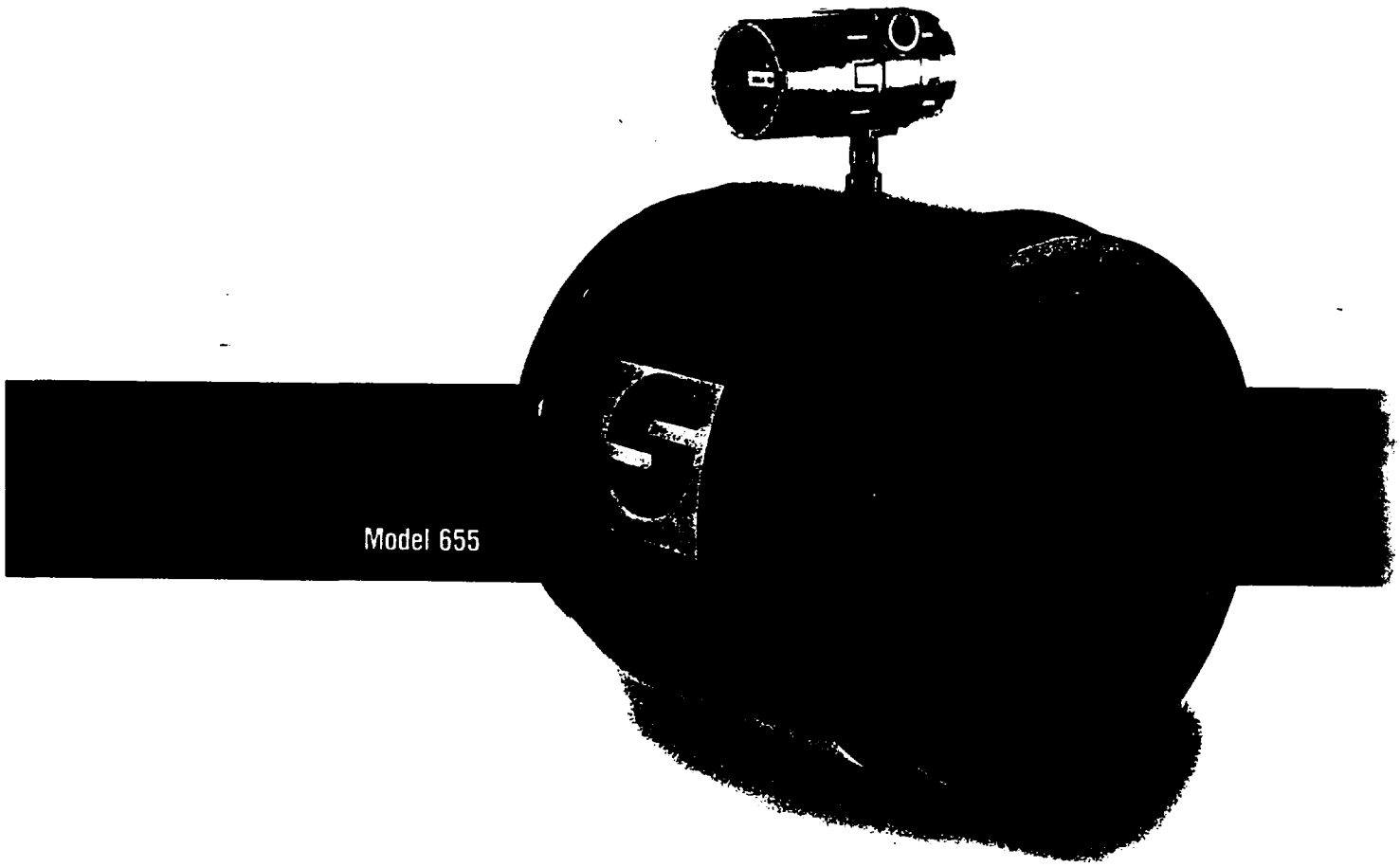
ITEM NO.	DESCRIPTION	PART NO.
1	Motor	53282
2	Capacitor	34964
3	Capacitor Retainer	33459
4	Terminal Boot	34322
5	Motor Housing	53154
6	Pipe Plug	3201
7	Cord Set Assembly	53165
8	Square Ring	17026
9	Cap Screw (4 used)	24418
10	Lockwasher (4 used)	22333
11	Lifting Bail	36754
12	Cap Screw (2 used)	2263
13	Wire Connector	26880
14	Ground Screw	38156
15	Key	35589
16	Conduit Nut	53749
17	Snap Ring	57882
18	Washer	53756
19	Bearing	53746
20	Shaft Seal	53754
21	Square Ring	33730
22	Seal Plate	53755
23	Screw	18923
24	Exclusion Seal	53747
25	Shim	8054
26	Shim	8053
27	Impeller	60875
28	Lockwasher	38519
29	Hex Nut	38132
30	Square Ring	33730
31	Cap Screw (4 used)	58547
32	Body	60876
33	Lockwasher (4 used)	35792
34	Hex Nut (4 used)	18927
35	Pull Washer	62641

B.2 FLOW METER AND REMOTE READ-OUT

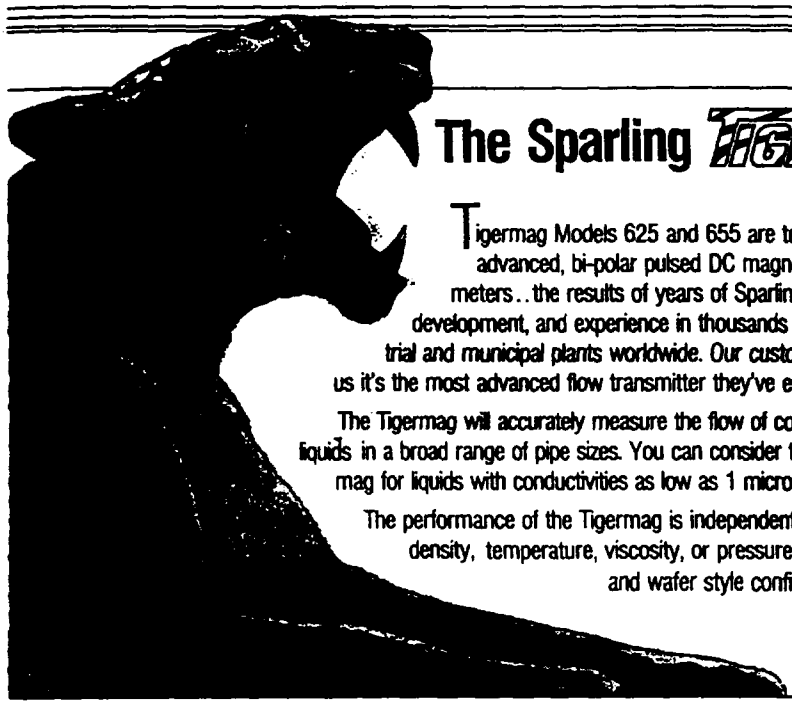
SPARLING



TIGERMAG



The Magnetic Flowmeter built to survive in harsh environments.



The Sparling TIGERMAG: A New Breed of Cat

Tigermag Models 625 and 655 are technically advanced, bi-polar pulsed DC magnetic flowmeters..the results of years of Sparling design, development, and experience in thousands of industrial and municipal plants worldwide. Our customers tell us it's the most advanced flow transmitter they've ever seen.

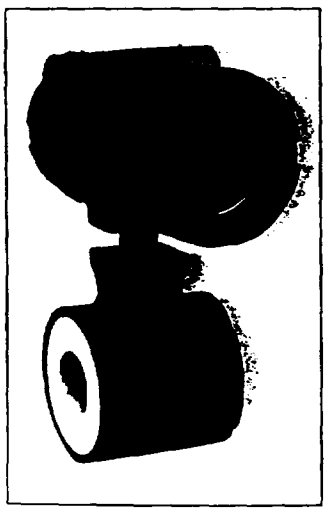
The Tigermag will accurately measure the flow of conductive liquids in a broad range of pipe sizes. You can consider the Tigermag for liquids with conductivities as low as 1 micromho/cm.

The performance of the Tigermag is independent of liquid density, temperature, viscosity, or pressure. Flanged and wafer style configurations offer the user optimum solutions to flow monitoring problems. You can count on Sparling's Tigermag for zero point stability and drift-free performance.

Microprocessor-based electronics, coupled with innovative software and advanced flow sensor design contribute to the Tigermag's high accuracy, dependability, and cost-effectiveness.

- SUPERIOR TECHNOLOGY
- MAXIMUM RELIABILITY
- UNEQUALED CUSTOMER SUPPORT

Model 625 is the flangeless configuration of the Tigermag ...available for pipe sizes 1/10" to 4" diameter. The unit is designed to be mounted between ANSI, DIN, BS, or JIS flanges and carries Factory Mutual approval for hazardous environments. The rugged aluminum housings are protected by a corrosion-resistant coating.



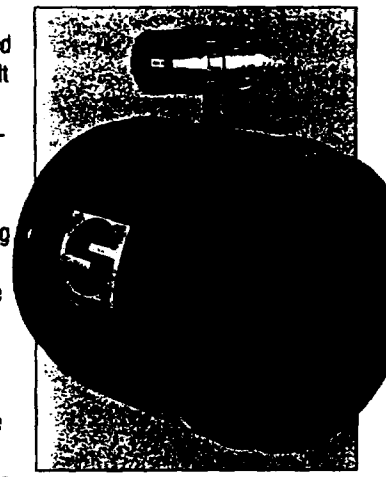
The unique flow sensor casting contains an aluminum oxide (ceramic) liner which stands up to virtually all corrosive liquids. The 625 is also highly resistant to abrasion and scale build-up. High input impedance eliminates the need for expensive electrode cleaning devices.

The construction of the 625 makes it an ideal choice for measuring flows in food processing facilities where product purity is essential. The unit is certified for use by the 3A Sanitary Council.

You can equip the 625 to handle your process by selecting the most suitable electrodes from a range of high tech materials.

Application engineering assistance is available from our Toll-Free Hot Line.

Model 655 is the flanged version of the TIGERMAG. It consists of a flanged flow tube and the same unique electronic transmitter supplied with the Model 625.



The 655 is mounted between mating ANSI, DIN, BS, or JIS flanges. You won't need grounding rings with the 655...built-in grounding electrodes do away with costly external rings and grounding straps.

You make the material choices. The 655 offers a wide selection of electrode and flow tube liner materials to stand up to the corrosion and abrasion that can wipe out other meters. Virtually any conductive liquid can be monitored by the 655 - even up to 300°F.

As with the 625, model 655 transmitter module is completely interchangeable and field programmable with a host of value-added features at no extra cost: positive zero return, low flow cutoff, selectable engineering units, simultaneous digital and analog outputs and many other parameters configurable with MAG-COMMAND and the 16 digit display. The 655 offers top performance at low installed costs.

MAG-COMMAND™... Field Programmability At Its Simplest

The Tigermag transmitter is easily configured to your requirements by means of MAG-COMMAND.™ Select and change nearly every parameter from outside the explosion-proof enclosure...quickly by means of a magnetic probe and Hall effect sensors. No covers — no fasteners...it's safe and simple. (see page 4 for details)

TIGERMAG Standard Specifications

Both Models 625 and 655

- **Full Scale Range** ..... From 0-3 to 0-33 ft/sec (0-10 mps).
- **Accuracy** ..... ±1% of rate 1-33 fps (.3-10 mps). ±0.01 ft/sec below 1.0 ft/sec.
- **Repeatability** ..... ±0.1% full scale.
- **Outputs** ..... Isolated analog 4-20 mAdc into 800 ohms and scaled pulse or frequency. Flow direction and fault open collector.
- **Mag-Command™** ..... Selection and change of meter parameters by magnetic probe without opening enclosure.
- **Display** ..... 16 Digit alphanumeric LCD (rate and total).
- **Power Requirements** ..... 100, 117, 230Vac + 10% 50/60 Hz. 24 Vdc optional
- **Power Consumption** ..... Less than 11 VA
- **Transmitter** ..... Cast aluminum with corrosion resistant epoxy coating. Integral or remote mounted (NEMA-7).
- **Electrical Rating** ..... FM Approved for Class I Division 1, Groups B C D, Class II Groups E F G.
- **Pre-amp Impedance** ..... 10^{11} ohms minimum.
- **Ambient Temperature** ..... -20° to 120°F (-30° to 49°C).
- **Selectable Damping** ..... 0-99 sec.
- **Low Flow Cut-Off** ..... Selectable 0-9% FS.
- **Electrodes** ..... 316 stainless steel standard. (others available)
- **Conductivity** ..... Minimum 1 micromho/cm.

OPTIONS

- Remote mount transmitter.
- Electrodes: (Titanium, Tantalum, Zirconium, Hastelloy C).
- High temperature operation.
- ±1/2% rate calibration.
- 24 Vdc power supply.

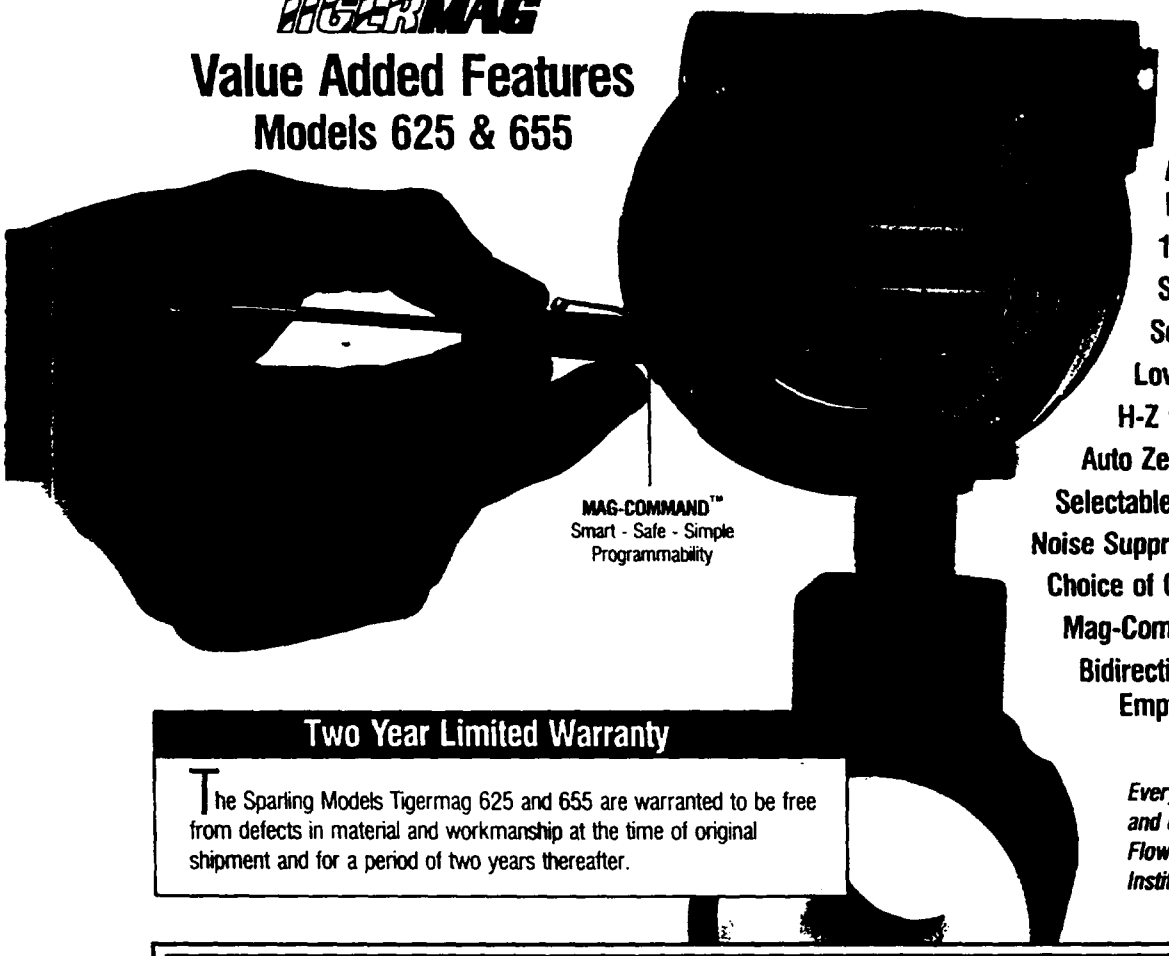
Individual Specifications

	Tigermag Model 625	Tigermag Model 655
Sensor Housing	Flangeless cast aluminum with corrosion resistant epoxy coating. FM Approved for Class I & II environments.	Flanged 304 stainless steel flow tube. Carbon steel flanges and welded construction with corrosion resistant epoxy coating.
Pressure	Full vacuum to 740 psi @ 350°F FM Approved to 150 psi)	150 psi - Higher pressures optional
Flow Tube Liner	Aluminum oxide 99.5% (ceramic)	Standard Polyurethane. Options include: Teflon, hard/soft rubber.
Standard Safety Classification	FM Approved for Class I Div. 1 Groups B, C, D Class II Groups E, F, G	Designed to Class I Div. 1 Groups B, C, D; Class 2 E, F, G.
Electrode Seals	Standard seals: Ethylene Propylene and Viton, Kalrez optional	Not Applicable
End Connections	Flangeless. Requires installation between ANSI, AWWA, DIN, BS, or JIS flanges.	Carbon steel flanges. 150 lb. or 300 lbs. ANSI, AWWA, DIN, BS, or JIS flanges
Max. Process Temp.	350°F (176°C) 500°F (260°C) optional	180°F (82°C) Polyurethane, hard/soft rubber 300°F (149°C) Teflon

For further information, request product data sheet PDS 625 or PDS 655

TIGERMAG

Value Added Features
Models 625 & 655



MAG-COMMAND™
Smart - Safe - Simple
Programmability

- **Interchangeable Electronics**
- **RFI-EMI Noise Rejection**
- **Accidental Submergence Proof**
- **16 Digit Display**
- **Software Menu Changes**
- **Security Interlock**
- **Low Flow Cutoff**
- **H-Z Circuitry**
- **Auto Zero - 20 times/sec**
- **Selectable Damping**
- **Noise Suppression**
- **Choice of Outputs**
- **Mag-Command™**
- **Bidirectional, Positive Zero Return, Empty Pipe Detection**

Two Year Limited Warranty

The Sparling Models Tigermag 625 and 655 are warranted to be free from defects in material and workmanship at the time of original shipment and for a period of two years thereafter.

Every meter is wet flow calibrated and certified in Sparling's Primary Flow Lab, traceable to the National Institute of Standards and Technology.

SPARLING...Simplifying Flow Measurement In The Following Industries

Municipal
Raw Sewage
Primary Sludge
Activated Sludge
Digested Sludge
Septic Sludge
Aerobic Sludge
Polymer Feed
Wastewater

Mining/Mineral Processing
Tailings
Ore Slurries
Washer Flows
Waste Water
Acid Mine Drainage

Pulp and Paper
Paper Stock
Pulp Stock
Cooling Water
Refiner Flows
Various Liquors
Wash Water
Waste Water

Food
Food Preparations
Beverages
Process Water
Dairy Products
Juices
Pulps

Power
Cooling Water
Recirculation Water
Lime Slurries
Fly Ash Slurries
Coal Slurries
Coal/Oil Mixtures

Chemical and Petrochemical
Acids
Caustics
Wastewater
Cooling Water
Slurries
Process Liquids
Process Water

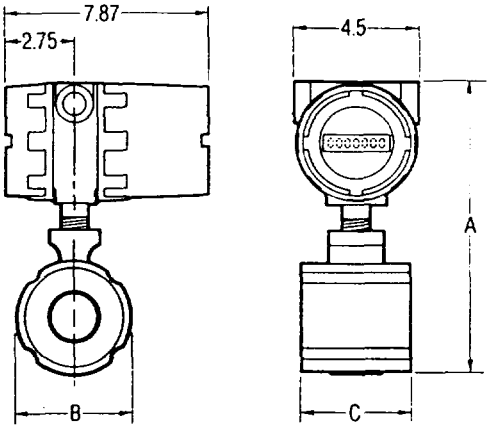
Other Demanding Applications
Pharmaceutical and Cosmetic Preparations
Inks and Dyes
Cement Slurries
Low Conductivity Liquids
Paints
Potable Water
Etching Acids
Fertilizers

TIGERMAG

Flow and Dimensional Data

Nominal Meter Size		Gallons Per Minute*			Dimensions in Inches		
(MM)	(INCHES)	±1% above 1 fps Min. full scale		Max. full scale	A	B	C
		1FPS	3FPS	33FPS			
3	0.10	0.04	0.12	1.3	9.00	2.31	4.06
6	0.25	0.22	0.66	7.3	9.00	2.31	4.06
12	0.50	0.55	1.50	16.5	9.00	2.31	4.06
25	1.0	1.62	4.86	53.5	9.62	2.31	4.06
40	1.5	4.40	13.20	145.0	10.50	3.62	4.06
50	2.0	7.00	21.00	231.0	11.00	4.12	4.06
80	3.0	20.60	61.80	680.0	12.25	5.25	6.06
100	4.0	35.40	106.20	1168.0	13.75	6.75	6.06

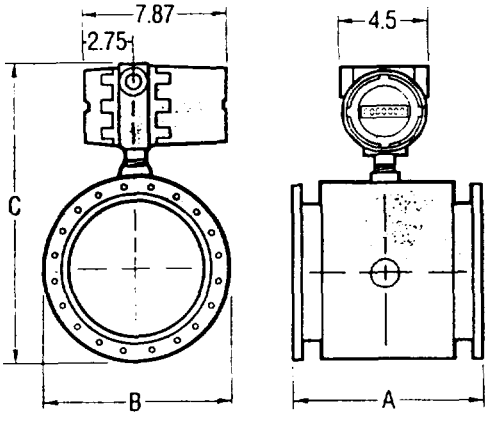
*GPM calculated at actual meter ID.



Tigermag Model 655

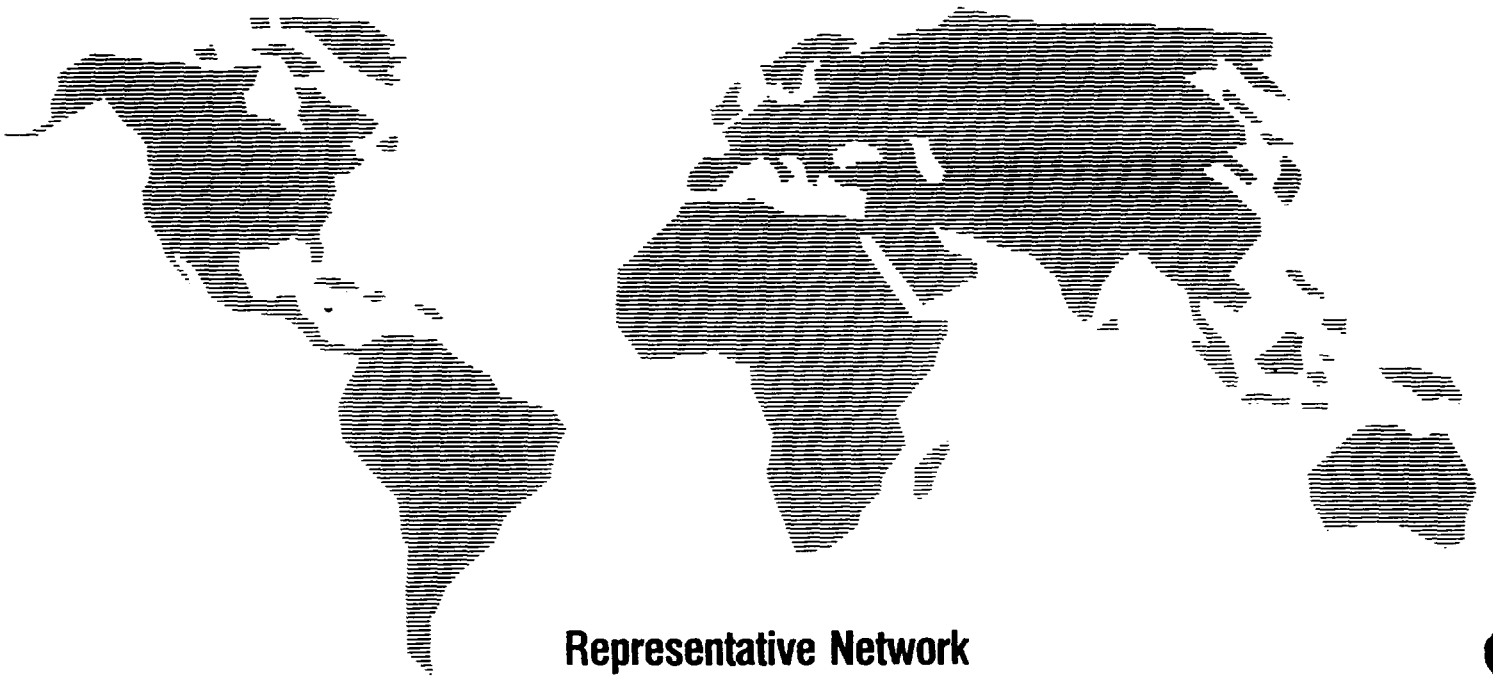
Nominal Meter Size		Gallons Per Minute*			Dimensions in Inches		
(MM)	(INCHES)	±1% above 1 fps Min. full scale		Max. full scale	A	B	C
		1FPS	3FPS	33FPS			
150	6.0	93	280	2800	13.00	11.75	18.25
200	8.0	167	500	5000	13.00	14.25	20.75
250	10.0	260	780	7800	17.75	17.12	23.62
300	12.0	367	1100	11000	18.87	20.12	26.62
350	14.0	500	1500	15000	20.87	22.87	29.37
400	16.0	667	2000	20000	22.87	24.62	31.12
450	18.0	734	2200	22000	26.75	26.12	32.62
500	20.0	1034	3100	31000	27.12	28.62	35.12
600	24.0	1500	4500	45000	32.25	33.12	39.62
750	30.0	2100	6300	63000	43.00	39.87	46.37

*GPM calculated at actual meter ID.



Dimensions for 150 lb. flanges. Allow 1/8" to 1/4" for liner.
DIN, BS, and JIS flanges available. Contact the factory for larger sizes.

Sparling Flow Experts Around The World



Representative Network

Domestic Representation

Albany, NY	Cleveland, OH	Los Angeles, CA	Pittsburgh, PA
Albuquerque, NM	Dallas, TX	Lynchburg, VA	Richmond, VA
Annapolis, MD	Davenport, IA	Memphis, TN	Rochester, NY
Atlanta, GA	Denver, CO	Milwaukee, WI	Salt Lake City, UT
Baltimore, MD	Detroit, MI	Minneapolis, MN	San Antonio, TX
Baton Rouge, LA	Great Falls, MT	Nashville, TN	San Francisco, CA
Billings, MT	Houston, TX	New Orleans, LA	Seattle, WA
Boston, MA	Indianapolis, IN	New York, NY	St. Louis, MO
Buffalo, NY	Kansas City, MO	Oklahoma City, OK	Syracuse, NY
Charlotte, NC	Knoxville, TN	Philadelphia, PA	Tampa, FL
Chicago, IL	Lafayette, IN	Phoenix, AZ	
Cincinnati, OH	Little Rock, AR		

International Agents

Austria	Japan	Spain
Belgium	Luxembourg	South Korea
Brunei	Malaysia	Sweden
Canada	Mexico	Switzerland
Chile	Netherlands	Taiwan
France	Norway	Turkey
Israel	Portugal	United Kingdom
Italy	Singapore	West Germany

Sparling also manufactures ULTRASONIC FLOWMETERS — Open Channel/Level and Transit-Time models — and PROPELLER FLOWMETERS in a wide range of sizes. Call us with your application details.

TIGERMAG
Capture It!

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No One Knows Flow Like Sparling

SPARLING

INSTRUCTION DATA SHEET

SERIES 600 METERS AND ACCESSORIES

FM625 TIGERMAG FLANGELESS PULSED DC MAGNETIC FLOWMETER INSTALLATION, OPERATION AND MAINTENANCE

IDS-625
Issue Date: November 1989
Supersedes: Feb. 1, 1989

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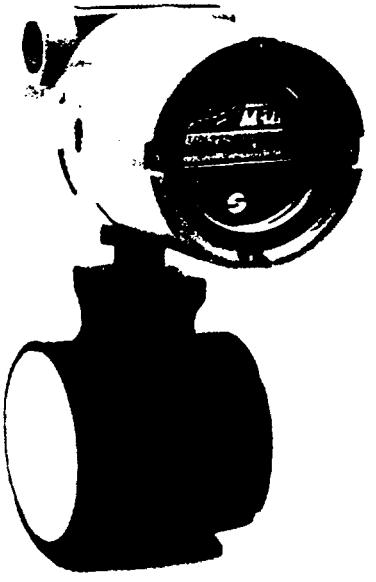


FIGURES

TABLES

Sparling Instruments Co., Inc.
4097 North Temple City Boulevard
El Monte, California 91731
Telephone 818/444-0571

SECTION 1 - GENERAL

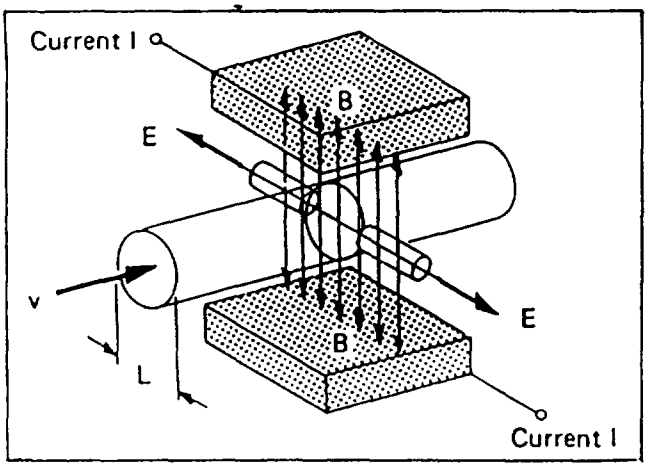
1.1 Measuring System

The Sparling TIGERMAG™ Model FM625 flowmeter is an obstructionless device for monitoring the volumetric flow of conductive liquids in full closed pipes.

The flowmeter consists of a flangeless sensor with a non-conductive ceramic flow tube and a measuring transmitter combined in a single compact unit.

1.2 Operating Principle

Operation is based on Faraday's Law of Magnetic Induction. An electrically conductive liquid flowing through a magnetic field induces a voltage which is perpendicular to this field and to the direction of the flow. This voltage is proportional to the average flow velocity. See figure 1.1.



Measuring Principle
Figure 1.1

The mathematical formula describing Faraday's law reads:

$$E = B \times L \times V$$

E = Induced voltage
B = Magnetic field intensity (flux density)
L = Distance between the electrodes (pipe diameter)
V = Average flow velocity of liquid

1.3 Application to Magnetic Flow Measurement

In a magnetic flowmeter the liquid acts as a moving conductor as it flows through the pipe. The induced voltage in the liquid is measured by two sensing electrodes mounted opposite each other in the meter sensing head.

The length of the conductor is equal to the distance between sensing electrodes and also the internal diameter of the pipe. The flux density is proportional to the coil current, I times a constant, k. The above formula can be restated as follows:

$$E = I \times k \times D \times V$$

$$V = \frac{\text{flow}}{\text{cross sectional area}} = \frac{Q}{A}$$

$$E = \frac{Q \times I \times 4 \times K}{D^2}$$

Note that if I is held constant, E is proportional to Q or *the induced voltage is directly proportional to the average flow rate.*

1.4 Interference

1.4.1 Electrochemical Interference

The signal voltage is measured by two electrodes. Galvanic elements form on the surface areas between the ion-conducting liquid and the metal electrodes. The polarization voltages which result are dependent on temperature, pressure, and the chemical composition of the electrodes and liquid. They are direct voltages which cannot be predicted and which can be different at each electrode. The signal voltage must be separated from the interference direct voltage.

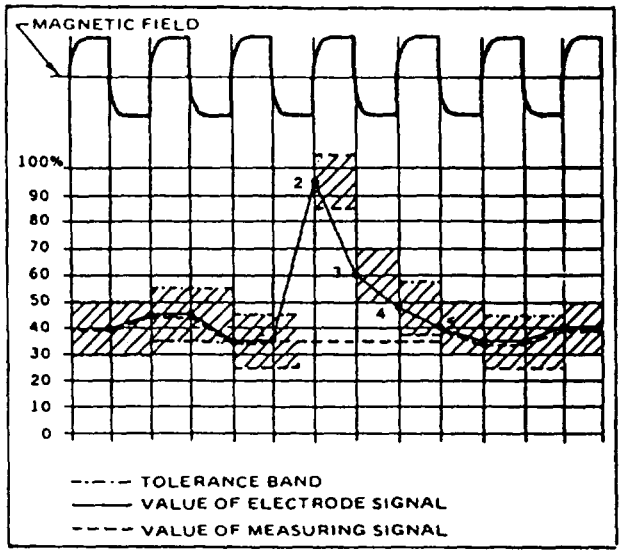
1.4.2 Induction Interference (Quadrature)

Electrode cables connect the electrodes with the meter electronics. Because these cables must run within the magnetic field, a voltage is induced which is proportional to the rate of change of the magnetic field strength. The meter design minimizes the length of conductor within the magnetic field in order to keep the value of this interference as low as possible.

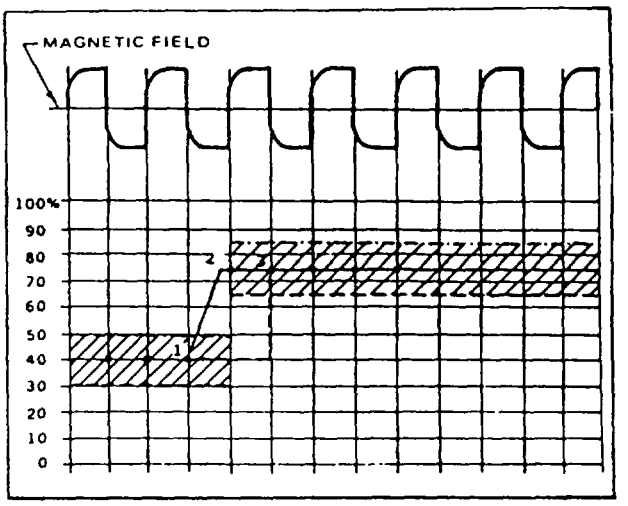
1.4.3 Pulp Noise

Liquids which contain pulp such as paper stocks or food mixtures can create high levels of electrode interference voltages as the pulp contacts the electrode. The FM-625 utilizes a suppression technique by which these interference voltages are rejected if they create an electrode signal which varies excessively from the immediately preceding signal.

This feature compares each sampled flow signal to the previous signal. Signals which vary from the preceding signal by more than 0-30% (selectable) are rejected. This feature provides a stable output during the cycles when spurious signals are interfering, yet permits rapid response to true flowrate changes.



Noise Rejection
Figure 1.2



Fast Changing Flows
Figure 1.3

In Figure 1.2, signals at 2, 3 and 4 are outside the tolerance band. A stable output of the signal at 1 is produced until two successive signals are within the change tolerance, as occurs at 5.

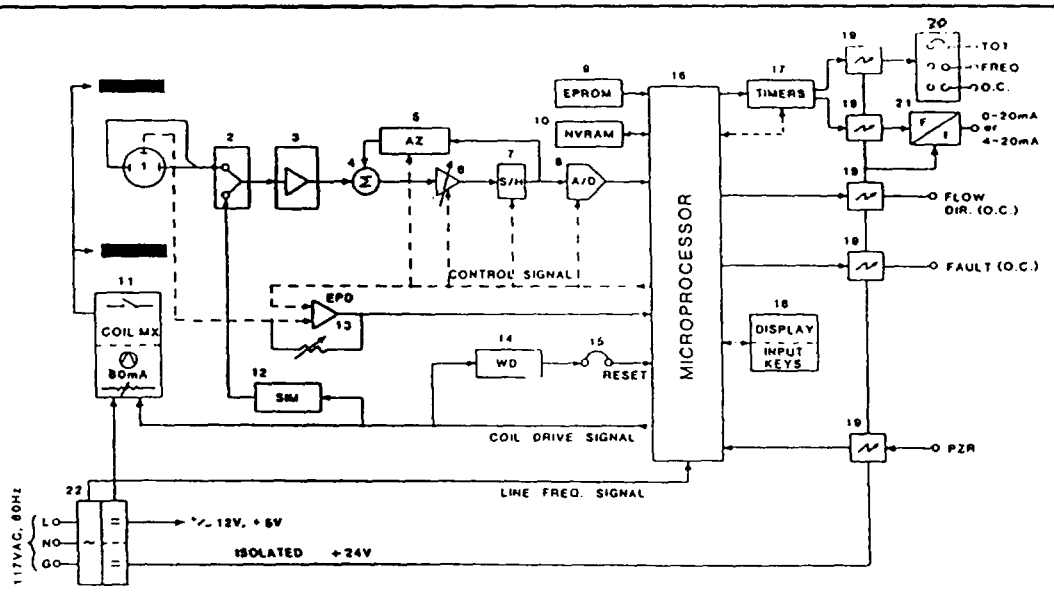
In figure 1.3, signal 3 is within tolerance when compared to signal 2. The new output is displayed at 3, a delay of only two coil cycles. This rapid response permits the meter to be used on rapidly changing flows even when the noise rejection feature is used.

This feature permits the use of the TIGERMAG™ automatic zeroing pulsed DC magmeter in applications which had previously required AC meters. See Noise Suppression in the Programming Appendix, 1.9.4.

1.4.4 Other Interference Voltages

Pipes and the liquids within them are often used as a conductor for electrical grounding. This creates a voltage potential between electrodes which can be high relative to the signal voltage. Proper grounding of the flowmeter to the liquid is necessary to achieve correct meter operation. **All necessary grounding of the FM625 is accomplished by built-in grounding electrodes. Grounding rings may be required if the flowing medium has a voltage potential.**

1.5 System Operation



1. Measuring Sensor
2. Electrode Cable PCB
3. Input Amplifier
4. Summing Point
5. Autozero Circuit
6. Variable Gain Stage
7. Sample and Hold
8. Analog to Digital Converter
9. Erasable PROM (program)
10. Nonvolatile RAM (constants)
11. Coil Current Multiplexer
12. Built-in Simulator
13. Adjustable Empty Pipe Detection (option)
14. Watchdog Timer
15. Enabling Jumper
16. Microprocessor
17. Solid State Timer
18. LCD Display with Hall Effect Switches
19. Optocouplers
20. Selecting Jumper (I/O PCB)
21. Frequency to Current Converter
22. Power Supply Section

Block Diagram
Figure 1.4

1.6 Automatic Gain Control

The FM625 incorporates 8 levels of automatic gain control. Electrode signals are automatically amplified to maintain proper signal levels at all flows. This makes accurate flow measurement with the display and with the pulse or frequency outputs completely independent of the settings of full scale. Rangeability of these outputs is in excess of 100:1 (from 0.3 feet per second to 33 feet per second). Rangeability at stated accuracies is 33:1 when the minimum velocity of 1 foot per second is considered.

1.7 Construction

1.7.1 Sensor

The FM625 TIGERMAG™ cast aluminum sensor housing is shrink fitted to the aluminum oxide liner to form a structurally sound waterproof assembly. This housing is Factory Mutual and CSA approved .

Electrodes in meters over 1/2" are sealed by a double O-ring seal. The primary O-ring seal is ethylene propylene. This seal is backed by a secondary seal of viton. The combination of seals makes the meter suitable for nearly all conductive liquids.

All internal cavities in the sensor housing are filled with a high temperature silicone potting compound to prevent the possibility of moisture damage and to avoid the possibility of collection of explosive gases.

When properly connected with liquid tight conduit, the meter will withstand accidental submergence.

1.7.2 Transmitter

The transmitter is housed in a CSA and Factory Mutual Approved, NEMA-7 instrument enclosure. The electrical connections are made in a separate section of the housing which is isolated from the electronics.

1.8 Specifications

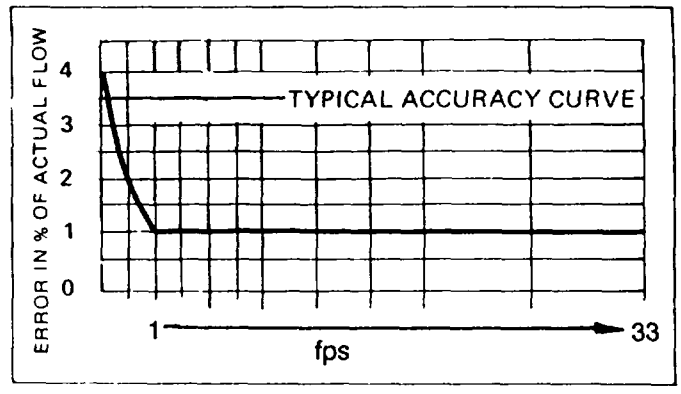
Power Requirements: - See Nameplate

	Fuse
100 V ac ± 10% 50/60 Hz ±10%,	1.0 amp
117 V ac ± 10% 50/60 Hz ±10%,	1.0 amp
230 V ac ± 10% 50/60 Hz ±10%,	0.5 amp
24 V dc ± 10%	2.0 amp

Fuse:
Fast-Blo, PCPI, Littelfuse Microfuse
Spare fuse provided on connector PCB.

Wire Size:
Power: 16 AWG 14 AWG Max
Signal: 18 AWG

Ground Cable: Third wire ground of power cable.



Standard Accuracy: Frequency Output
± 1% of rate with flow velocity above 1 fps (0.3 mps)
± 0.1% of full scale flow below 1 fps.

Reference Conditions:
25° C, 6 fps full scale
Temperature effect, 0.025% Full Scale/° C
Voltage effect, 0.3% Rate/10% Fluctuation
Accuracy statement based on digital outputs

Repeatability: within ± 0.1% FS

Power Consumption: Less than 11 VA

Output Signals: Simultaneous Isolated Analog and Digital
Analog: 0 or 4-20 mA dc into 800 ohms max.
Digital: Scaled pulse or Frequency (selectable)
a. Scaled Pulse. 24 V dc square wave, 25 ms pulse width, 0-10 Hz max. into 150 ohm impedance min.
b. Scaled Frequency. 15 V dc square wave, 50/50 duty cycle, 0 -1000 Hz max.
Note: Either (a) or (b) with transistor open collector to common, jumper selectable.

Fault: Open collector. Active on self test failure and during programming.

Flow Direction: Open collector. Active in reverse flow.

Input Signal: Positive zero return (PZR). Connect to remote contact to drive output to zero (0-4 mA) when an empty pipe condition can occur.

Minimum Conductivity: 1 micromho/cm

Full Scale Velocity Ranges: 0-3 to 0-33 fps (0 - 1 to 0 - 10 mps)

Ambient Temperature Limits: -20° to 140° F (-30° to 60° C)
(Display may darken above 110° F)

Liquid Temperature Limits: -40° to 350° F (-40° to 176° C)

Temperatures above 158° F (70° C) require mounting the electronics separately (max. distance 15 feet at liquid conductivity of 1 micromho and min. velocity of 1 fps).

Storage Temperature Limits: -20° to 140° F (-30° to 60° C)

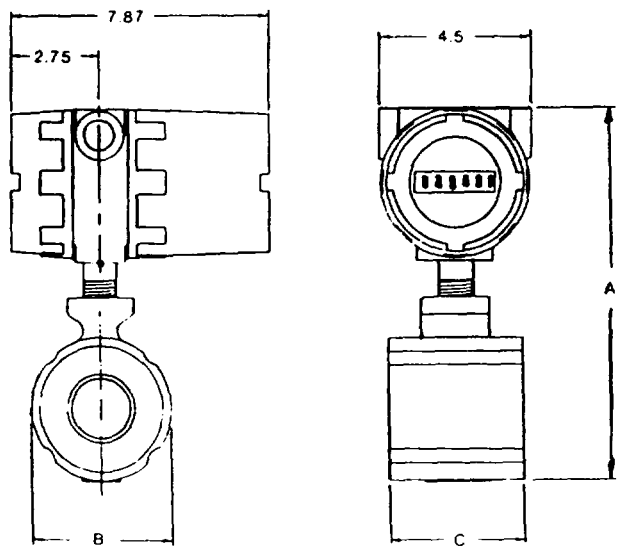
CONSTRUCTION

Metering Tube	Cast Aluminum
Lining	Aluminum Oxide 99.5%
Electrodes	316 SS. Others as req'd.
Housing	Cast Aluminum Hi-build Epoxy Coated
Protection rating	NEMA-4, NEMA-7
Electrical rating	General Purpose
FM	Designed for Class I & II, Division 1 & 2, Groups B, C and D
CSA	This equipment for use in Class 1, Division 2, Groups or non-hazardous locations only

1.9 Interchangeability

The FM625 Transmitter is designed to be used with any FM625 Sensor. Electronics are completely interchangeable. Each electronics module is software configured to the sensor.

METER SIZE (in)		DIMENSIONS IN INCHES/MM					
NOM	ACT	in A	mm	in B	mm	in C	mm
1/10	0.125	9.00	228	2.31	59	4.06	103
1/4	0.302	9.00	228	2.31	59	4.06	103
1/2	0.452	9.00	228	2.31	59	4.06	103
1	0.812	9.62	244	2.31	59	4.06	103
1-1/2	1.34	10.50	267	3.62	92	4.06	103
2	1.69	11.00	279	4.12	105	4.06	103
3	2.90	12.25	311	5.70	145	6.06	154
4	3.80	13.75	349	6.62	168	6.06	154



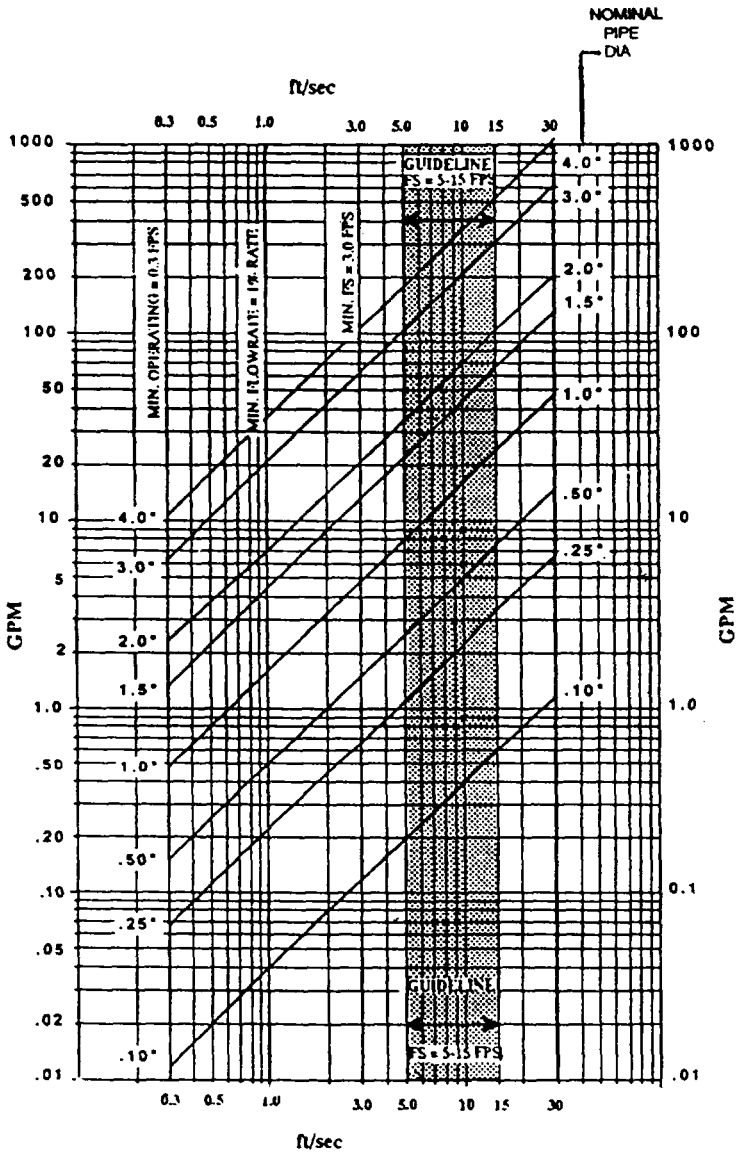
Dimensions
Figure 1.5

2.0 Application Considerations

The TIGERMAG™ can be used to accurately measure the volumetric flow rate of liquids having a conductivity of at least 1 micromho/cm.

The presence of entrained air or gases in the process liquid will not prevent meter operation, but will produce a positive (+) error equal to the % by volume gas entrainment.

Full scale flow rates should be selected above 3 feet per second (1 meter per second) for best accuracy. Verify proper velocities from the nomogram in figure 1.6.



Flowmeter Sizing Guide
Figure 1.6

SECTION II - PRE-INSTALLATION

2.1 Receiving and Inspection

When the equipment is received, the outside of the package should be inspected for damage. If any damage or shortage is found, notation to that effect should be made on the carrier's delivery receipt.

Visually inspect the sensor and transmitter for damage from rough handling or faulty packaging. If concealed damage is discovered, notify the delivering carrier at once and request an inspection. Confirm telephone conversations in writing. If inspection is not made, prepare an affidavit stating that you notified the transportation company and that they failed to inspect. Save containers and packaging material.

It is essential that the carrier be notified within 15 days from the date of delivery in order to be in a position to present your claim. Make your claim promptly.

Unpacking and handling of FM625 Magnetic Flowmeters should be consistent with the procedures used to handle field instruments.

2.2 Storage

This equipment should be stored in a clean, dry environment. Do not store outside in an unprotected area. Observe the storage temperature requirements. Unpowered storage should not exceed 2 years.

2.3 Return of Equipment

Obtain an RGA (Returned Goods Authorization) number from the factory prior to returning any materials. The RGA number should be marked on the outside of the package. Failure to obtain authorization will unnecessarily delay any work to be performed at the factory.

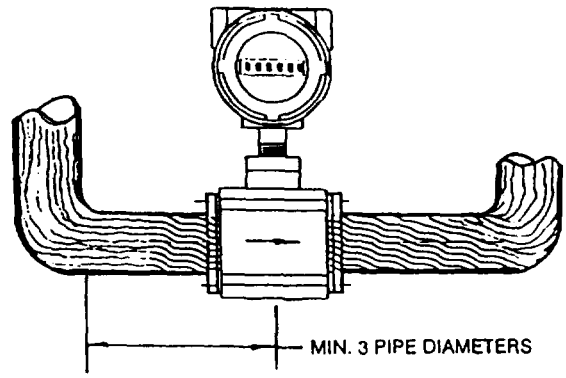
SECTION III - INSTALLATION

3.1 Site Selection

Select a pipe location which will always be full of liquid. The equipment should be located where the sensor will be accessible for adjustment. Provide a minimum of 18" clearance to the electronics enclosure.

The meter may be located in any position from vertical to horizontal. Flow may be in either direction through the meter. Vertical installation minimizes the possibility of slurry separation. Vertical installation with the liquid flowing upwards assures full pipe conditions.

Horizontal installation requires that the sensing electrodes be positioned in the horizontal plane and grounding electrodes be positioned at the bottom of the meter.



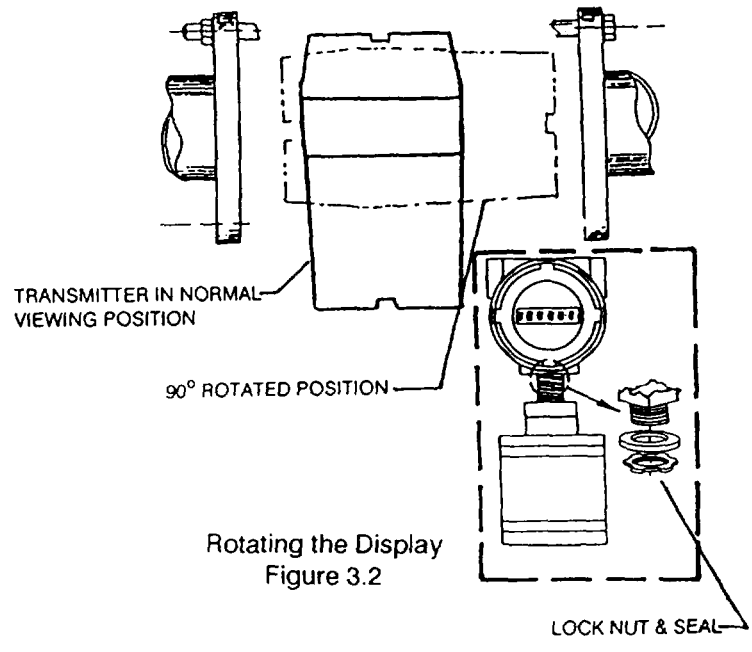
Full Pipe Required
Figure 3.1

Provide at least three pipe diameters of straight piping approach between an upstream elbow and the midpoint of the meter. In small meters this can be achieved within the meter itself. More straight approach should be provided after valves or multiple elbows. Provide at least 10 diameters after expanders or laterals which are smaller diameter than the line size.

3.2 Rotating the Transmitter Display

The transmitter can be rotated 90 degrees in either direction. See figure 3.2. Loosen the lock nut securing the transmitter to the standoff. Rotate the transmitter by hand in the desired direction. Tighten the lock nut to prevent further rotation and to prevent moisture entering the enclosure.

Additional rotation can be achieved by removing the meter from the line and reversing the flow through the meter. Excessive rotation of the transmitter can damage internal wiring. ***Do not rotate the transmitter more than 90° in either direction.***



Rotating the Display
Figure 3.2

3.3 Pipe Connections

The flangeless sensor is installed between two process pipe flanges. The sensor contains a non-conductive aluminum oxide liner (ceramic). The integrity of this liner must be maintained for the flowmeter to function. ***CARE SHOULD BE TAKEN DURING INSTALLATION TO INSURE THAT THIS LINER IS NOT DAMAGED.*** Depending upon meter size, four (4) or eight (8) steel bolts are furnished with the FM625.* These bolts are for installing the meter between existing flanges. Also included are two (2) gaskets of PTFE. See Table 3.1

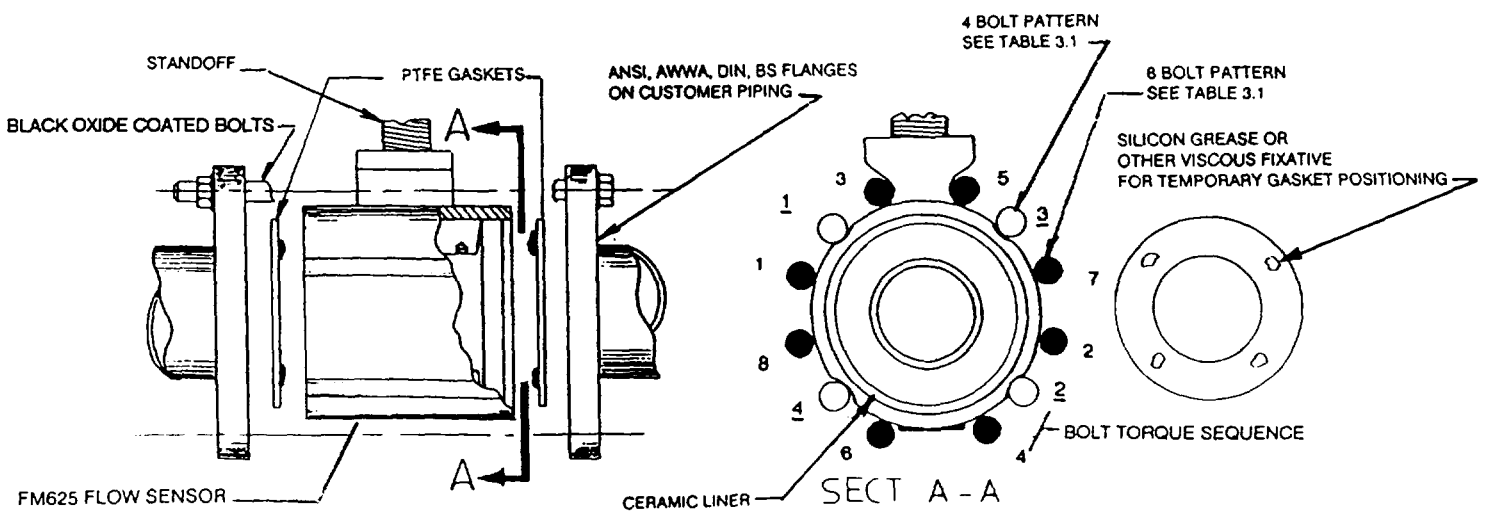
Install the two bolts at the bottom of the meter. Place the meter temporarily between the flanges to confirm correct positioning. The meter should rest directly on the bolts. Remove the meter. Put a small quantity of silicone grease or other tacky material on gasket to hold it temporarily to the end of the meter. Reinstall the meter taking care to keep the gasket centered. Install all bolts and tighten finger tight. Complete installation with torque wrench. It is important that the bolts be tightened alternately so that excessive force is not applied to a concentrated point. See Figure 3.3. Do not exceed the torque limits in Table 3.1

Table 3.1 Flange and Bolt Specifications - ANSI and AWWA (Bolts furnished for U.S. shipments only)

Flange Size	Pressure Rating	O.D. Inch	Bolt Circle	Hole Dia	Bolt Size	Torque Limits (ft-lbs)
1/2	150	3-1/2	2-3/8	4 @ 5/8	7/16-14 x 6-3/4	17
1/2	300	3-3/4	2-5/8	4 @ 5/8	1/2-13 x 6-3/4	17
1/2	600	3-3/4	2-5/8	4 @ 5/8	1/2-13 x 6-3/4	17
1	150	4-1/4	3-1/8	4 @ 5/8	7/16-14 x 6-3/4	17
1	300	4-7/8	3-1/2	4 @ 3/4	5/8-11 x 7-1/2	17
1	600	4-7/8	3-1/2	4 @ 3/4	5/8-11 x 7-1/2	17
1-1/2	150	5	3-7/8	4 @ 5/8	1/2-13 x 6-3/4	17
1-1/2	300	6-1/8	4-1/2	4 @ 7/8	3/4-10 x 7-1/2	17
1-1/2	600	6-1/8	4-1/2	4 @ 7/8	3/4-10 x 7-1/2	17
2	150	6	4-3/4	4 @ 3/4	5/8-11 x 7-1/2	17
2	300	6-1/2	5	8 @ 3/4	5/8-11 x 7-1/2	17
2	600	6-1/2	5	8 @ 3/4	5/8-11 x 7-1/2	17
3	150	7-1/2	6	4 @ 3/4	5/8-11 x 9-1/2	24
3	300	8-1/4	6-5/8	8 @ 7/8	3/4-10 x 10-1/2	24
4	150	9	7-1/2	8 @ 3/4	5/8-11 x 9-1/2	30
4	300	10	7-7/8	8 @ 7/8	3/4-10 x 10-1/2	30

Table 3.2 DIN Flange and Bolt Specifications

Flange Size	Pressure Rating	O.D. mm	Bolt Circle	Hole Dia	Bolt Size	Torque Limits (kg-m)
15	10	95	65	4@14	M10 x 170	2.3
15	25	95	65	4@14	M12 x 170	2.3
25	10	115	85	4@14	M12 x 170	2.3
25	25	115	85	4@14	M12 x 170	2.3
40	10	150	110	4@18	M16 x 190	2.3
40	25	150	110	4@18	M16 x 190	2.3
50	10	165	125	4@18	M16 x 190	2.3
50	25	165	125	4@18	M16 x 190	2.3
80	10	200	160	8@18	M16 x 240	3.3
80	25	200	160	8@18	M16 x 240	3.3
100	10	220	180	8@18	M12 x 240	4.0
100	25	235	190	8@22	M20 x 260	4.0



Installation
Figure 3.3

* Bolts furnished for U.S. Shipments only.

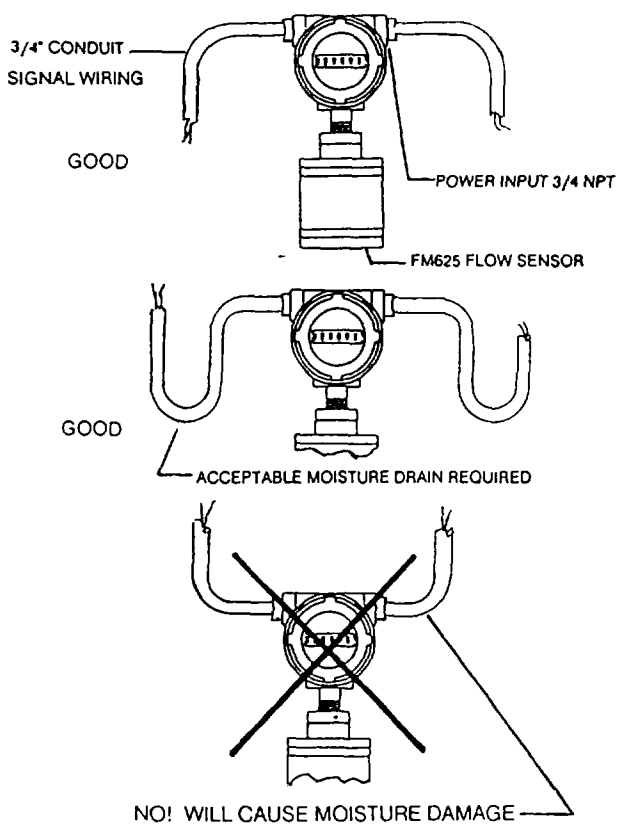
3.4 Grounding

The TIGERMAG™ has built -in grounding electrodes. The grounding electrodes are in continuous contact with the process liquid providing a direct means for grounding electrical noise in the liquid and eliminating the need for grounding rings or straps. The grounding electrodes are connected to the meter housing and to the ac power electrical ground. The transmitter electronics operate on dc power and are isolated and floating electrically. The signal outputs therefore are isolated from process liquid and ac ground electrical noise.

The electrical noise potential in the process liquid is at a similar level to the electrical ground plane to which the ac supply ground is connected. This grounding method stabilizes the electrical field within the sensor measuring section permitting accurate flow detection. Contact our technical support group if process liquid is maintained at a potential to ground.

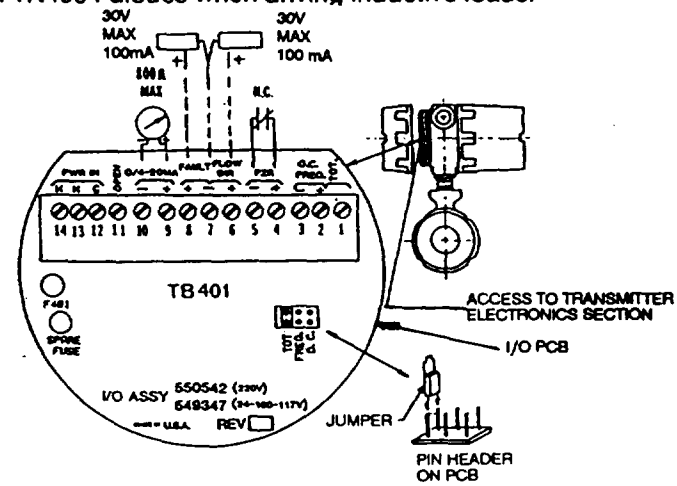
3.5 Electrical Connections

Unscrew the small blind cover of the electronics enclosure to gain access to the I / O PCB. Separate conduit entrances are provided for power and signal wiring. Conduit entrances are 3/4" NPT. Conduit connections should follow good practice and should be routed from below the meter. If conduit cannot be routed from below, provide moisture traps to prevent moisture from entering the meter enclosure. See figure 3.4.



Conduit Connections
Figure 3.4

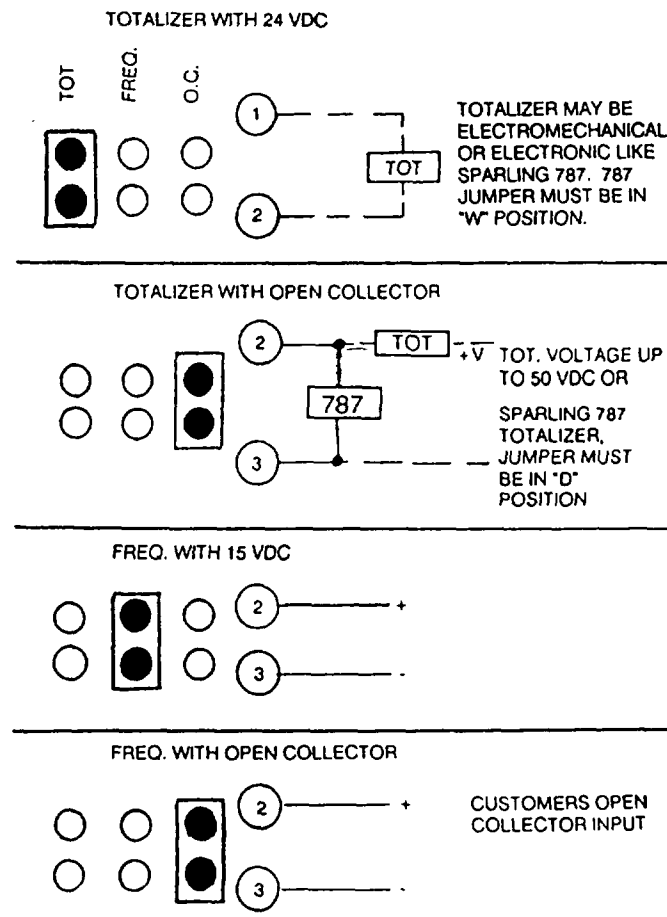
A connection diagram is located in the cover of the connection section and in figure 3.5. Determine which of the outputs (4-20 mA, fault, flow direction, pulse or frequency) are to be used. Connect the required outputs as shown in figure 3.5. Install 1N4004 diodes when driving inductive loads.



Electrical Connections I/O PCB
Figure 3.5

Connect power to the power input. If required, connect the Positive Zero Return (PZR) input. Note that meter output is forced to zero when terminals 4 and 5 are jumpered.

Check the position of the jumper on the I/O board. Place the jumper as shown below. See figure 3.6.



I/O Board Jumper Position
Figure 3.6

The external load on the outputs must be within the limits specified. Calculate the external load by summing the input resistance, including all interconnecting cable. Signal cable of 18-22 gauge is normally adequate.

External load limits:
Analog output: 800 ohms max impedance
Pulse output: 150 ohms min impedance

Both outputs are floating and use the same isolated ground. If both outputs are used simultaneously, only one of the common legs can be grounded. If both are grounded, a ground loop will occur causing erroneous signals.

CAUTION
ONLY ONE LOAD MAY HAVE A LEG STRAPPED TO GROUND UNLESS THE LOADS ARE ISOLATED FROM EACH OTHER.

3.6 Remote Mounted Transmitter

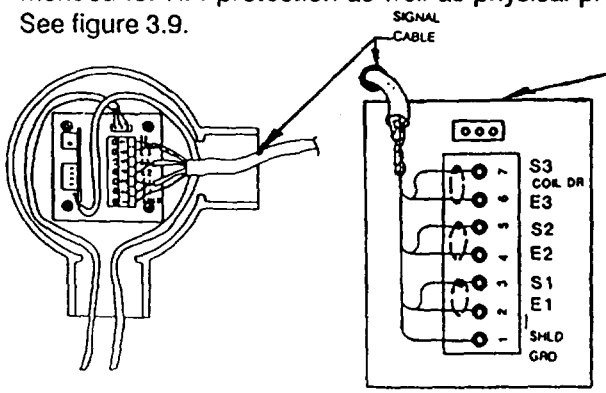
Remote mounting of the electronics is required when process temperatures exceed 158° F (70° C) or when pipe vibration is excessive. Remote mounting should be used when high process temperatures exist at high ambient temperatures.

A bracket for wall or pipe mounting is furnished as part of the optional remote mounting kit. Interconnecting cable is supplied between the sensor and transmitter enclosure. The cable is pre-wired to the transmitter. Also supplied is a sensor mounted NEMA-7 rated junction box in which coil and electrode connections are made.

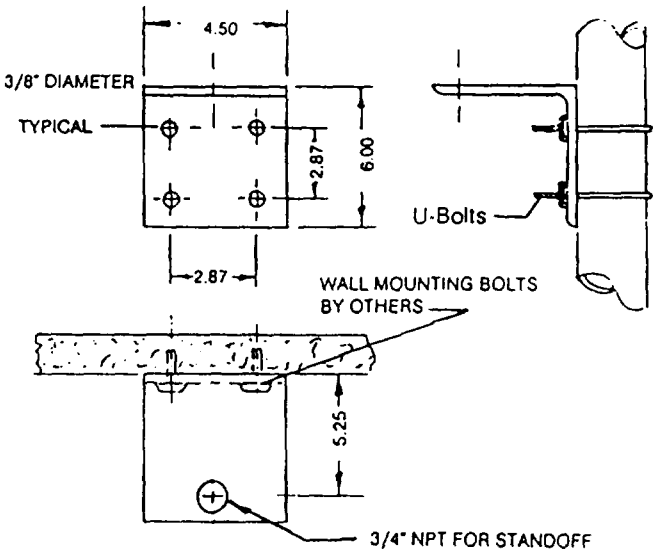
The standard interconnecting cable length is 15 feet. Shorter or longer cables should be ordered from the factory. ***Do not attempt to shorten the cables in the field.***

CAUTION
DO NOT MAKE CONNECTIONS WHILE POWER IS APPLIED. DISCONNECT POWER BEFORE PROCEEDING.

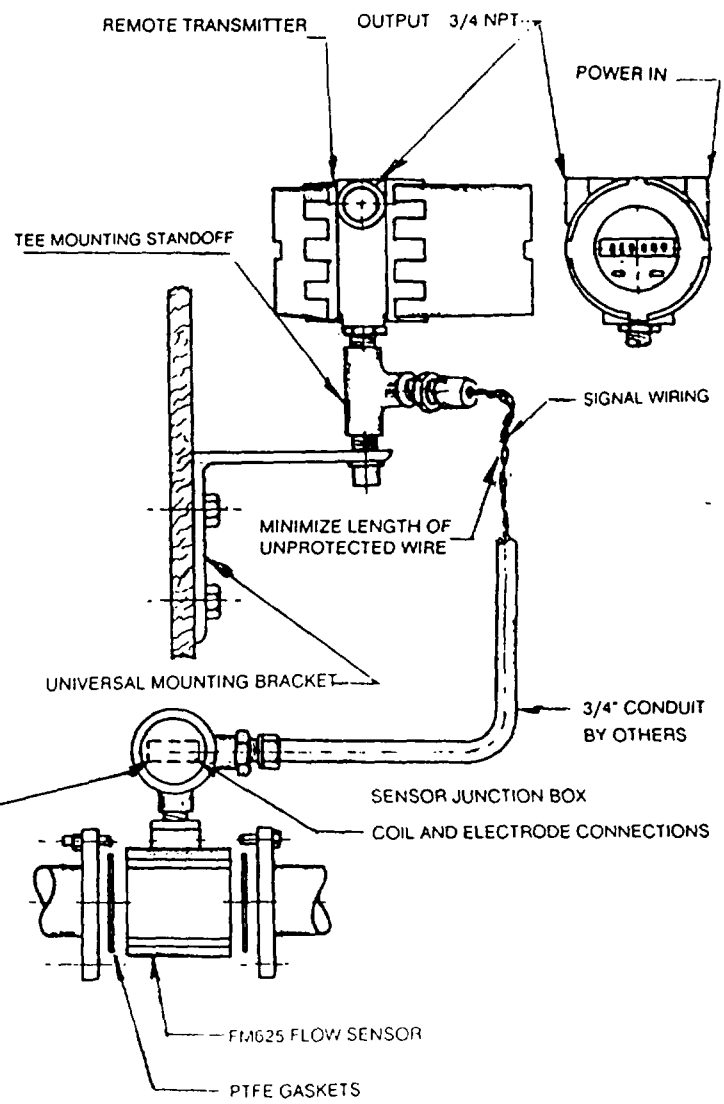
Connect terminals 1 through 7 with the special cable provided. See figure 3.7. Installation in metal conduit is recommended for RFI protection as well as physical protection See figure 3.9.



Sensor Wiring - Remote Transmitter
Figure 3.7



Remote Transmitter Mounting Bracket
Figure 3.8



Remote Mounted Transmitter
Figure 3.9

SECTION IV - START-UP

Prior to applying power, the following checks should be made:
a) Check the flowmeter nameplate to insure that the power supply voltage is correct.
b) Verify that all electrical connections are correct. See figures 3.5 and 3.7.
c) Check the polarity of external loads connected to the outputs.

SECTION V - CALIBRATION

All flowmeters are calibrated before leaving the factory. No field recalibration is required.

The 4 and 20 mA current level may be checked if desired by following the procedure in Appendix I DIAGNOSTICS. The meter can be used as a current calibrator to check connected equipment. See Appendix para. 2.2.2.

SECTION VI - MAINTENANCE

No routine maintenance is required.

SECTION VII -TROUBLESHOOTING

7.1 General

Each flowmeter is rigorously tested during production. The final test stage is a wet flow calibration in a Sparling precision primary flow laboratory traceable to the National Institute of Standards and Technology (NIST).

Before troubleshooting, carefully verify the operating conditions of the meter:

1. Verify the interconnecting wiring by using a local milliammeter connected to the current output with no other load connected.
2. Verify that the sensor is completely filled with liquid. An empty or partially full sensor will continue to send a flow signal even with no flow.
3. Verify that the flow test comparison is valid to be sure that the meter is in error.
4. If in doubt, verify the conductivity of the liquid to see that it exceeds 1 michromho/cm.

7.2 Troubleshooting Chart

The following trouble shooting chart should assist in correcting meter malfunction. For additional assistance, contact Technical Support 800/423-4539 (818/444-0571 in California).

WARNING

(a) "WARNING - EXPLOSION HAZARD- SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2";

"AVERTISSEMENT - RISQUE D'EXPLOSION - LA SUBSTITUTION DE COMPOSANTS PEUT RENDRE CE MATERIEL INACCEPTABLE POUR LES EMPLACEMENTS DE CLASSE 1, DIVISION 2".

(b) "THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS 1, DIVISION 2, GROUPS (AS APPLICABLE) OR NON-HAZARDOUS LOCATIONS ONLY.

SYMPTOM	POSSIBLE CAUSE AND CURE
1. Meter display reads "CHECKSUM ERROR" on power-up.	1. The meter has failed the power on self-test. Answer "YES" and the meter will load default values and start operating. Both factory and user setting will require reprogramming. See Appendix II A-9.
2. Display is blank.	2. Check the power and the fuse. Turn the power off and on. Call the factory for assistance.
3. Display is turning black around edges.	3. Temperature is too high inside the enclosure. Relocate the meter or shield against the heat source. Continuing to power the meter in this condition will permanently damage the display.
4. Display is difficult to read.	4. Improve the lighting conditions if ambient light is dim. Remove large cover and adjust the pot directly below the display for best contrast while viewing from the intended viewing angle.
5. Displayed flow rate changes rapidly (jitters).	5. Unsteady flow. Increase display damping. See Appendix I, 1.9.1.
6. Recorder trace is too wide (paints).	6. Increase current damping. See Appendix I, 1.9.2.
7. Display is correct but current output does not correctly track the flow.	7. Incorrect selection of full scale "Q" which defines the flow rate for 20 mA. Verify current scale selection (0 - 20 mA or 4 - 20 mA). Perform "CURRENT CHECK" in diagnostics.
8. Display is correct but totalizer doesn't correctly track the flow.	8. Incorrect selection of registration "R". Verify output selection (either "TOT" or "FREQ") and matching jumper placement on I/O board.
9. Display and outputs are at zero.	9. Dry Sensor Full pipe no flow condition. PZR contact closed.
10. Display and outputs are not zero at zero flow.	10. Leaky valves Some liquid movement. Set Low flow cutoff to keep totalizer from advancing.
11. Display and outputs are erratic or wander.	11. Pipe partially full. Large air bubbles are present in the process liquid. Increase the head in the line by restricting downstream flow. Pipe freshly drained. If part of process cycle utilize PZR to inhibit outputs.
12. Internal totalizer not advancing.	12. Meter operating in reverse flow. (Negative sign will show on display.) Change flow direction. (See Appendix I, 1.8.2. "R" selected too high for the actual flow.

If the above steps fail to correct the problem, try different flow rates and disconnecting loads temporarily and see if the problem persists. Perform simulator check and call the factory.

Please have the following information available when you call:

Meter serial number.

Description of the problem. (Display, current output, totalizer/frequency, all of the above.)

When does the symptom occur or repeat?

What are the flow rates, the orientation of the meter in the pipeline, environmental conditions and the output loads on the meter?

How did you verify the discrepancy?

Contact Technical Support 800/423-4539 (in California 818/444-0571) for additional assistance.

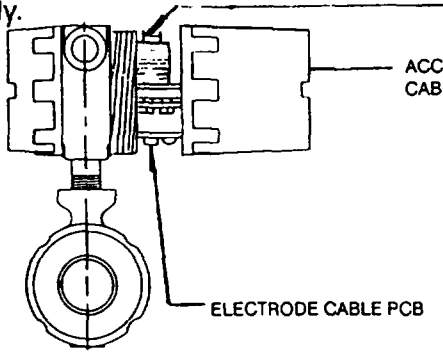
7.3 Electronics Self Test

Using the MAG-COMMAND™ (magnetized screwdriver), enter programming mode by holding the MAG-COMMAND to the "NO" switch for several seconds. See Appendix for detailed instructions. Answer NO to all prompts until the DIAGNOSTICS menu appears. Answer YES to the DIAGNOSTICS menu. Follow the menu instructions.

At this point, it will be necessary to remove the cover to gain access to the electrode cable PCB.

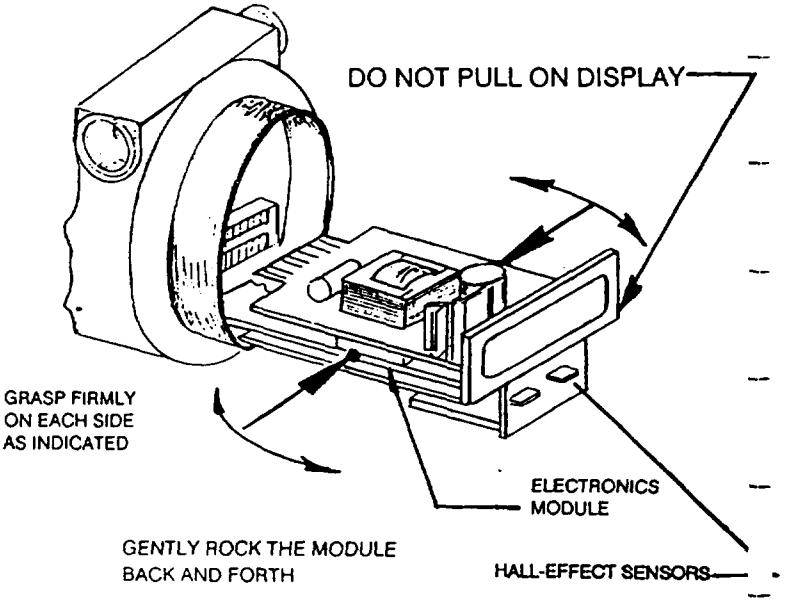
Remove the electrode cable PCB and rotate it 90 degrees as shown in figure 7.2. Continue to follow the instructions in the menu. The meter will self test exercising the coil timing circuits and internal electronics. If it obtains the same values as were factory stored, it will answer "PASSED".

This confirms that the electronics are functioning correctly.

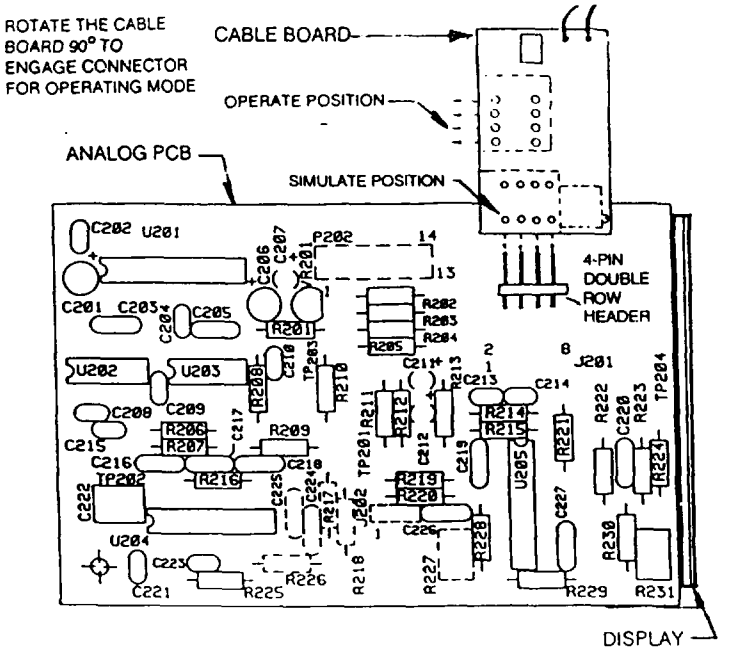


Access to Electronics
Figure 7.1

7.4 Electronics Module Replacement



Removing the electronics module
Figure 7.3



Electrode Cable - Simulate Position
Figure 7.2

Meter electronics are contained in a plug in module. *This module contains no user serviceable parts.*

WARNING: DO NOT REMOVE ELECTRONICS MODULE WHILE POWER IS APPLIED. DISCONNECT POWER BEFORE PROCEEDING

To remove the electronics module, first unplug the electrode cable PCB and the coil cable. See figure 7.1.

Grasp the module at each side and pull firmly while rocking the boards gently from side to side. *Do not pull the module out by the display.*

When re-installing the electronics module, observe the connector in the bottom of the electronics enclosure. Line up the electronics module with the connector. Plug in the replacement module. Plug in coil and electrode PCB's. **Be certain the plug wires are routed properly and will allow you to engage housing cover.**

Apply power and observe display. Now, reprogram any values which were modified from factory preset levels.

7.5 Sensor Testing

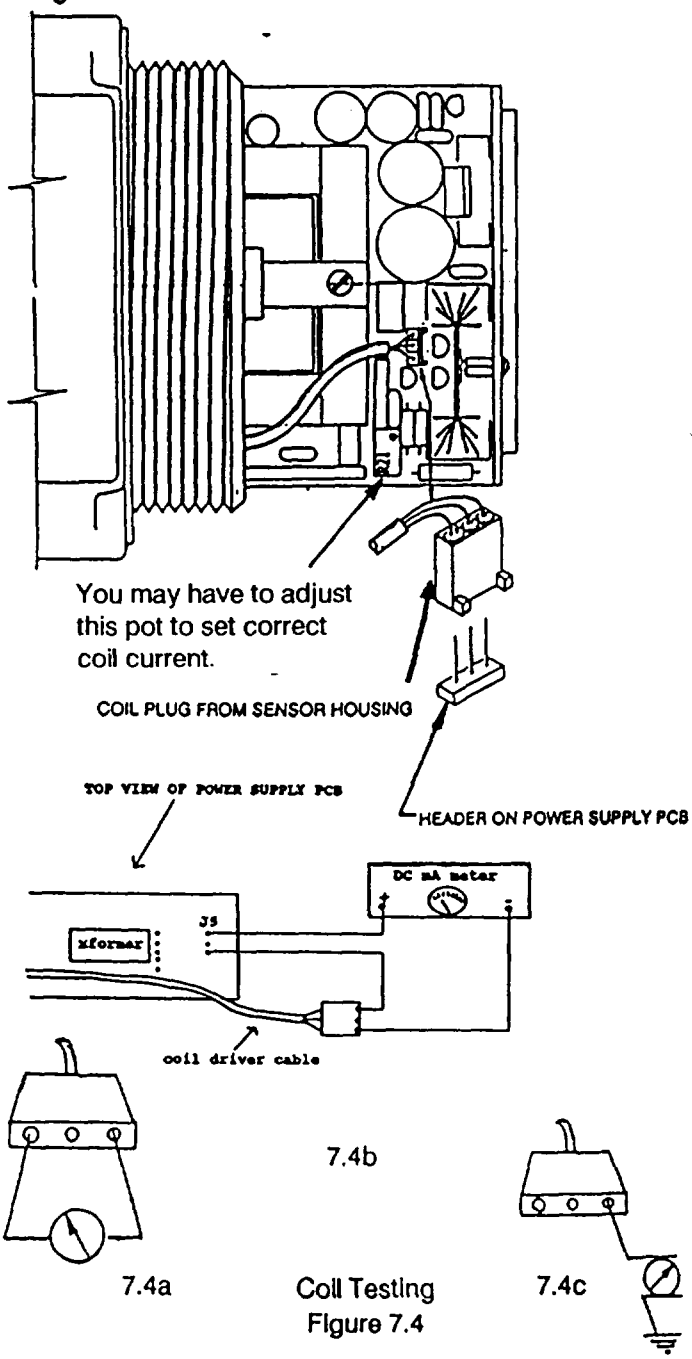
The sensor consists of a measuring section with electrodes and coils in an aluminum enclosure. Defective sensors should be returned to the factory for repair. **OBTAIN A RETURNED GOODS AUTHORIZATION PRIOR TO RETURNING MATERIALS TO PREVENT DELAYS.**

7.6 Coil Continuity Testing

CAUTION

DO NOT MAKE OR BREAK COIL CONNECTION WHILE POWER IS APPLIED. DISCONNECT POWER BEFORE PROCEEDING WITH 7.4a AND 7.4b.

Unplug coil cable PCB. Using a short test lead, connect ohmmeter between coil wires and measure resistance. See Figure 7.4b.



7.4a 7.4b 7.4c

Coil Testing
Figure 7.4

Dia. Inches	Coil Resistance Ohms (±5%)	Power Input (VA)
0.1	270	11
0.25	270	11
0.5	270	11
1.0	270	11
1.5	270	11
2	270	11
3	270	11
4	270	11

If the coil resistance is too high or low (including open and short circuits) the sensor must be returned to the factory for inspection and/or repair.

7.7 Coil Insulation Test

Required test equipment: Insulation tester 10^{10} ohm

Disconnect coil wires, figure 7.4c.

Connect insulation tester between coil wire and housing ground. Test the insulation at 500 V dc. A reading below 10000 meg ohms indicates moisture in the sensor. The sensor must be returned to the factory for inspection and/or repair.

7.8 Electrode Circuit Continuity Test

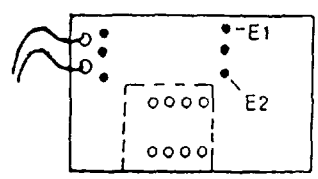
Remove sensor from the pipeline. Drain sensor and dry interior thoroughly.

Unplug coil and electrode cable pcbs.

Connect ohmmeter to E1 (center conductor of one electrode cable) and to the electrodes which are accessible through the open sensor. Use the sensing electrodes which are located opposite each other in the center of the sensor. Do not use the grounding electrodes which are located at the ends of the pipe (0.1" thru 2") or midway between the sensing electrodes (3" & 4").

Measure 0 ohms for one electrode and oo ohms for the other.

Connect ohmmeter to E2 and repeat the above procedure.



Electrode Cable PCB
Figure 7.5

7.9 Electrode Circuit Insulation Test

Unplug coil and electrode cable PCB's.

Connect insulation tester three ways (see figure 7.5.):

1. Between E1 and housing ground.

2. Between E2 and housing ground.

3. Between E1 and E2.

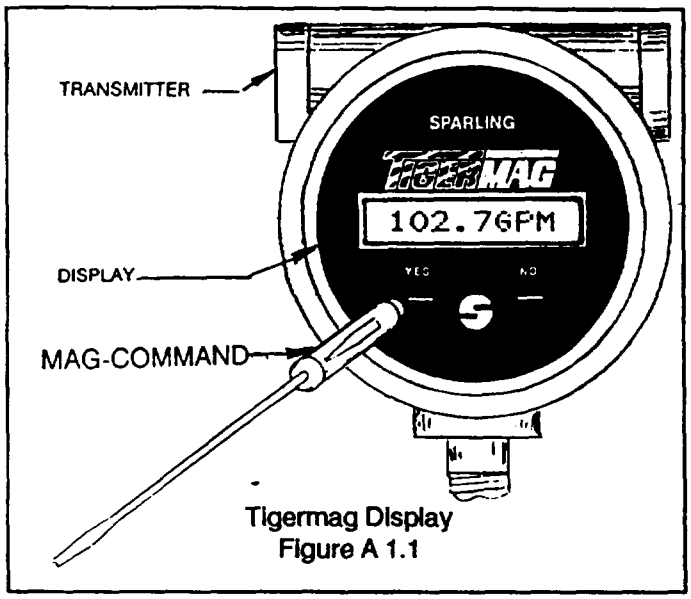
A reading below 1400 meg ohms at 500 V dc indicates moisture in the sensor. Return the sensor to the factory for inspection and repair.

SECTION VIII REPLACEMENT PARTS LIST

		Part Number
1. Electronics Module, complete		549993
2. I/O PCB		549347
3. Fuse, Fast-Blo, PCPI Littelfuse		
230 Vac	0.5 amp	116287
117 Vac	1.0 amp	116295
24 Vdc	2.0 amp	117102
4. Transmitter, remote mount assembly includes:		550203
a) Mounting bracket		
b) Tee mounting standoff		
c) Sensor junction box		
d) 15 ft. cable assembly		
e) Cable grip		
5. Replacement remote mount cable, ft		143967
6. Remote mount PCB		550071

APPENDIX I - PROGRAMMING (Firmware Ver. 5.2)

1.1 General



Tigermag Display
Figure A 1.1

The 16 character alpha-numeric display is located directly above two magnetically operated Hall effect switches. The left switch is labeled "YES" and the right switch is labeled "NO". **THESE SWITCHES ARE THE ONLY CONTROLS YOU WILL USE TO SELECT AND CHANGE PARAMETERS ON THE TIGERMAG.**

The TIGERMAG is configured to the user's installation (programmed) using the MAG-COMMAND magnetic probe furnished with each meter. It can also be programmed with any high strength magnet. (See figure A 1.1). Either switch is activated by momentarily holding the MAG-COMMAND probe close to the switch.

IT IS NOT NECESSARY TO OPEN THE ELECTRONICS COMPARTMENT IN ORDER TO CHANGE PROGRAM SETTINGS.

Refer to figure A 1.2 to determine how to get to each section of the program.

1.2 Entering alphanumeric data

Alphanumeric data is required for the password and to enter or change constants. When data is required, the cursor will be positioned under the first character. A "NO" answer will cause the next valid character to be displayed in turn. A "YES" answer accepts the displayed character or digit and moves the cursor to the next position. After answering "YES" to the last character, you will be prompted with the entire data just entered. Answer "NO" if you wish to change. Answer "YES" when it is correct.

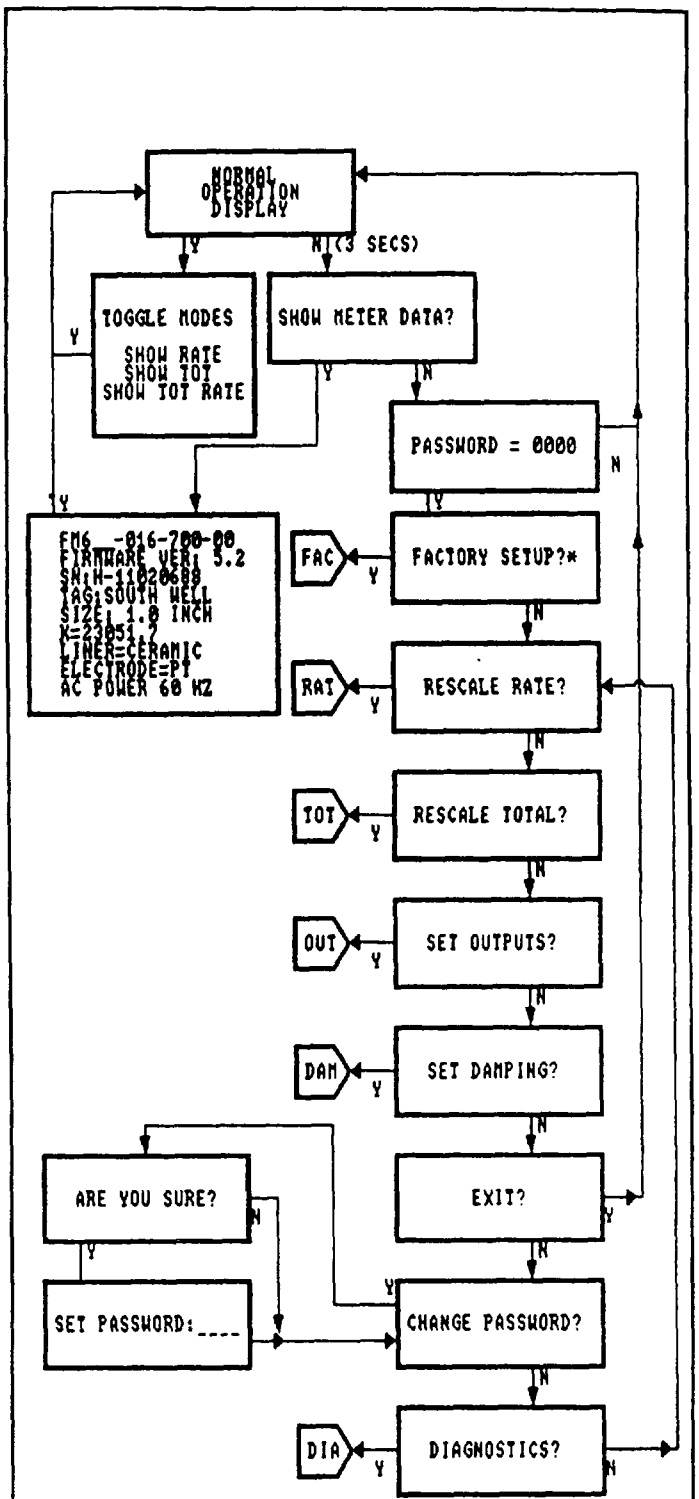


Figure A 1.2
Main Program

In this manual the meter display will be shown in a box like this:

82.3 GPM

1.3 Select Display Mode

Answer "YES" when the meter is in operation to toggle the display modes. A "YES" will change the display from showing flow rate (the default) to showing both rate and total alternately or showing the totalizer counter only.

SHOW TOT

SHOW RATE

SHOW TOT RATE

1.4 Show Meter Data

Hold the MAG-COMMAND next to the "NO" switch for approximately 3 seconds. The meter will respond:

SHOW METER DATA?

a) Answer "YES" and the meter will display the model number, firmware version, serial number,tag number, K factor (pulses/gallon) liner and electrode material . As each data line is displayed a "YES" answer will display the next item. A "NO" answer at any item (or lack of response for 12 seconds) will return the meter to the operating display.

b) A failure to answer this prompt within a few seconds will automatically bring the PASSWORD menu. See Sec. 1.5.

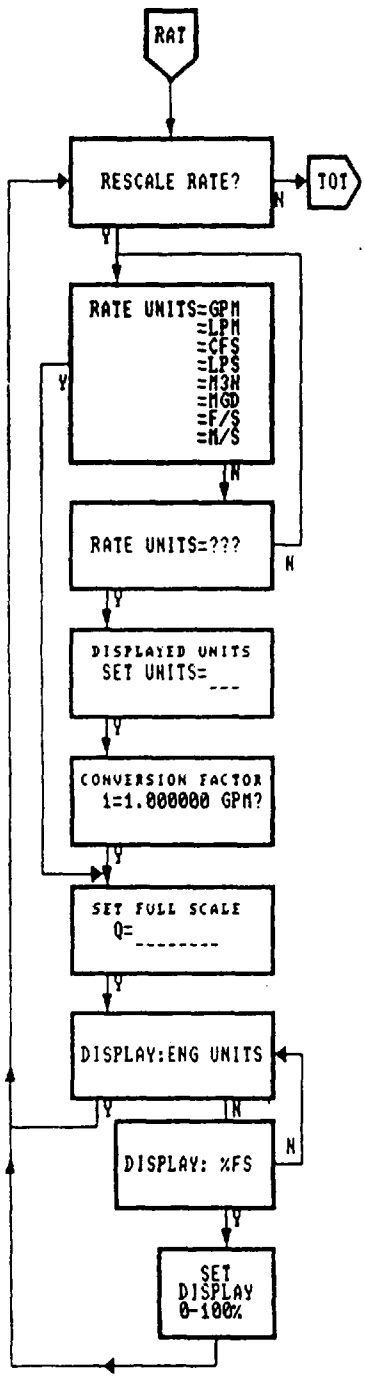
c) Answer "NO" and the PASSWORD prompt appears. A failure to enter a correct password will return the meter to operation.

1.5 Enter Program Loop

PASSWORD=0000

To go beyond this point, a valid password is required. Every meter is shipped with the default password "0001". Any user with a valid password can change the password.

The meter password is entered by responding to each digit of the password with a "YES" or "NO". A "YES" moves the cursor under the next digit to the right.. A "NO" scrolls to the next higher value for the underlined digit and then back to 0 again. The same 12 second time limit applies to each digit selection ie., a lack of response advances the cursor to the next position. Upon entry of a valid password, the meter enters program mode and activates the fault output to signal remotely that programming is taking place.



Rescale Rate Flowchart
Figure A 1.3

1.6 Rescale Rate

RESCALE RATE?

A "YES" answer enters the Rescale Rate loop. A "NO" answer continues to the next menu item.

A menu is presented to select the engineering units in which rate is displayed and scaled. By answering "NO" each menu selection is presented in turn. A "YES" selection selects the unit displayed and moves on to the next item.

1.6.1 Select Rate Units

RATE UNITS = GPM

Answer "YES" if you want the rate displayed in "GPM". Otherwise answer "NO". A "NO" answer will bring the other pre-defined choices in turn ie., liters/min., cu. ft./sec., liters/sec., cubic meters/hour, million gallons/day, ft./sec., meters/sec. and ???. Answer "YES" to the predefined rate units or to "???". A "NO" to each item brings you back to the beginning of the loop. You must answer "YES" to one of the selections to leave the loop.

Select one of the presented units of measure by answering "YES" and skip to Sec. 1.6.2. If no appropriate choice is displayed, select "???" and define your own units in 1.6.1a below.

1.6.1a User defined rate units

RATE UNITS = AAA

Note the cursor under the first A. Select the three alphabetic or numeric characters which you want displayed for your selected rate units by answering "NO" until the correct character is displayed in the current cursor position. A "YES" answer then accepts that character and moves the cursor one position to the right. A "YES" to the last character brings the conversion factor menu.

1.6.1b Conversion Factor

1 = 1.200000 GPM?

The conversion factor is defined as U.S. GPM/user unit. This is interpreted to mean that 1 of your selected units equals 1.2 GPM. Enter the number of GPM which is equal to 1 of your selected units.

Example: To set the conversion factor for gallons per hour, enter the number of gallons per minute which is equal to 1 gallon per hour. In this case, 1/60 GPM = 1 GPH. Enter 1/60 or 0.0166666.

1.6.2 Set Full Scale

The full scale flow rate defines only the flow rate at which the current output is set to 20 mA and at which the frequency output is set to 1000 Hz. It does not affect the display or the accuracy of the frequency or pulse output.

Q = 5.0000000 GPH?

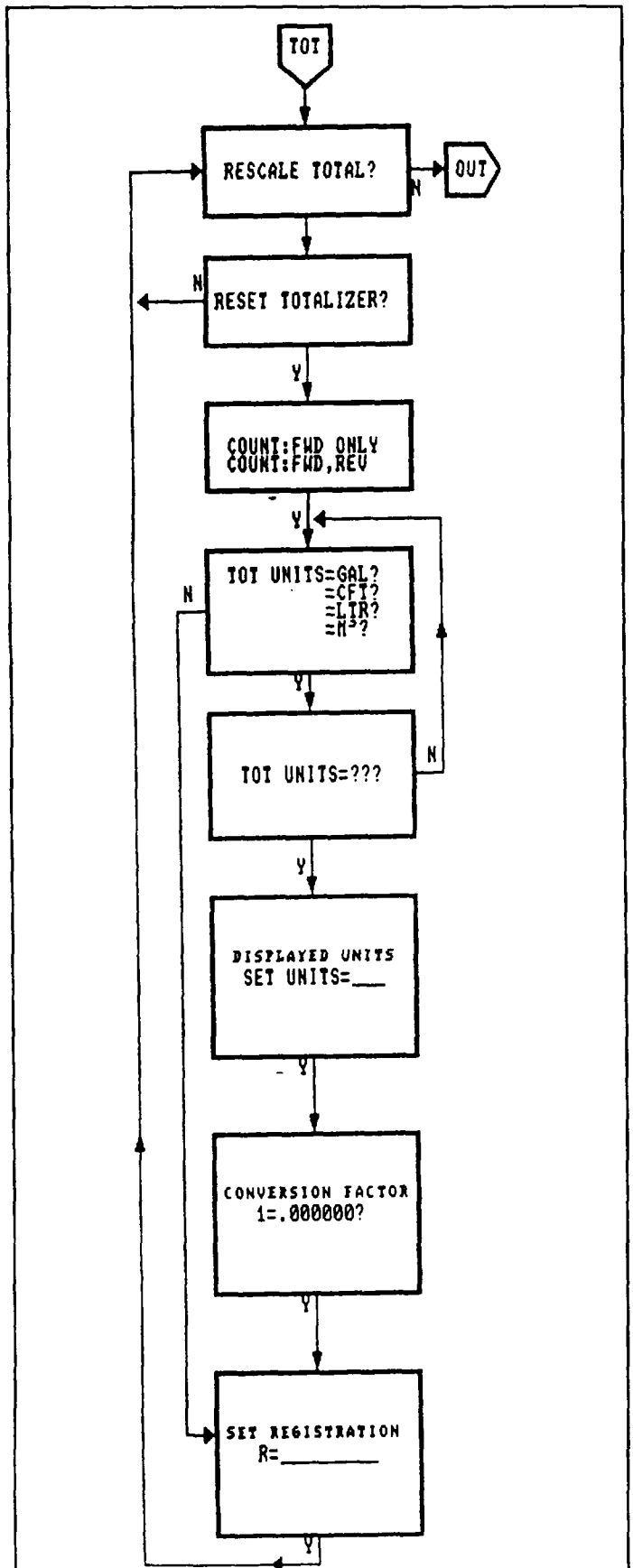
Full scale flow is selected in the units defined in 1.6.1 above. Thus, if "GPH" were defined, full scale would be defined in GPH not GPM. By answering "YES" or "NO" to each digit, you can enter the full scale flow rate. A full scale below 1 FPS or above 33 FPS will receive a warning of "OUT OF RANGE LOW" or "OUT OF RANGE HIGH".

1.6.3 Select Rate as Percent of Full Scale

DISPLAY: RATE UNITS

A "YES" answer will display flow in engineering units as defined in 1.6.2.. "NO" displays rate as a percentage of full scale. Either choice will affect only the format of the display and nothing else.

1.7 Rescale Total



Rescale Total Flow Chart
Figure A 1.4

RESCALE TOTAL

A "YES" answer enters the Rescale Total loop. A "NO" answer continues to the next menu item.

RESET TOTALIZER?

This is a warning that any change of totalizer scaling will automatically reset the internal totalizer(s). A "NO" answer ends this loop.

1.7.0 Count Direction

The internal totalizer can be programmed to totalized in the forward direction only or to totalize separately for forward and reverse.

COUNT: FWD ONLY

Answer "YES" to count in the forward direction only (shown in the "operate" mode as "COUNT= ").

COUNT: FWD,REV

Answer "YES" to have separate internal counters for forward and reverse flow (displayed as "F CNT= " and "R CNT= " respectively.)

1.7.1 Select Total Units

A menu is presented to select the engineering units in which totalization or frequency is displayed and scaled. By answering "NO" each menu selection is presented in turn. A "YES" selection selects the unit displayed and moves on to the next item.

TOT UNITS = GAL

Answer "NO" to view the available pre-defined totalization units. Select "YES" to the preferred engineering units for totalization. One of the options will be ???. This permits the definition of any desired units. A "YES" must be selected to one of the options to exit this loop.

1.7.1a User defined totalizer units

TOT UNITS = AAA

Select the desired 3 character abbreviation as in 1.6.1a above.

1.7.1b Conversion factor

1 = 1.2500000 GAL?

Enter the number of U.S. gallons which is equivalent to 1 of your selected units.

For example, the conversion factor from U.S. Gallons to Imperial Gallons is 1.25 because there are 1.25 U.S. Gallons to each 1 Imperial Gallon.

1.7.2 Set Registration

R= 100.000 GAL?

Enter the number of your engineering units of totalization which is equivalent to one count of the totalizer. This is normally an even number such as 0.1,1, 10, 100, etc. In the above case 100 gallons will produce one totalizer pulse.

1.8 Set Outputs

OUTPUT: 4-20 MA

This permits the selection of 4-20 or 0-20 mA dc outputs. Answer yes to the output desired. Most U.S. installations will use 4-20.

1.8.1 Select Pulse or Frequency

OUTPUT: TOT

This selects the totalizer output of 0-10 Hz 25 ms, 24 V dc. The frequency output of 0-1000 Hz, 50/50 duty cycle is selected by answering "NO" to "OUTPUT: TOT" and "YES" to "OUTPUT: FREQ".

A jumper located on the I/O board under the small cover must be correctly set in the "totalizer" or "frequency" position. Be sure that your connections are properly made for the outputs which you select. (See figure 3.6). Set the jumper in the "open collector position" if an unpowered signal is preferred.

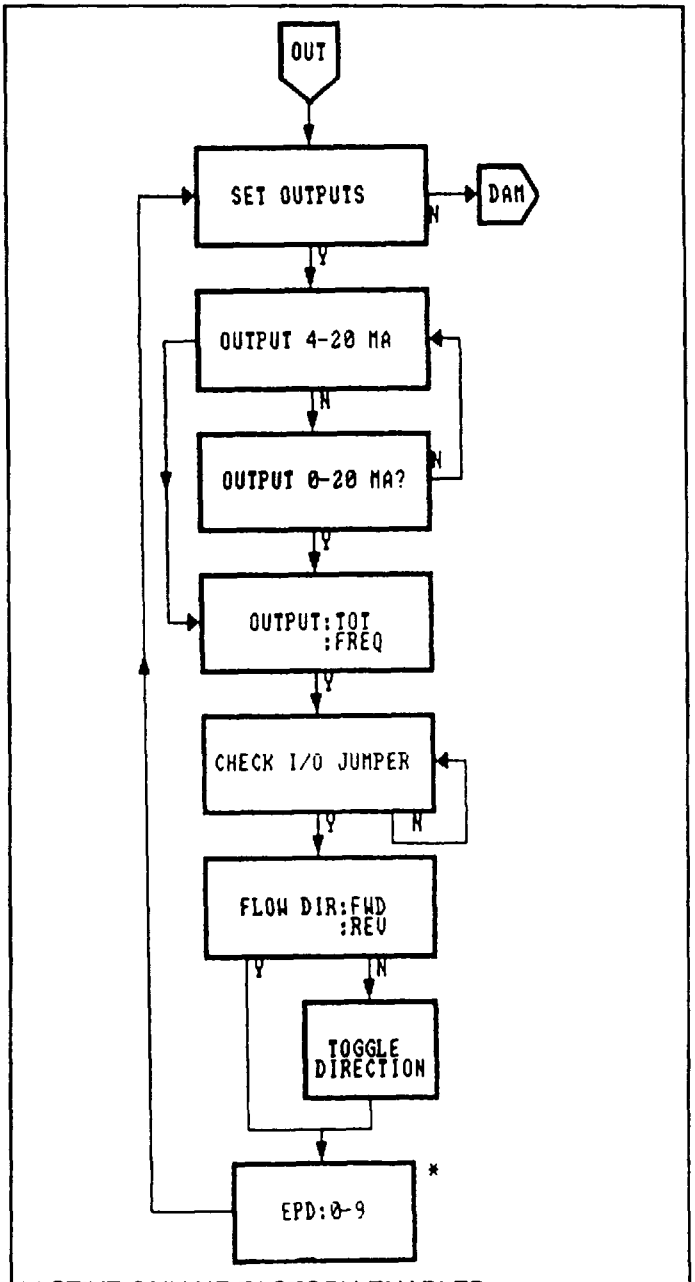
1.8.2 Set flow direction

FLOW DIR: FWD

This allows the user to reverse the normal flow direction. The default flow direction is from left to right as you face the display. If flow is in the opposite direction a minus sign (-) will appear in the display, the flow direction output will be active and the internal totalizer will be inhibited in the count forward direction. Apart from that, the meter will operate prroperly in either direction. Answer "NO" to reverse the normal flow direction. The meter will operate properly in either direction.

1.8.3 Empty Pipe Detection

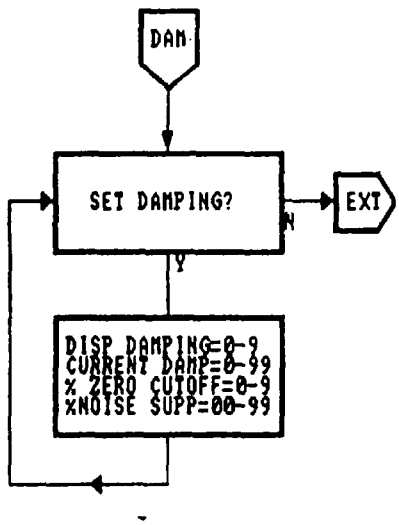
Disabled on default, it must be enabled in the factory. It allows the user to set the EPD control between 0 (= off) and 9 as part of "SET OUTPUTS?" menu. Numerically, this represents approx. delay in seconds before the activation of EPD state (outputs driven to zero, totalizer on hold, message "OUTPUT INHIBITED" on display). Note that EPD setting functions like a "volume" control, with "0" serving as an 'EPD-off' click and "1" thru "9" enabling various levels of detection. Typical setting may fall between 3 and 6, for the customer to select: the lower the number, the higher the possibility of 'false' detection of a single air bubble. Factory setting is "0" (off).



*ACTIVE ONLY IF FACTORY-ENABLED

Set Outputs Flow Chart
Figure A 1.5

1.9 Damping adjustments



Set Damping Flow Chart
Figure A 1.6

SET DAMPING?

Display and current output are damped independently. Answer "YES" to enter this loop.

1.9.1 Display Damping

DISP DAMPING = 5

A "NO" answer scrolls from 0 (no damping) through 9 (maximum damping). Answer "YES" to the desired degree of display damping. Some experimentation may be necessary to obtain optimum results.

1.9.2 Current Damping

CURRENT DAMP = 20

Current damping may be selected from 0 to 99 seconds. This corresponds approximately to the number of seconds to respond 90% of the way to a step change in input.

1.9.3 Low Flow Cutoff

% ZERO CUTOFF = 0

This is the minimum flow rate at below which meter outputs are forced to zero. The number entered corresponds to the selected percentage of full scale. Choices range from 0 (low flow cutoff disabled) through 9%.

1.9.4 Pulp Noise Suppression

NOISE SUPP = 10

This feature provides a method of rejecting noisy signals received at the electrodes. These signals are normally associated with pulp flow such as found in paper processing or in juice processing.

Pulp noise rejection ignores any single flow signal which differs excessively from the preceding signal. As soon as two consecutive signals are received which are within the accepted range, the meter responds to the signal as being a true flow signal.

If pulp noise is encountered, select a suppression amount required to stabilize the signal. The units are the percentage change which is acceptable from one sampling cycle to the next as being a true flow signal. Zero is arbitrarily defined as disabling noise suppression. See Manual section 1.4.3.

2.0 Exit Programming

EXIT?

A "YES" answer stores the changes which have been made and returns the meter to operation. A "NO" goes to the next menu item.

2.1 Change Password

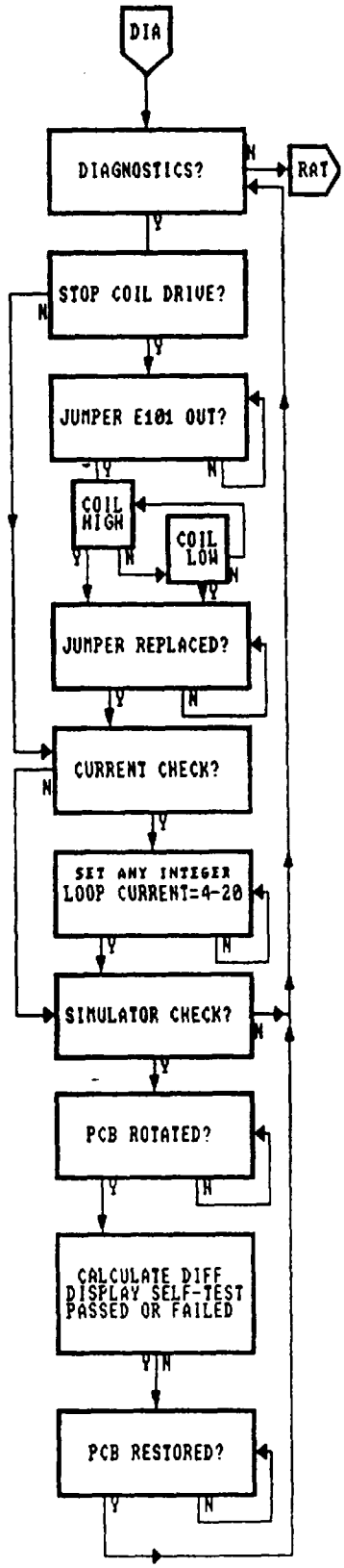
CHANGE PASSWORD?

ARE YOU SURE?

Answer "NO" to return to CHANGE PASSWORD. Answer "NO" again to continue to the next item.

A "YES" answer permits you to change the password by scrolling through the four available digits. Be sure to record your new password. ***If you change the password and fail to record or remember it you will be unable to re-enter the program at a later date.***

2.2 Diagnostics



Diagnostics Flow Chart
Figure A 1.7

DIAGNOSTICS?

Answer "YES" to enter the diagnostics loop. A "NO" answer returns to the RESCALE RATE menu.

It is recommended that you do not perform diagnostics unless malfunction is suspected. Refer to the trouble shooting section for coil and electrode tests which can be performed.

WARNING. The meter will cease to be updated while you are in this loop. Outputs will be held at their last value.

2.2.1 Check coil current. *(Perform this test last)*

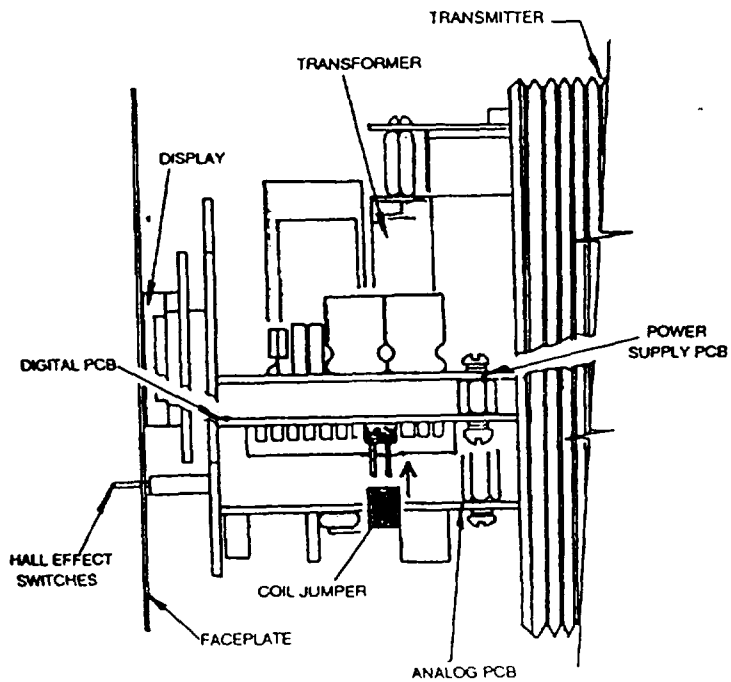
DISCONNECT POWER BEFORE PROCEEDING.

CAUTION: The coil current has been factory set using precision instrumentation. Confirm the accurate calibration of test equipment prior to making any adjustments. ***Improper adjustment will affect meter calibration.***

STOP COIL DRIVE?

A "YES" response enters the simulation mode. the Display reads:

JUMPER E101 OUT?



Coil Jumper
Figure A 1.8

Remove coil jumper. See figure 1.8. Place a digital current meter in series with the coils. See figure 7.4b.

BE SURE TO DISCONNECT POWER FIRST.

COIL=HIGH

Read coil current of 80.00 mA ±0.05 mA.

COIL=LOW

Read coil current of -80.00 mA ±0.05 mA. If necessary adjust pot R21 to achieve the correct current reading.

A "NO" response enters the loop current check mode.

2.2.2 Check Current Loop

LOOP CURRENT = 04

By answering "NO" the loop current can be scrolled up to 20 mA and then back to 4. Answer "YES" at the desired value. Check the 4 mA and 20 mA positions with a digital milliammeter. Each should be accurate within ±0.02 mA.

The current output can also be used to test other equipment in the current loop such as recorders and controllers.

2.2.3 Simulator

SIMULATOR CHECK?

Answer "YES" to enter the self test mode.

PCB ROTATED?

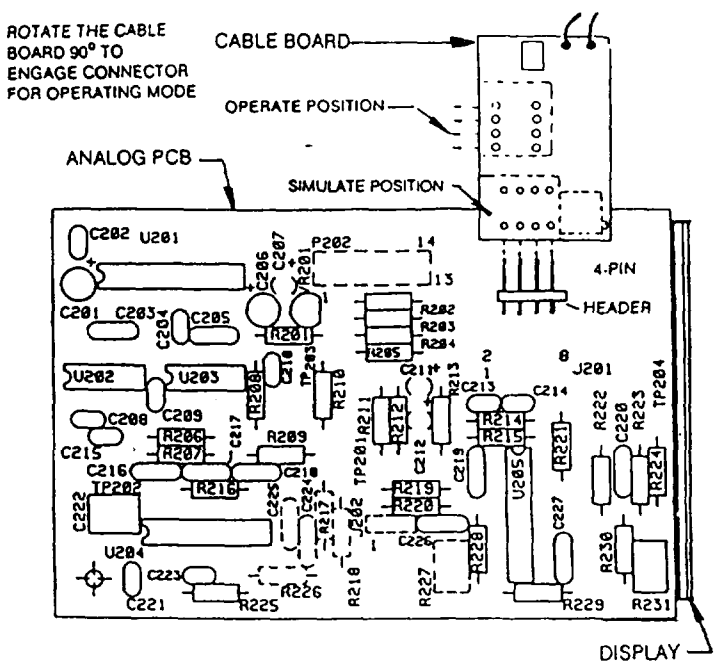
Rotate the electrode PCB to the test position. See figure 1.9. Then answer "YES". The meter will then compare the signal level injected into the meter with the level which was set at the factory.

SELF -TEST PASSED

The electronics are working satisfactorily.

SELF-TEST FAILED

The electronics are not operating accurately. Replace the electronics module. See Section 7.3.



Electrode Cable - Simulate Position

Figure 1.9

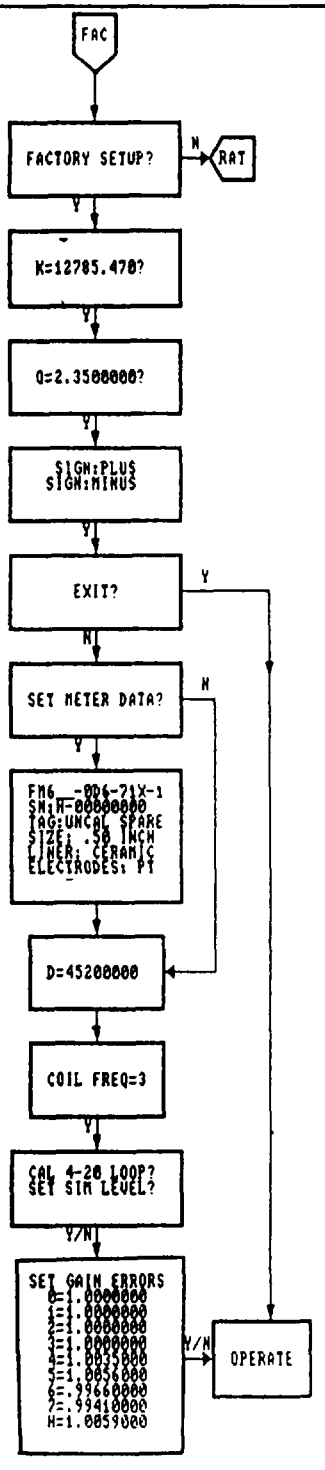
APPENDIX II - FACTORY SET-UP

1.1 General

The Factory Set-up menu is available only on spare electronics modules or on recovery from "CHECK SUM ERROR".

Enter the programming loop as described in Appendix I, 1.1 - 1.5.

1.2 Factory Set-Up



Factory Set-up Flow Chart
Figure A 2.1

In this menu, data is entered which customizes a universal set of electronics to the specific sensor. This is normally a factory function and is done in the field only when spare electronics are stocked in the field or when a "CHECK SUM ERROR" occurs. Replacement electronics from the factory are pre-programmed for your sensor serial number.

1.3 Setting the Calibration Constant "K".

K = 2000.0000 ?

Set "K" to the value stamped on the sensor nameplate.

1.4 Setting the off set

O = 1.0000000 ?

Set "O" (the offset in Hz) to the correct value. The correct value of "O" is located on the Nameplate (SN H - 16000000 and above) and on the meter data printout furnished with each meter. Select proper sign of the offset (+ or -) by replying "YES" to:

Sign: Plus

Sign: Minus

1.5 Exit

When replacing the electronics module, you can exit at this point and the meter will function correctly. *Do not proceed unless recovering from "CHECK SUM ERROR". Any errors made will affect meter accuracy.*

Exit

1.6 Set Meter Data

This permits setting the model number, serial number, tag number, nominal meter size, liner, electrode material, actual diameter (see figure 1.5) and the coil frequency.

Caution: Do not change the tag number at this time. A change will prevent return to factory set-up.

1.7 Cal 4-20 Loop

Answer "YES" and connect an external digital current meter (DMM) to the current output in series with or in place of field wiring.. While display shows "SET 4MA OUTPUT", hold the magnet over the "NO" and watch the current increase on the DMM. As it passes the 3.9 mA mark apply brief magnet strokes to "NO" until the DMM reads 4.00 + 0.05 mA. Reply "YES" to that and to the prompt "OUTPUT = 4 MA?" that follows. A "NO" answer will restart the adjustment. The 20 mA level is set in the same manner.

1.8 Set Sim Level

A "YES" answer resets the stored values used by the simulator to confirm proper meter operation. Answer "YES" if correcting a "CHECK SUM ERROR", otherwise answer "NO".

1.9 Set Gain Errors

Automatic ranging uses 8 gain levels. Each level can be individually trimmed in software to enhance interchangeability of electronics. These gain levels require resetting when recovering from a "CHECK SUM ERROR". Set the gain correction to the data supplied with the meter. Also set "H", a slope correction factor.

When exchanging electronics, do not change these correction factors as the gain errors and "H" relate to the electronics rather than the sensor.

2.0 Finalizing

The meter will return to operation as soon as "H" is set. Return to user programming and set full scale, damping etc. as required.

After confirming proper operation you may disable the factory set-up menu as follows:

Enter Factory Set-up and answer "NO" to each prompt until the display reads

SET METER DATA?

Answer "YES" to enter the SET METER DATA loop. Set through each item until the display reads:

TAG: ~~~ SPARE ~~~~

Answer "NO" to any character to change it. Change the tag so that it no longer contains the word "SPARE."

Caution: When you exit the SET METER DATA loop, you will not have access to the Factory Set-up Menu.

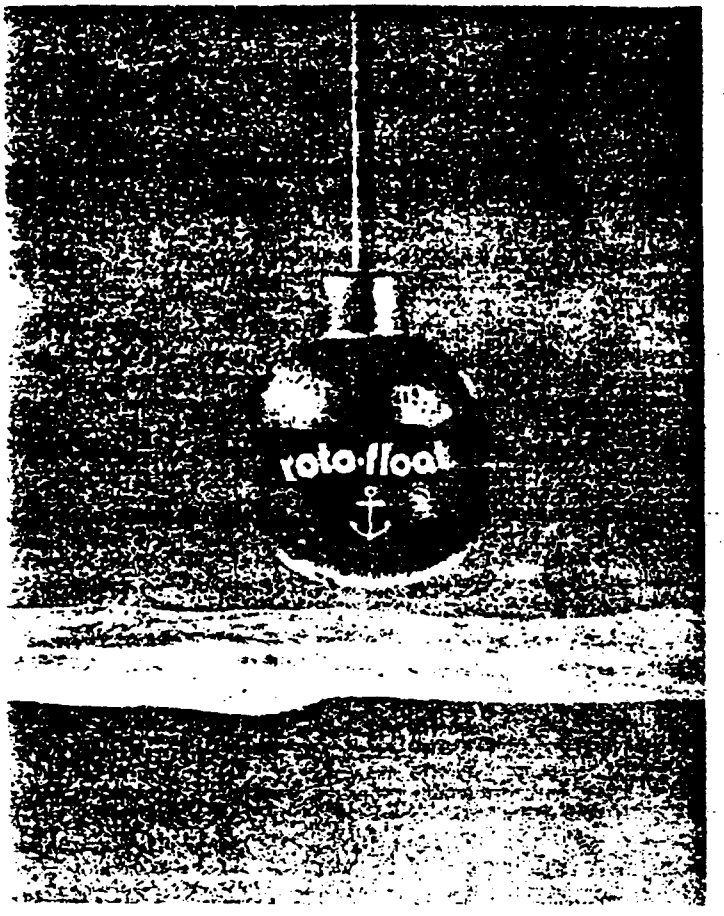
B.3 FLOAT CONTROL SWITCHES

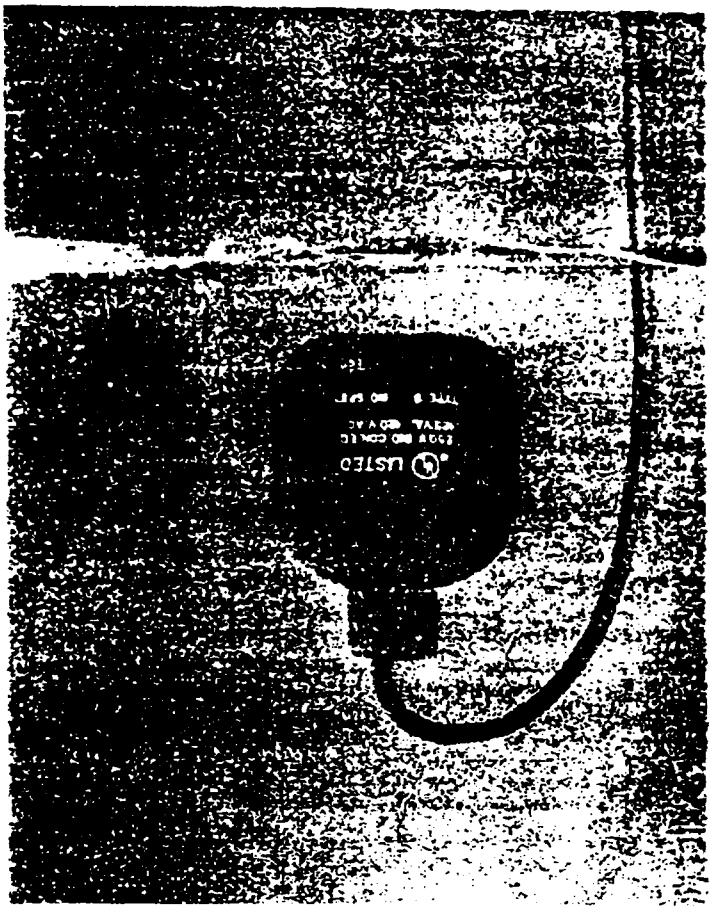
roto-float

Type S - Suspended

Form 2700-A

TYPE S





The ROTO-FLOAT is a direct acting float switch. Each ROTO-FLOAT contains a single pole mercury switch which actuates when the longitudinal axis of the float is horizontal, and deactuates when the liquid level falls 1" below the actuation elevation.

The float is a chemical resistant polypropylene casing with a firmly bonded electrical cable protruding. One end of the cable is permanently connected to the enclosed mercury switch and the entire assembly is encapsulated to form a completely water tight and impact resistant unit. Type S — Suspended has built in weight.

ROTO-FLOATS can be mounted on a support pipe (type P) or suspended from above (type S). Advantages of the ROTO-FLOAT are low cost, simplicity and reliability.

(UL) Listed

- Pilot Duty
- Industrial Control Equipment

CABLE

P.V.C. type STO #18 conductors (41 strand) rated 600 volts • Various lengths available • See table of models • Non-standard lengths also available on special order.

Switch Arrangement	Cable Length	Suspended Type S Model No.	Ship. Wt.
Normally Open	20	S20NO	4#
	30	S30NO	4 1/2#
	40	S40NO	5 1/4#
Normally Closed	20	S20NC	4#
	30	S30NC	4 1/2#
	40	S40NC	5 1/4#

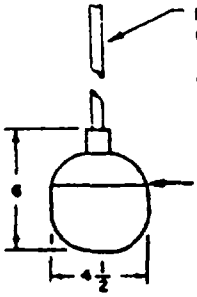
GENERAL DESC

THE ROTO-FLOAT IS A DIRECT ACTING FLOAT SWITCH. EACH ROTO-FLOAT CONTAINS A SINGLE POLE MERCURY SWITCH WHICH ACTUATES WHEN THE LONGITUDINAL AXIS OF THE FLOAT IS HORIZONTAL, AND DEACTUATES WHEN THE LIQUID FALLS 1" BELOW THE ACTUATION ELEVATION.

THE FLOAT IS A CHEMICAL RESISTANT POLPROPYLENE CASING WITH A FIRMLY BONDED ELECTRICAL CABLE PROTRUDING. ONE END OF THE CABLE IS PERMANENTLY CONNECTED TO THE GLASS ENCLOSED MERCURY SWITCH AND THE ENTIRE ASSEMBLY IS ENCAPSULATED TO FORM A COMPLETELY WATER TIGHT AND IMPACT RESISTANT UNIT.

ROTO-FLOATS CAN BE MOUNTED ON A SUPPORT PIPE, (TYPE P); OR SUSPENDED FROM ABOVE, (TYPE S). ADVANTAGES OF THE ROTO-FLOAT ARE LOW COST, SIMPLICITY AND RELIABILITY. VARIOUS CIRCUIT CONFIGURATIONS, OTHER THAN THE ONES LISTED BELOW, ARE AVAILABLE.

SPECIFICATIONS:



PVC TYPE STO, 2 • 18 AWG 41 STRAND 600V, 60°C CONDUCTORS 20', 30', 40' LENGTHS STANDARD. OTHER LENGTHS AVAILABLE. UL & CSA LISTED.

TEMP LIMIT 50°C

POLYPROPYLENE CASING CONTAINS HERMETICALLY SEALED MERCURY SWITCH.

USE: N.O. FOR PUMP OUT
N.C. FOR PUMP IN

- UL LISTED, IND. CONT. EQ.
  PILOT DUTY
  4.5 AMPS 120 VAC
  2.25 AMPS 240 VAC
- FLOAT COLOR
  N.O., BLACK
  N.C., RED
- MOUNTING ARRANGEMENT
  TYPE P - PIPE MOUNTED MODEL INCLUDES POLYPROPYLENE CLAMP

  TYPE S SUSPENDED MODEL WITH STABILIZING WEIGHT

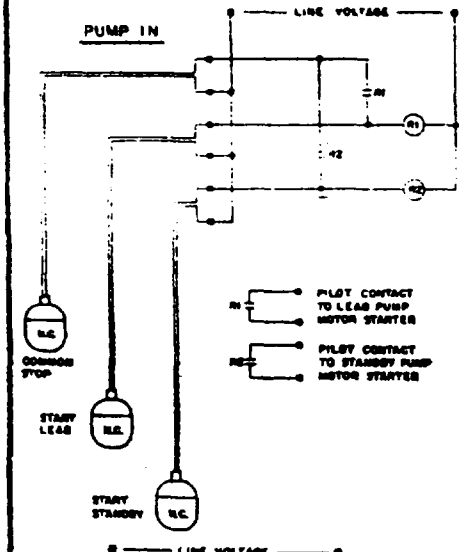
MODELS:

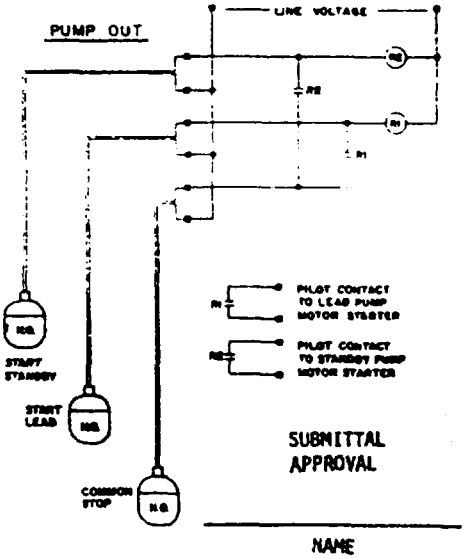
SWITCH ARRANGEMENT	CABLE LENGTH	SUSPENDED TYPE S		PIPE MOUNTED TYPE P	
		MODEL NO.	SHIP WT.	MODEL NO.	SHIP WT.
NORMALLY OPEN	20	S20NO	4•	P20NO	2•
	30	S30NO	4 ½•	P30NO	2 ¾•
	40	S40NO	5 ¼•	P40NO	3 ¼•
NORMALLY CLOSED	20	S20NC	4•	P20NC	2•
	30	S30NC	4 ½•	P30NC	2 ¾•
	40	S40NC	5 ¼•	P40NC	3 ¼•

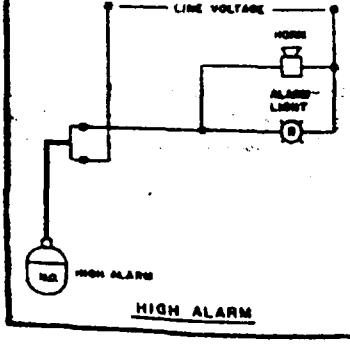
APPLICATIONS:

FOR USE IN CONTROLLING PUMPS OR OTHER MACHINES AND MEASURING ALARM LEVELS IN WATER, SEWAGE AND MANY OTHER LIQUIDS. ROTO-FLOATS MAY BE USED FOR PUMP IN OR PUMP OUT CONTROL, FOR LOW LEVEL CUTOUT, OR FOR LOW AND HIGH LEVEL ALARMS.

TYPICAL 2 PUMP CIRCUITS

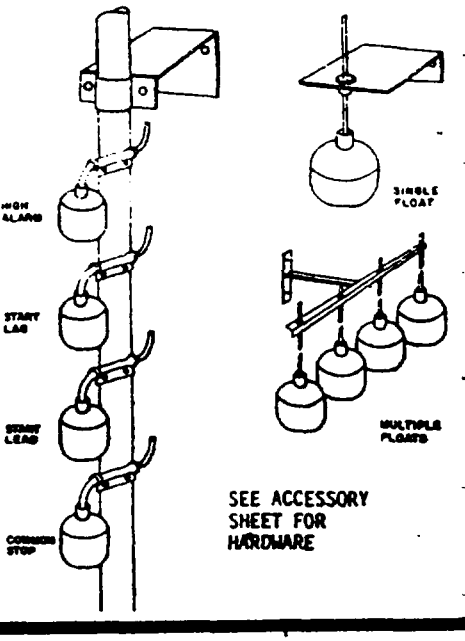






HIGH ALARM

TYPICAL MOUNTING



SEE ACCESSORY SHEET FOR HARDWARE

SUBMITTAL APPROVAL

NAME

DATE

IMPORTANT NOTE: Use in accordance with local electrical code and authority having jurisdiction. Do not use Roto-Floats in gasolines, volatiles or other combustibles.

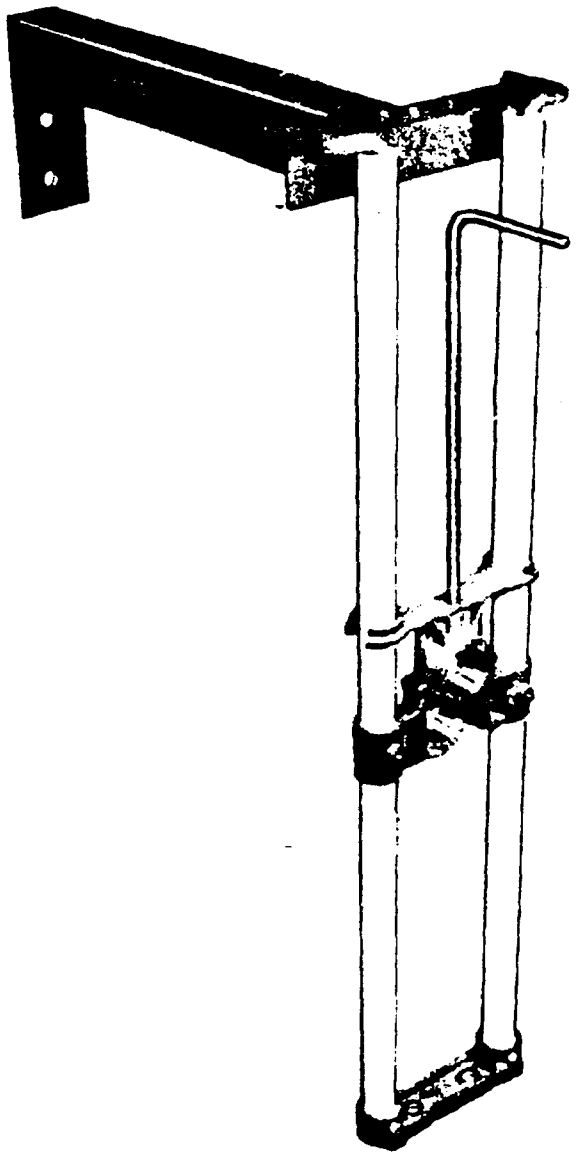
DRWN BY: PD	DATE: 1-9-74
DES BY: JA	DATE: 1-9-74
APPD BY: DS	DATE: 4-30-76
PROJECT NAME: ROTO-FLOAT	
FACTORY ORDER NO.	

gai
Gasvoda & Associates, Inc
1594 Huntington Drive
Calumet City, Illinois 60409
service
parts
(312) 891-4400 24 Hours a day sales

B.4 SLIDE-AWAY COUPLING DEVICES

Slide Away Coupling

SECTION	15
PAGE	39
ISSUED	10/85
SUPERSEDES	2/85



Model

BAF 1-1/4M

A complete system in one carton includes top brackets, moveable and stationary fittings, and bottom rail supports.

This coupling allows the submersible wastewater or effluent pumps to be installed or removed without requiring personnel to enter the wet well.

¾" pipe, plastic, galvanized or stainless steel, should be used for guide rails.

The stationary portion is made of cast brass and locks to the guide rails with stainless steel set screws, and has a funnel top for easy mating with the moveable portion.

The moveable portion is made of cast brass and has a teflon coated O-ring in it to provide a positive leak-proof seal. The moveable portion is provided with a 3/8"-16 tapping for installation of a pull rod if desired.

Specifications

Overall Width	7.0"
Overall Height	4.5"
Overall Depth	2.0"
Guide Rails—Center to Center	5.18"
Travel to Completely Disengage	4.0"
Pressure Rating—Min. P.S.I.	150

Peabody Barnes
651 North Main Street Mansfield Ohio 44902
Phone 419 522-1511

B.5 AIR RELEASE VALVE

UNIVERSAL AIR VALVES

OPERATION

The Universal Air Valve is designed to permit automatic escape of large quantities of air from a pipeline when the line is being filled, and permit air to enter the pipeline when the line is being emptied. It will also allow accumulating air to escape while the line is in operation and under pressure.

Cutaway View A shows the valve in a wide open or empty position. As the liquid rises into the valve, air escapes through the large orifice and into the outer atmosphere. Liquid entering the valve raises the float and lever system, carrying with it the pressure plunger and the main valve. When the liquid has raised the float to its limit (View B), the stainless steel main valve rests against the seat and the pressure plunger also rests against its seat, which is the main valve. In this position, the valve is closed and no liquid can escape.

If accumulating air rises into the valve while the line is in operation and under pressure, it will displace the liquid at the top of the valve body and the float will start to go down as the liquid level drops. As this occurs, the pressure valve will open (View C), permitting the escape of the accumulated air, after which the liquid level will rise and the valve will close.

Should the pipeline be drained through natural processes or a large break develop, the float will drop all the way down as the liquid level sinks in the valve body. The valve will then stand in the full open position (View A) permitting the entrance of air and eliminating danger of pipeline collapse due to vacuum.

These cycles will repeat automatically as each condition presents itself, and the valve will function satisfactorily with hot or cold water, and in the presence of many chemicals and oil base liquids.

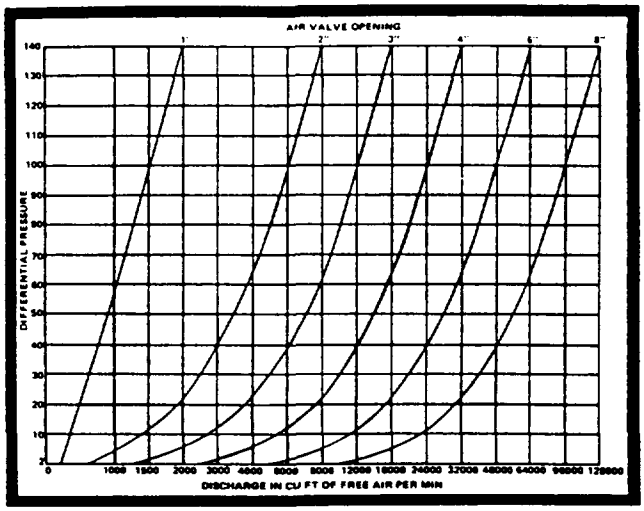
ORIFICE SIZING INFORMATION
FOR 1" VALVE

ORIFICE DIA.	RANGE OF WORKING PRESSURE
3/16"	0 TO 125 LBS.
5/32"	0 TO 200 LBS.
1/8"	0 TO 250 LBS.
3/32"	0 TO 300 LBS.

ORIFICE SIZING INFORMATION
FOR 2"-3"-4"-6" AND 8" VALVES

ORIFICE DIA.	RANGE OF WORKING PRESSURE
1/4"	0 TO 165 LBS.
3/16"	0 TO 250 LBS.
1/8"	0 TO 300 LBS.

PERFORMANCE CHART



PARTS LIST

Part No.	Name	Material
1P*	Protectop	Cast Iron
1S*	Top	Cast Iron
2	Flange	Cast Iron
3*	Body, Screwed	Cast Iron
3F*	Body, 125 lb. Flgd.	Cast Iron
3FH*	Body, 250 lb. Flgd.	Cast Iron
4	A & V Fulcrum	Brass
5 & 16 Assy.		
6	Valve Lever	Brass
7	Link	Brass
8	Ball Lever	Brass
9	Ball Float	Stainless Steel
10	Ball Fulcrum	Brass
11	Plunger	Brass
12	Plunger Nut	Brass
13	Screw	Stainless Steel
14	Pressure Valve	Rubber
15	Pressure Seat	Stainless Steel
16 & 5 Assy.		
17	Seat Cage	Brass
18	A & V Seat	Rubber
19	A & V Limit Stop	Stainless Steel
20	Limit Stop Nut	Stainless Steel
21	Press. Limit Stop	Brass
22	Screw	Stainless Steel
23	Bearing Pin	Brass
23A	Bearing Pin	Brass
24	Bearing Pin	Brass
25	Bearing Pin	Brass
26	Pin Clip	Stainless Steel
26A	Pin Clip	Stainless Steel
27	Screw	Stainless Steel
27A	Screw	Stainless Steel
28	Screw	Stainless Steel
29	Drain Plug	Steel
30	Fulcrum Washer	Fibre
31	Fulcrum Washer	Fibre
32	Flange Gasket	Accopac
33	Flange Bolt	Steel
34	Flange Nut	Steel
35	A & V Fulcrum Nut	Steel
36	Ball Fulcrum Nut	Steel
5 & 16 Assy.	Press. Fulcrum & Cage Base Assy.	Brass

*Parts are interchangeable and optional at customer's request. When ordering repair parts state for use with Universal Air Valve. Give the size of valve, name, and part number along with quantity desired.

NOTE: MATERIALS AND PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

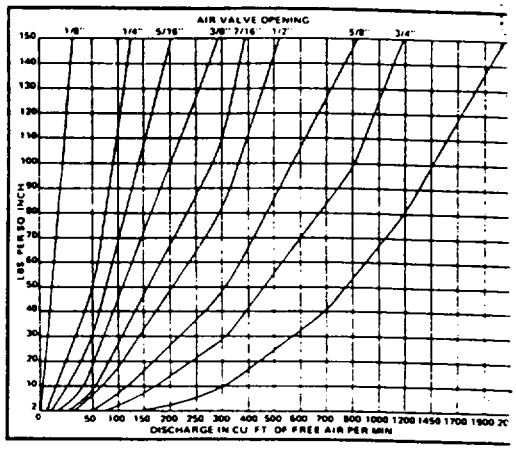
MODEL INFORMATION

Size of Valve	1"	2"	3"	4"	6"	8"
Model No. Screwed Inlet	U10	U20	U30	U40		
125 Flanged Inlet		U21	U31	U41	U61	U81
250 Flanged Inlet		U22	U32	U42	U62	U82

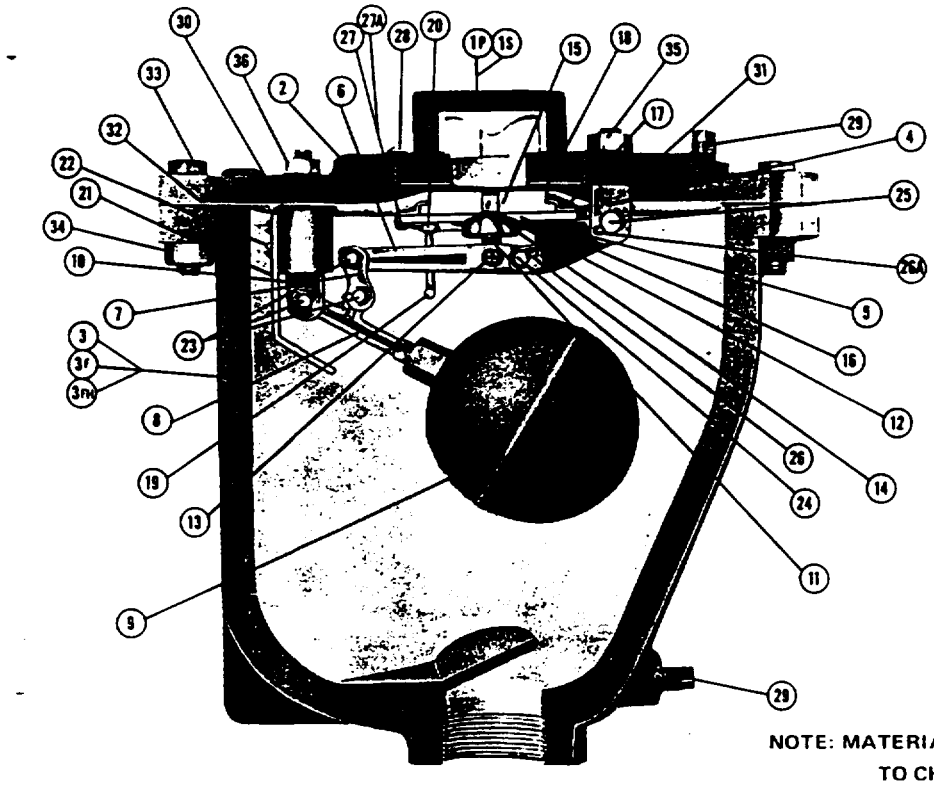
DIMENSION AND WEIGHT INFORMATION

SIZE OF VALVE	1"	2"	3"	4"	6"	8"
WIDTH	6⅞"	8⅜"	10¼"	11¾"	16"	16"
LENGTH	9¾"	12⅜"	14¾"	16¾"	22"	22"
HEIGHT SCWD. CONNECTION	10¼"	13½"	17¼"	20"	—	—
HEIGHT FLGD. CONNECTION	—	15¾"	20⅛"	23"	25⅞"	28½"
WEIGHT SCWD. CONNECTION	27 lbs.	66 lbs.	111 lbs.	163 lbs.	—	—
WEIGHT FLGD. CONNECTION	—	72 lbs.	131 lbs.	180 lbs.	425 lbs.	480 lbs
STANDARD WORKING PRESSURE	125 psi	165 psi	165 psi	165 psi	165 psi	165 psi
STANDARD PRESSURE ORIFICE	3/16"	¼"	¼"	¼"	¼	¼"

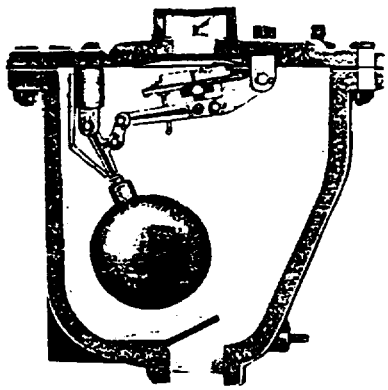
PERFORMANCE CHART



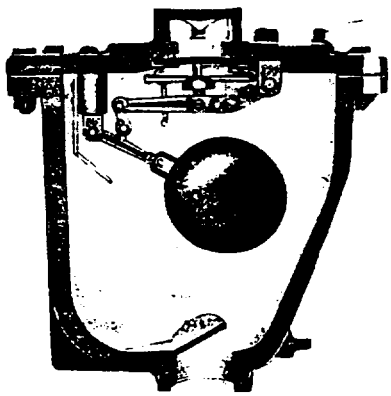
UNIVERSAL AIR VALVES



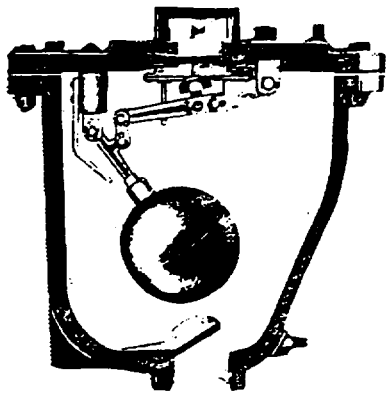
NOTE: MATERIALS AND PRICES SUBJEC
TO CHANGE WITHOUT NOTIC



View A



View B



View C

MULTIPLEX Manufacturing Co.
600 Fowler Ave., P.O. Box 427, BERWICK, PA 18603 / 717-752-45

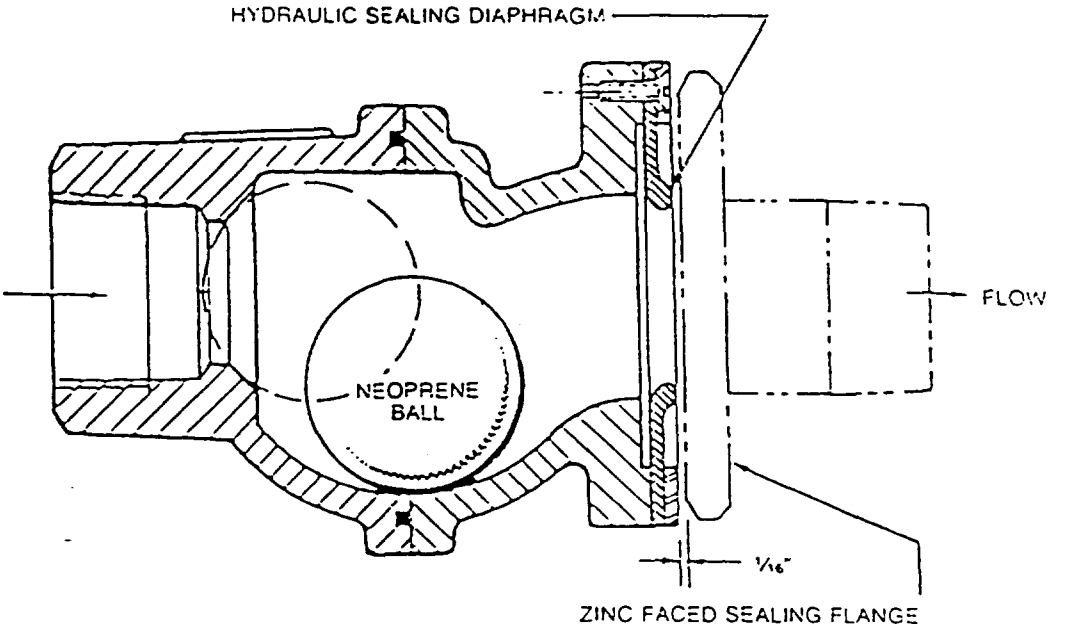
B.6 ISOLATION VALVES

- Swing Check
- Ball
- Gate
- Actuator

AS FURNISHED BY

METROPOLITAN PUMP COMPANY

This is a combination ball check and hydraulic sealing diaphragm in a single housing. The assembly is mounted in a horizontal position in the pump discharge piping and is removed with the pump as a unit for inspection and service. On initial installation, the design clearance between the sealing diaphragm and the sealing flange is 1/16". When the pump starts, discharge water pressure expands the sealing diaphragm, effecting an hydraulic seal between the check valve assembly and the sealing flange. The neoprene ball is non clog, self cleaning, while the pump is running, and is shown in the drawing as a solid line. This allows full flow of the ground slurry.



When the pump stops, the ball check valve will seat as shown in dotted lines, and seal down to a minimum discharge line back pressure of 1-2 psi.

When the pump stops and when the pump is not running the hydraulic sealing diaphragm will maintain contact with the sealing flange down to a minimum downstream line back pressure of 2-3 psi.

Below this pressure, and at negative discharge line pressures the sealing flange shall automatically release and act as an anti-syphon valve, venting the downstream discharge line to atmosphere.

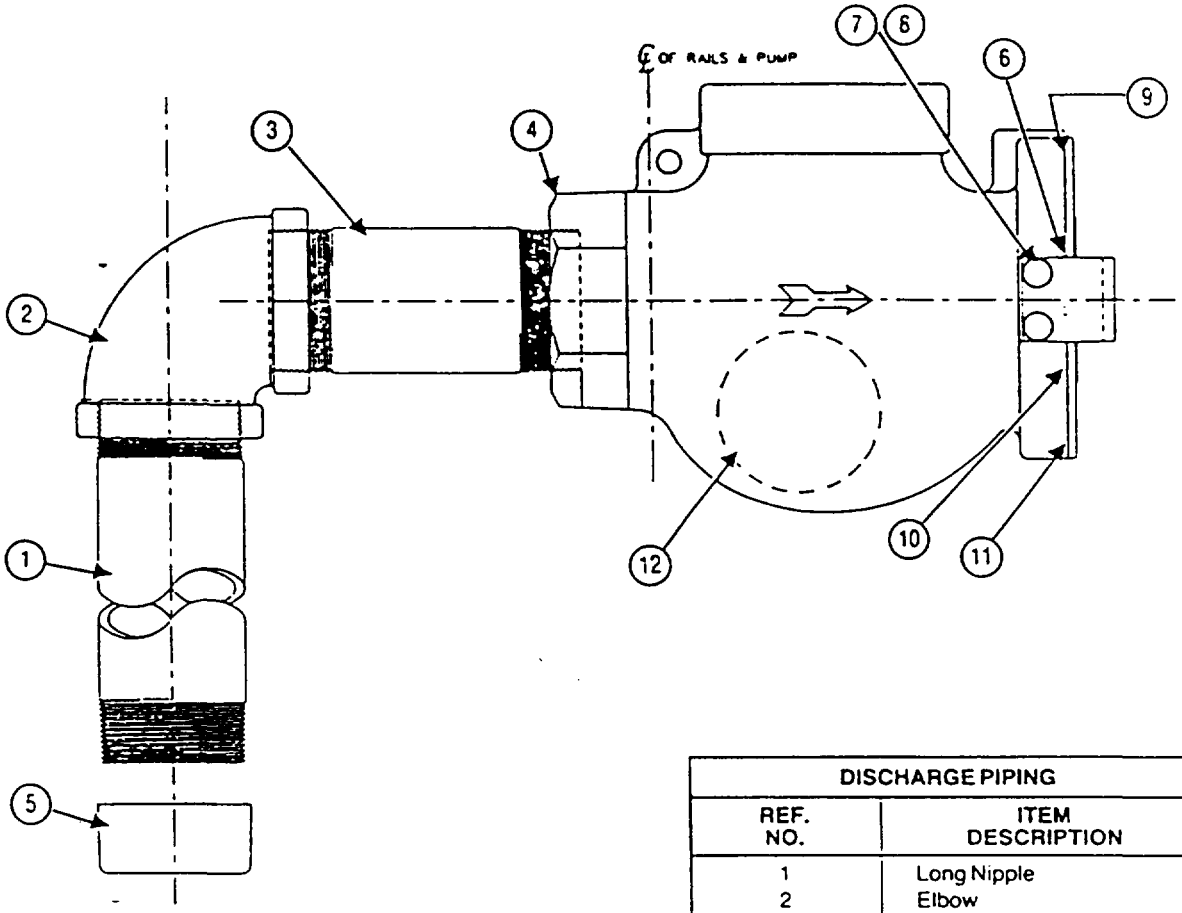
Anti-syphoning is important with grinder pump installations as it prevents an accumulation of solids in the tank. Should this occur there is a much higher possibility of the pump clogging when the pump finally turns on.

CHECK VALVE ASSEMBLY

1400 BLUFF ROAD ROMEOVILLE, IL 60441
(708)972-9400 • (800)323-1665 • FAX(708)972-9594

AS FURNISHED BY

METROPOLITAN PUMP COMPANY



DISCHARGE PIPING	
REF. NO.	ITEM DESCRIPTION
1	Long Nipple
2	Elbow
3	Short Nipple
4	Check Valve
5	Thread Protector

CHECK VALVE (#4)	
REF. NO.	ITEM DESCRIPTION
6	Lug
7	Screw (Holds Lugs)
8	Lock Washer (Holds Lugs)
9	Sealing Diaphragm
10	Ring to Hold Diaphragm
11	Screws to Hold Ring
12	Neoprene Ball

PUMP DISCHARGE PIPING AND CHECK VALVE

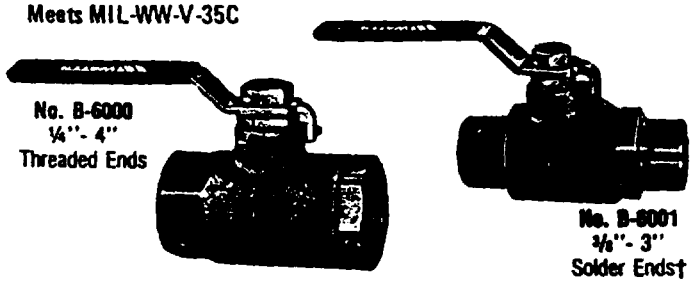
1400 BLUFF ROAD ROMEOVILLE, IL 60441
(708)972-9400 • (800)323-1665 • FAX(708)972-9594

bronze and brass ball valves

Series B-6000, B-6001

2-Piece Bronze, Standard Port
For Residential, Commercial and Industrial Use

Meets MIL-WW-V-35C



No. B-6000
¼"- 4"
Threaded Ends

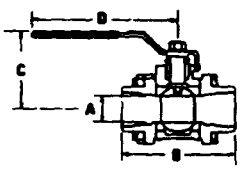
No. B-6001
⅜"- 3"
Solder Ends†

- Glass reinforced Durafill seats standard
- Hard chrome plated brass ball
- Sizes ¼"- 2" pressure rated at 600 psi WOG , 2½"- 4" 400 psi WOG (non-shock) and 150 psi saturated steam
- Adjustable stem packing gland
- Suitable for temperatures from 0°F to +450°F

**Note: 4" size Virgin Teflon seats, max. temp. 350°F.

OPTIONS - Add Suffix:
*GS - Ground washer
*TH - Tee handle
*RH - Round handle - sizes ¼"-2"
*SS - Stainless steel ball and stem
*SH - Stainless steel handle and nut
*XH - Extended handle
*CL - Chain lever kit - sizes ¼"-1"
*BS - Balancing stop
SC - Rough chrome - sizes ¼"- 2"
*04 - Mineral filled TFE seats and seals (available in all 316SS ball and stem option valves)
*Z15 - Less lever and nut

MODELS: B-6000UL
U.L. - Flammable Liquids (YRBX)
U.L. - Compressed Gas (YQNZ)
U.L. - Fire Protection (HNFX)
U.L. - LP Gas (YSDT)
U.L. - Natural/Manufactured Gas (YRPV)
U.L. - for #1/#2 Fuel Oils (MHKZ)



B-6004 - Size ½"- 1" single hose connection. Ideal for applications where flexible hose will be used downstream of valve

DIMENSIONS (Inches) B-6000

Size	A Ball Orifice	B End to End	C Center to Handle	D Radius of Handle	Weight (Lbs.)
¼"	3/8	2 1/16	1 3/4	3 1/16	.58
3/8"	3/8	2 1/16	1 3/4	3 1/16	.60
½"	½	2 3/16	1 3/4	3 3/4	.63
¾"	11/16	2 13/16	2	3 3/4	1.19
1"	7/8	3 7/16	2 5/16	4 1/2	2.13
1¼"	1	3 7/8	2 15/16	5 1/2	3.25
1½"	1¼	4¼	2 15/16	5 1/2	4.13
2"	1½	4 13/16	3 5/8	8 1/8	6.38
2½"	2	4¼	6½	8 1/8	12.75
3"	2½	6 13/16	4½	8 1/8	17.75
**4"	3	7 11/16	5	11	24.94

†B-6001

3/8", ½"	½	2 3/8	1 3/4	3 3/4	.63
¾"	11/16	3 5/16	2	3 3/4	1.13
1"	7/8	3 13/16	2 5/16	4½	1.81
1¼"	1	4½	2 15/16	5 1/2	2.88
1½"	1¼	5	2 15/16	5 1/2	4.25
2"	1½	6¼	3 5/8	8 1/8	6.81
2½"	2	7 5/8	4½	8 1/8	13.00
3"	2½	8 3/16	4½	8 1/8	18.00

†Designed to be soft soldered without disassembly, using a low temperature solder (420°F). Other solders, 95/5 tin antimony (460°F) or 96/4 tin silver (430°F) can be used, however, extreme caution must be used to prevent seat damage. Higher temperature solders will damage the seat material. ANSI B.16.18 stated that the maximum operating pressure of 50/50 solder sweat connections is 200 PSI at 100°F and decreases with higher temperatures.

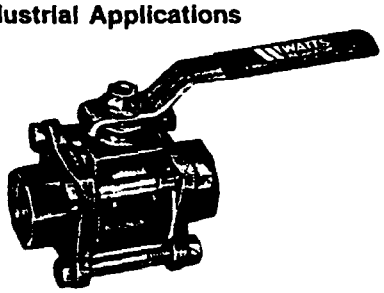
For Additional Information, send for F-B6000.

Series B-6800

3-Piece Brass, Full Port
For Commercial and Industrial Applications

No. B-6800
¼"- 2"
Threaded Ends

No. B-6801
½"- 2"
Solder Ends†



- Three-piece lift-out design is ideal where maintenance is a must.
- High cycle life reinforced TFE stem packing seal and thrust washer.
- Excellent for throttling and balancing applications.
- Individually tested, air under water, opened & closed position
- Sizes ¼"- 1" pressure rated at 600 psi WOG, 1¼"- 2" at 400 psi WOG (non-shock) and 150 psi saturated steam
- Suitable for temperatures from 0°F to +450°F at 50 psi
- Other features same as B-6000

OPTIONS (See * on B-6000 plus LL - Latch-Lok, SE - Safety exhaust)

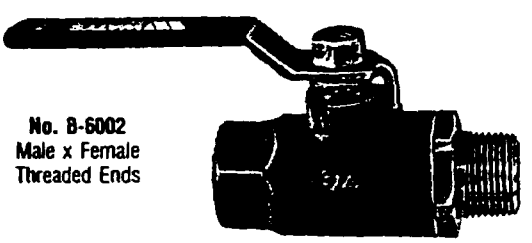
DIMENSIONS (Inches) B-6800

Size	A Ball Orifice	B End to End	C Center to Handle	D Radius of Handle	Weight (Lbs.)
¼", 3/8", ½"	½	2 3/8	1 3/4	3 7/8	1.12
¾"	¾	3¼	2¼	4½	2.50
1"	1	3 7/8	2 3/4	5 1/2	4.12
1¼"	1¼	4½	3	5 1/2	6.25
1½"	1½	5	3½	8 1/8	9.25
2"	2	5 5/8	3 7/8	8 1/8	13.75

For Additional Information, send for ES-B6800.

Series B-6002

Male x Female Bronze, Standard Port
For Industrial Applications



No. B-6002
Male x Female
Threaded Ends

- Same features as B-6000.

OPTIONS: Same as B-6000 except SC, U.L. and OC.

DIMENSIONS (Inches)

Size	A Ball Orifice	B End to End	C Center to Handle	D Radius of Handle	Weight (lbs.)
¼", 3/8"	3/8	2½	1 3/4	3 1/16	.56
½"	½	2 7/8	1 3/4	3 13/16	.69
¾"	11/16	3 7/16	2 1/16	3 13/16	1.25
1"	7/8	4 1/8	2 3/8	4 9/16	2.12

For Additional Information, send for ES-B6002.

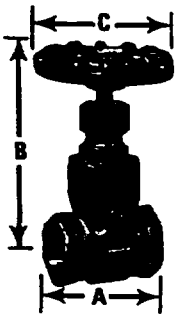
bronze and brass gate valves

Complies with Federal Specification WW-V-54,
Type I, Class A, 85-5-5-5 construction

Series FGV-1

Federal Specification MSS SP-80
Inside screw bonnet, NRS, solid disc

(I)



Designed for continuous service on steam, water, oil and gas in either the open or fully-closed position. They are ideally suited for areas where space is a premium. Virgin PTFE packing and a gland follower. ASTM B62 body, stem and disc. Threaded IPS connections.

Pressure rating: 200 WOG
Steam rating: 125 W.S.P.

No.	Size	Dimensions (Inches) A	B	C	Master Carton Qty.	Weight (lbs.)
FGV-1, FGVS-1*	1/4"	1.66	3.05	1.88	120	60
FGV-1, FGVS-1*	3/8"	1.66	3.05	1.88	120	60
FGV-1, FGVS-1*	1/2"	1.96	3.29	2.44	96	74
FGV-1, FGVS-1*	3/4"	2.05	3.92	2.75	48	62
FGV-1, FGVS-1*	1"	2.48	4.46	2.75	42	74
FGV-1, FGVS-1*	1 1/4"	2.60	5.24	3.35	24	64
FGV-1, FGVS-1*	1 1/2"	2.77	5.59	3.74	15	46
FGV-1, FGVS-1*	2"	2.96	6.38	4.13	10	45

*FGVS-1 solder end connections

For Additional Information, send for F-BBV, GV, CV

Series FGV-UB

Federal Specification MSS SP-80
Union bonnet, rising stem, solid disc

(I)

Designed for continuous service on steam, water, oil and gas in either the open or fully-closed position. They afford free flow with minimum pressure drop. The union bonnet provides for quick valve disassembly for inspection and repair plus it reinforces the body to protect against vibration and pipeline strain. Virgin PTFE packing and a gland follower.

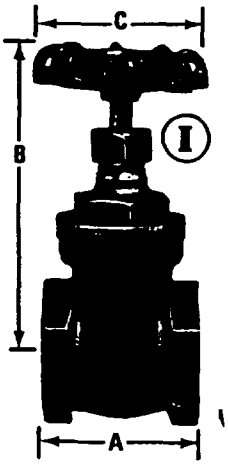
Pressure rating: 300 WOG
Steam rating: 150 W.S.P.

No.	Size	Dimensions (Inches) A	B	C	Master Carton Qty.	Weight (lbs.)
Threaded IPS connections						
FGV-UB	1/4"	1.75	4.13	1.88	120	60
FGV-UB	3/8"	1.75	4.13	1.88	120	60
FGV-UB	1/2"	2.13	5.00	2.44	96	74
FGV-UB	3/4"	2.24	6.10	2.75	48	62
FGV-UB	1"	2.62	7.56	2.75	42	74
FGV-UB	1 1/4"	2.87	8.62	3.35	24	64
FGV-UB	1 1/2"	3.13	10.04	3.74	15	46
FGV-UB	2"	3.52	12.13	4.13	10	45

For Additional Information, send for F-BBV, GV, CV

Series GV, GVS

Bronze Gate Valves
For Water and Steam Service



(I)

Full rating for broad application.
125 WSP, 200 psi WOG.

Series GV have IPS threaded connections in sizes 1/4"- 4".

Series GVS have CxC sweat connections in sizes 3/8"- 3".

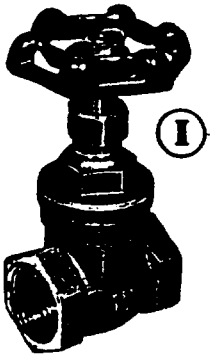
- Screw-in bonnet
- 85-5-5-5 bronze body

Size	DIMENSIONS (Inches) A GV	A GVS	B GV	B GVS	C GV	C GVS	Weight (lbs.) GV	Weight (lbs.) GVS
1/4"	15/8	–	3	–	1 15/16	–	0.62	–
3/8"	15/8	1 3/4	3 3/16	3 3/8	1 15/16	2 1/8	0.62	0.62
1/2"	1 3/4	1 3/4	3 3/8	3 3/8	2 3/16	2 1/8	0.71	0.62
3/4"	1 15/16	2 3/8	3 5/8	3 5/8	2 3/8	2 3/8	0.93	0.88
1"	2 1/8	2 13/16	4 7/16	4 7/16	2 9/16	2 9/16	1.2	1.15
1 1/4"	2 3/8	3	5	5	2 3/4	2 3/4	2.0	1.72
1 1/2"	2 1/2	3 3/8	5 3/8	5 7/16	3 1/8	3 1/8	2.7	1.85
2"	2 7/8	4	6 1/2	6 1/2	3 9/16	3 1/2	3.4	3.53
2 1/2"	3 1/2	4 1/2	8	8 5/16	4 5/16	4 3/8	6.4	5.95
3"	3 15/16	5 3/16	9 3/16	9 3/16	4 15/16	4 15/16	9.3	8.82
4"	4 3/4	–	10 3/4	–	5 3/4	–	18.0	–

For Additional Information, send for F-BBV GV CV.

Series WGV, WGVS

Brass Gate Valves



(I)

Rating: 200 psi WOG

Series WGV have IPS threaded connections in sizes 1/2"- 4".

Series WGVS have CxC sweat connections in sizes 1/2"- 2".

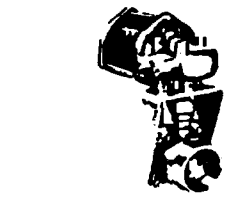
Size (Inches)	DIMENSIONS (Inches) A WGV	A WGVS	B WGV	B WGVS	C WGV	C WGVS	Weight (lbs.) WGV	Weight (lbs.) WGVS
1/2	1 3/4	1 15/16	3	3	2 1/8	2 1/8	.60	.58
3/4	1 15/16	2 1/2	3 1/2	3 1/2	2 1/8	2 1/8	.82	.80
1	2 1/8	2 3/4	4 1/8	4	2 3/8	2 3/8	1.1	1.
1 1/4	2 3/8	3	4 1/2	4 1/2	2 1/2	2 3/4	1.37	1.33
1 1/2	2 3/8	3 1/2	5 3/8	5 1/8	2 3/4	2 3/4	2	2
2	2 13/16	4 1/4	6	6	3 1/4	3 1/4	3	3
2 1/2	3 1/2	—	7 3/4	—	4	—	6.25	—
3	3 7/8	—	8 7/8	—	4 7/16	—	7.75	—
4	4 3/4	—	10 1/2	—	5 1/8	—	13.50	—

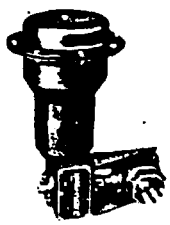
For Additional Information, send for S-WGV.

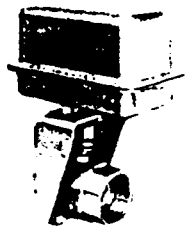
(I) International Product

INTERNATIONAL REPRESENTATION

		Telephone #	Fax #
Trayco Sales, Inc.	P.O. Box 653, Lynnfield, MA 01940	617 334-6078	617 334-2859
W. P. Haney Co., Inc.	51 Norfolk Ave., South Easton, MA 02375	508 238-2030	508 238-8353
E. W. Leonard, Inc.	Ray Palmer Rd., P.O. Box 371, Moodus, CT 06469-0371	203 873-8691	203 873-8693
WMS Sales, Inc.	9580 County Rd., Clarence Center, NY 14032	716 741-9575	716 632-0633
WMS Sales, Inc.	4415 Cindy Lane, Syracuse, NY 13215	315 469-8083	
WMS Sales, Inc.	4 McMillen Place, Delmar, NY 12054	518 475-1017	
Mack-Allied Sales Co., Inc.	1012 Goffle Rd., Hawthorne, NJ 07506	201 423-1101 212 594-1319	201 423-2641
Mack Allied Sales Co., Inc.	95 J. Hoffman Lane, Central Islip, NY 11722	516 348-2550	
Vernon Bitzer Associates, Inc.	138 Railroad Dr., Northhampton Ind. Pk., Ivyland, PA 18974	215 953-1400	215 953-1250
J. B. O'Connor Company, Inc.	120 Union St., Bridgeville, PA 15017	412 221-5300	412 221-4510
Walter E. Harkleroad Sales Agency Inc.	12213 Distribution Way, Beltsville, MD 20705	301 595-4495	301 595-0577
Virginia Marketing Associates	P.O. Box 29, Virginia Beach, VA 23458	804 428-2060	804 428-8129
Virginia Marketing Associates	3396 Londonderry Lane S.W., Roanoke, VA 24018	703 989-6800	703-989-8216
Virginia Marketing Associates	P.O. Box 8891, Richmond, VA 23225	804 272-6345	804-330-7099
Smith & Stevenson	4935 Chastain Ave., Charlotte, NC 28210	704 525-3388	704 527-0539
Central Sales Company	2700 Murfreesboro Rd., Antioch, TN 37013	615 361-4244	615 366-1175
Central Sales Company	2170 York Ave., Memphis, TN 38104	901 278-2251	901 272-1614
Spotswood Parker & Company	6700 Best Friend Rd., Norcross, (Atlanta) GA 30071-2919	404 447-1227	404 263-6899
Distributor Sales of Florida	6520 35th St. North, Pinellas Park, FL 33565	813 527-6651	813 223-2776
Distributor Sales of Florida	311 Kenilworth Ave., Ormond Beach, FL 32074	904 673-4935	
Earl L. Griffin Co.	2776 B.M. Montgomery St., Birmingham, AL 35209	205 879-3469	205 870-5027
Billingsley & Associates, Inc.	2000 Clearview Pkwy. Suite 201, Metairie, LA 70001	504 885-6771	504 885-7516
Billingsley & Associates, Inc.	478 Cheyenne Lane, Madison, MS 39110	601 856-7565	
JLM & Assoc., Inc.	P.O. Box 10301, Caparra Heights Station, Rio Piedras, PR 09922-0301	809 782-4244	809 782-6576
C.T. Rao, Jr., S.E. Reg. Director	126 Stone Lake Ct., Tabb, VA 23602	804 867-9675	
Mid-Continent Marketing Services Ltd.	1724 Armitage Ct., Addison, IL 60101	312 953-1211	312 953-1067
Mid-Continent Marketing Services Ltd.	11424 Whistler Dr., Indianapolis, IN 46229	317 894-3618	317 894-3974
Advance Industrial Marketing Ltd.	923 South Bird St., Sun Prairie, WI 53590	608 837-5005	608 837-2368
Dave Watson Associates	1325 West Beecher, Adrian, MI 49221	517 263-8988	517 263-2328
The Harris-Billings Co.	P.O. Box 41304, 1920 Annapolis Lane North, Plymouth, MN 55441	612 559-9400	612 559-8239
Mack McClain & Associates, Inc.	1537 Ohio St., Des Moines, IA 50314	515 288-0184	515 288-5049
Mack McClain & Associates, Inc.	1438 South 76th St., Omaha, NE 68124	402 397-3688	
Mack McClain & Associates, Inc.	15090 West 116th St., Olathe, KS 66062	913 339-6677	913 339-9518
R. R. Iverson & Associates	4141C South 68th East Ave., Tulsa, OK 74256	918 664-0423	918 664-0425
J. W. Sullivan Company	7901 Manchester Ave., St. Louis, MO 63143	314 644-5454	314 644-5527
Disney-McLane, Inc.	2704 Colerain Ave., Cincinnati, OH 45225	513 541-1682	513 541-0073
Madsen-Bayer & Associates, Inc.	2510 Englewood Dr., Columbus, OH 43219	614 476-1833	614 476-1846
Madsen-Bayer & Associates, Inc.	4640 Warner Rd., Garfield Heights, OH 44125	216 641-5808	216 641-5546
Gary S. Gilpin Sales Co.	4468 Emberson Ave., Louisville, KY 40209	502 367-2178	502 367-9080
Don Sinsabaugh MidWest Reg. Sales Mgr.	42 W 597 Steeple Chase, St. Charles, Ill. 60175	312-377-3671	312 513-5063
R. C. Hartnett & Associates	30852 Huntwood Ave., Hayward, CA 94544	415 471-7200	415 471-4441
Hollabaugh Brothers & Associates	1260 6th Ave. South, Seattle, WA 98134-1308	206 467-0346	206 467-8368
Hollabaugh Brothers & Associates	3028 S.E. 17th Ave., Portland, OR 97202	503 238-0313	503 235-2824
R. E. Fitzpatrick Sales, Inc.	16 East 8th Ave., Midvale, UT 84047	801 566-7156	801 556-4979
Hudson and Lening Sales Co.	2596 W. Barberry Place, Denver, CO 80204	303 623-1186	303 623-8676
Benisek Associates	2267 Yates Ave., Los Angeles, CA 90040	213 685-9900	213 685-3164
R. D. Wager Company.	2012 West 4th St., Tempe, AZ 85281	602 968-8586	602 829-7682
Rocky Mountain Marketing	3300 Princeton N.E., N-27, Albuquerque, NM 87107	505 883-4405	505 881-3767
Hugh M. Cunningham, Inc.	4309 N. Beltwood Pkwy. Dallas, TX 75244-3294	214 661-0222	214 490-6678
Hugh M. Cunningham, Inc.	1999 Kolfahl, Houston, TX 77023	713 923-2371	713 923-8357
Hugh M. Cunningham, Inc.	5130 Service Center, San Antonio, TX 78218	512 661-4161	512 661-0954
Crown Sales	360 Mokauea St., Honolulu, HI 96819	808 845-7881	808 841-4504
Jim Engard, West Reg. Sales Mgr.	749 Renate Way, Paso Robles, CA 93446	805 239-8852	805 239-8859
HDQTRS: Watts Regulator Co./EXPORT	Rte. 114 and Chestnut St., No. Andover, MA 01845 USA	508 688-1811	508 794-1848 508 794-1674
Watts Regulator of Canada Ltd.	441 Hanlan Rd., Woodbridge, Ontario L4L3T1, Canada	416 851-8591	416 851-8788
Walmar	24 Gurdwara Rd., Nepean Ontario K2E 8A2	613 225-9774	613 225-2972
Currie Agencies Ltd.	3468 Bridgeway, Vancouver, BC V5K 1186	604 294-5321	604 294-1612
Polymex Controles Inc.	1375 Boul Charest Ouest, Suite 6, Quebec City, Quebec G1N 2E7	418 682-1690	418 682-8743
Watts Regulator of Canada Ltd.	3179 DeMiniac St., St. Laurent, Quebec H4S 1S9	514 337-9010	514 337-8843
Murray Krovats Sales Agency	1374 Spruce St., Winnipeg, Manitoba R3E 2V7	204 943-2684	204 775-3186
Bayers-Conte Sales Ltd.	1601-10th Ave. Southwest, Calgary, Alberta T3C 0K2	403 244-1818	403 245-9297
W.B. Gingerich Sales Ltd.	107 Hamilton Rd., New Hamburg, Ontario N0B 2G0	519 662-2460	519 662-2491
S.T.E. Fetterly & Son Ltd.	6080 Young St., Ste. 911, Halifax, NS B3K 5L8	902 454-9377	902 454-6085
Watts Regulator of Nederland b.v.	P.O. Box 98, 6960 AB Eerbeek, Holland Telex 35365	(011) 31-8-338-59028	8-338-52073







NELES-JAMESBURY
AMI - 2

Actuator Mounting Instructions

TO MOUNT THESE ACTUATORS:

SL10, EL8, EL20, EJ20, EJX20, EJ50, EJX50, EJ90, EJX90, SERIES B AND C QUADRA-POWR®, ST20, ST50, ST13MS, ST20MS, TORQ HANDLE SERIES A AND B, MA010, PMV, FSRB AND FSRC

ON THESE VALVES:

SERIES 2000 CLINCHER*

Read these entire instructions carefully before installation or servicing.

RECOMMENDED TOOLS	
2 open end wrenches for body bolts	7/16" for 1/4, 3/8, 1/2, 3/4 & 1" 1/2" for 1-1/4" 9/16" for 1-1/2 & 2"
1 open end wrench for stem nut	1/2" for 1/4, 3/8, 1/2 & 3/4" 3/4" for 1 & 1-1/4" 15/16" for 1-1/2 & 2"
1 open end wrench for actuator to bracket screws	7/16"
1 socket wrench for Series C adapter plate	9/16"
1 soft mandrel to fit through ball opening	

DESCRIPTION

These actuator mounting instructions describe the steps required to assemble Jamesbury valves and actuators listed above, using appropriate linkage kits that are available from Jamesbury. The 3/4" and smaller bronze valves must be equipped with stainless trim.

Linkage kits covered in this AMI are shown in Table I.

CAUTION: This table should not be used for sizing actuators to valves. Refer to the Jamesbury general catalog for sizing information.

TABLE I
LINKAGE KIT DESIGNATION ON–OFF SERVICE (NOT FOR ACTUATOR SIZING)

	ACTUATORS	
VALVE SIZE	SL10,ST20,ST50,ST13MS, ST20MS,QUADRA-POWR SERIES B, EL8,EL20,EJ20,EJX20, EJ50,EJX50, TORQ-HANDLE A & B, MA010,PMV,FSRB	EJ90,EJX90 QUADRA-POWR SERIES C, FSRC
1/4", 3/8", 1/2"	LK-499	- -
3/4"	LK-500	- -
1"	LK-501	- -
1-1/4"	LK-502	- -
1-1/2"	LK-503	LK-514
2"	LK-504	LK-515

*For EJ20, EJX20 & EJ50, EJX50 also use LK-505, when manual override is required.

*Bronze Model C, Carbon Steel and Stainless Steel Series 2000 Clincher valves.

WARNING

BEFORE INSTALLING THE VALVE AND ACTUATOR, BE SURE THAT THE INDICATOR POINTER ON TOP OF THE ACTUATOR IS CORRECTLY INDICATING THE VALVE'S POSITION. FAILURE TO ASSEMBLE THESE PRODUCTS TO INDICATE CORRECT VALVE POSITION COULD RESULT IN PERSONAL INJURY.

CAUTION: WHEN INSTALLING A LINKAGE OR SERVICING A VALVE/ACTUATOR ASSEMBLY THE BEST PRACTICE IS TO REMOVE THE ENTIRE ASSEMBLY FROM SERVICE.

CAUTION: AN ACTUATOR SHOULD BE REMOUNTED ON THE VALVE FROM WHICH IT WAS REMOVED. THE ACTUATOR MUST BE READJUSTED FOR PROPER OPEN CLOSE POSITION EACH TIME IT IS REMOUNTED.

CAUTION: THIS LINKAGE HAS BEEN DESIGNED TO SUPPORT THE WEIGHT OF THE JAMESBURY ACTUATORS AND RECOMMENDED ACCESSORIES. USE OF THIS LINKAGE TO SUPPORT ADDITIONAL EQUIPMENT SUCH AS PEOPLE, LADDERS, ETC. MAY RESULT IN THE FAILURE OF THE LINKAGE, VALVE OR ACTUATOR AND MAY CAUSE PERSONAL INJURY.

VALVE PREPARATION
(REFER TO FIGURE 1 & 2)

1. Remove the stem nut (16), lockwasher (9), handle (15) and second stem nut (16). These parts except the handle (15) will no longer be used.

2. Assemble the stem nut (4) from the linkage kit onto the valve stem until the spring washers (10) are compressed flat (use a soft mandrel through the ball to keep the stem from turning.)

   NOTE: When spring washers are not used (monel trim valves) tighten the stem nut (4) until the stem seal is fully seated, then tighten the stem nut (4) an additional 1/4 turn.

3. Remove the four hex nuts (19), the four lockwashers (21), if applicable, and the four body bolts (20). These parts will no longer be used. Do not discard the valve identification tag (22).

4. Rotate the body cap (2) 180 degrees as shown. Be careful not to damage the valve seats and body seal. Replace the body cap (2) back on the body (1) and proceed with the assembly.

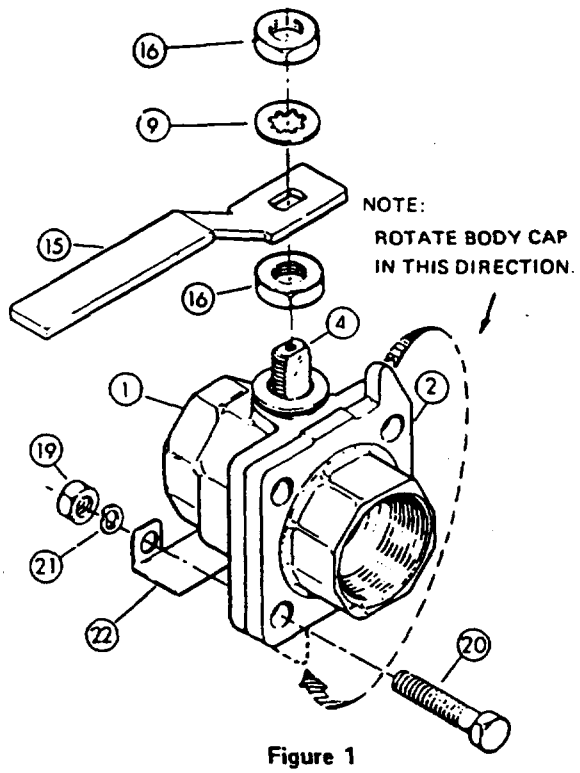


Figure 1

PARTS LIST FOR FIGURE 1		
Item No.	Description	Qty.
1	Body	1
2	Body Cap	1
4	Stem	1
9	Lockwasher (Stem)	1
10	Spring Washer	2
15	Handle	1
16	Stem Nut	2
18	Compression Ring *	1
19	Hex Nut	4
20	Body Bolt	4
21	Lockwasher	4
22	Tag	1
*Not Shown		

ASSEMBLY

(REFER TO FIGURE 2)

1. When a spring return actuator is being mounted, the valve should be in the closed position for spring-to-close operation, or in the open position for the spring-to-open operation. When an electric or double acting pneumatic actuator is being mounted, the valve position should correspond to the actuator indicator call out. (Use the handle (15) to position the valve. Remove the handle (15) and discard.)

2. Place the bracket (1) onto the body cap. The bracket (1) pilots onto the turned diameter of the body cap and may need to be snapped into place.

3. Install the four Grade B7 body bolts (5). Install the valve identification tag (22) that was removed on one of the lower body bolts. Place the four lockwashers (9) and the four hex Grade 2H nuts (8) on the body bolts. Be sure that the material markings on the nuts are on the outside. Snug up the four body bolts (5) and the four hex nuts (8), but do not tighten.

NOTE: Linkage kits are supplied only with Grade B7 body bolts and Grade 2H nuts.

4. Place the coupling (2) onto the valve stem and insert the reducer (3) only if the actuator driver is 3/8 square.

5. a. For mounting EJ20, EJX20, EJ50 and EJX50 ACTUATORS when manual override is required, LINKAGE 201-0505 (LK-505) MUST BE USED IN ADDITION TO THE STANDARD LINKAGE. Place adapter plate (14) on top of the bracket (1).

   b. For mounting SL10, and EL8 when the coupling (2) has excessive movement up and down, place the spacer (13) on top of the coupling (2).

   c. When mounting Series C Quadra-Powr actuators, secure the adapter plate (10) to the actuator using the four hex head cap screws (12) with the four shakeproof washers (11) (See Torque Table IV.)

6. Lower the actuator onto the bracket and valve assembly, carefully inserting the actuator shaft into the coupling (2) and spacer (13) if required.

   a. Secure the actuator to the bracket (1) using the three hex head cap screws (6) or (15) with the three lockwashers (7) (See Torque Table IV.)

7. Visually straighten the actuator over the valve. Using 2 ft. lb. increments, tighten the body bolts (5) alternately in a diagonal pattern, as you would the lug nuts on an auto wheel until the torque shown in Table II is met. DO NOT TIGHTEN ONE NUT COMPLETELY, THEN PROCEED TO THE NEXT.

TABLE II
BODY BOLT TORQUES

SERIES 2000 CLINCHER	
Valve Size	Torque
1/4", 3/8", 1/2", 3/4", 1"	8-10 ft. lbs.
1-1/4"	18-20 ft. lbs.
1-1/2" & 2"	32-35 ft. lbs.

8. Refer to the appropriate actuator IMO for instructions on setting the actuator travel stops or limit switches for proper full-open and full-closed positions. Actuator IMO's are listed in Table III.

9. For proper ball position in the open and closed valve position, use the following procedures.

   a. Valve open position: Allowable misalignment of the ball port in relation to the body port is 1/32" misalignment and 1/16" misalignment for bronze valves.

      NOTE: The seat I.D. should not be used to measure misalignment since, in many cases, the I.D. is larger than the ball and body ports.

   b. Valve closed position: With the valve in the closed position against the stops, make a pencil mark on the ball, as in Fig. 3. Open the valve and measure Dim. "B", the measurement should deviate no more than ± 1/32" of Dim. "B" give in Table V.

TABLE III

Actuator Model	IMO-
SL10	21
ST20, ST50	22
ST13MS, ST20MS	25
Series B & C Quadra-Powr	32
PMV	36
EL20, EJX20	41
EL20	43
EL8	44
EJ50, EJX50, EJ90, EJX90	48
MA010	63
Torq-Handle	71
FSR-B, FSR-C	546

*For copies of any of these IMO's, contact the nearest stocking distributor or write: Jamesbury Corp., 640 Lincoln St., Worcester, Mass. 01605 U.S.A.

TABLE IV
RECOMMENDED FASTENER TORQUES* GRADE 5 BOLTS

Size	Torque
1/4" - 20 UNC	9 ft. lbs.
3/8" - 16 UNC	30 ft. lbs.
*Does not apply to body bolts or stem nuts.	

NOTE:

The SL10 actuator will only mount with its cylinder parallel to the pipe over the body cap side.

To prevent interference between the diaphragm casing and the pipe, Series B Quadra-Powr actuators should be mounted perpendicular to the pipe on 1/4" - 1-1/4" valves. Series C Quadra-Powr actuators should always be mounted perpendicular to the pipe.

All other actuator/valve combinations allow for the actuator to be mounted in any 90 degree position.

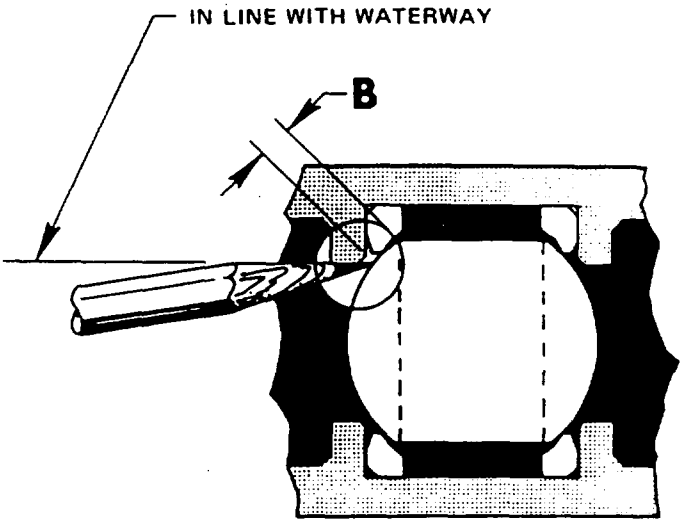


Figure 3

TABLE V

DIMENSION "B" FOR SERIES 2000	
VALVE SIZE	DIM. "B"
1/4-1/2	3/32
3/4	1/8
1	3/16
1-1/4	1/4
1-1/2	1/4
2	9/32

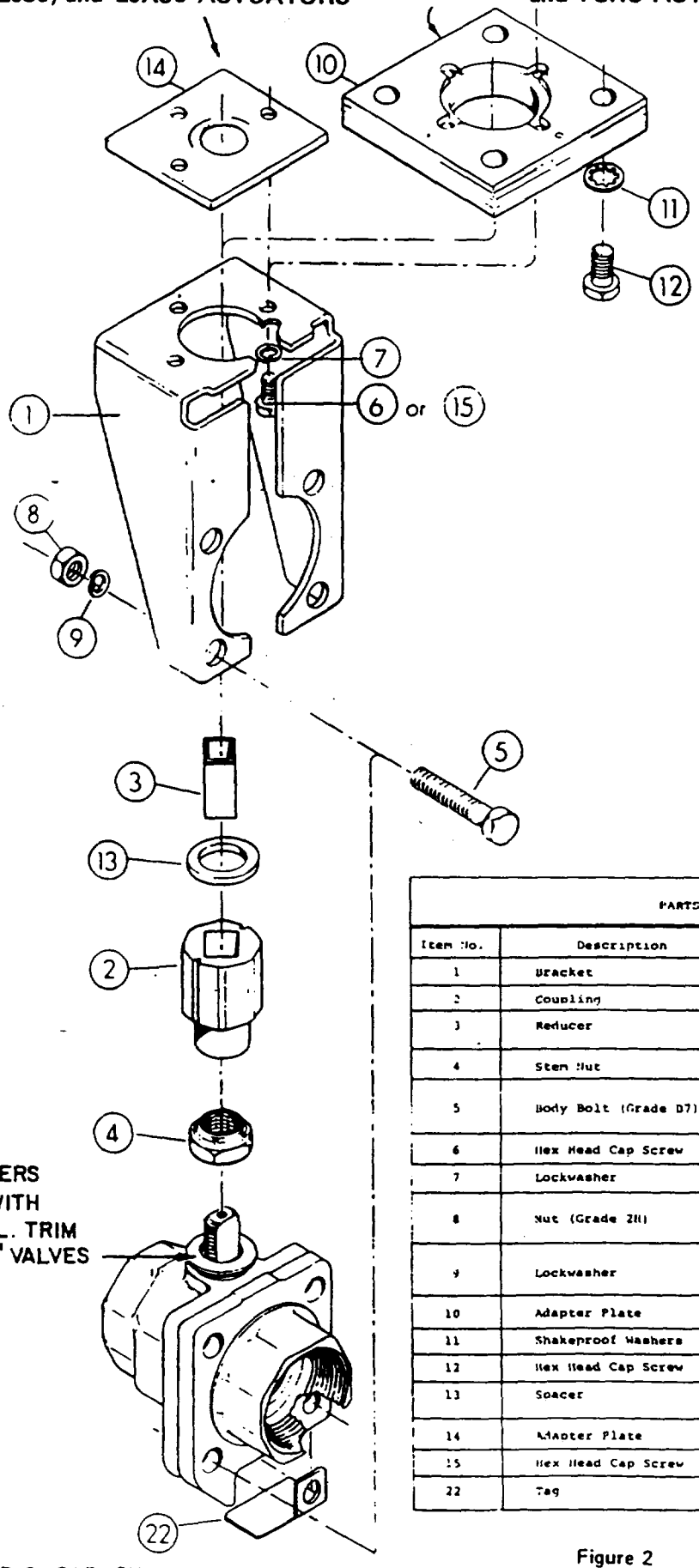
Neles-Jamesbury, Inc.
640 Lincoln Street
Box 15004
Worcester, Massachusetts 01615-0004, U.S.A.

NELES-JAMESBURY

4/90
Phone: (508) 852-0200
Telex: 92-0448
Fax: (508) 852-8172

FOR EJ20, EJX20, EJ50, and EJX50 ACTUATORS

FOR SERIES C QUADRA-POWR, EJ90, EJX90, and FSRC ACTUATORS

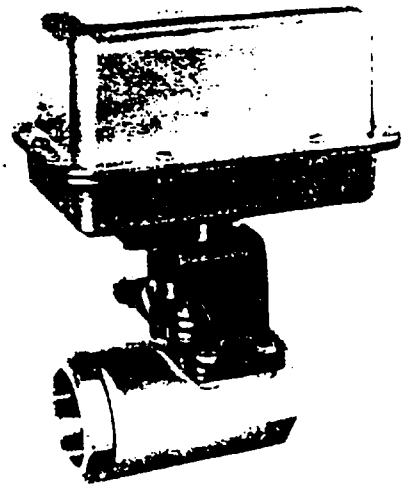


SPRING WASHERS NOT USED WITH MONEL MATL. TRIM ON 1/4"-3/4" VALVES

BRONZE MOD. C, CARBON STEEL, 316 ST. STL.

PARTS LIST FOR FIGURE 2			
Item No.	Description	Qty.	Remarks
1	Bracket	1	
2	Coupling	1	
3	Reducer	1	SL, EL, EJ20 and TORQUE HANDLE Actuators Only
4	Stem Nut	1	Locking Nut
5	Body Bolt (Grade B7)	4	1/4"-1" Valves: 1/4"-20 x 1-1/8" 1-1/4" Valve: 5/16"-18 x 1-1/4" 1-1/2" & 2" Valves: 3/8"-16 x 1-1/4"
6	Hex Head Cap Screw	3	1/4"-20 x 5/8" (Not used with LK-505)
7	Lockwasher	3	1/4" Split
8	Nut (Grade 2H)	4	1/4"-1" Valves: 1/4"-20 1-1/4" Valve: 5/16"-18 1-1/2" & 2" Valves: 3/8"-16
9	Lockwasher	4	1/4"-1" Valves: 1/4" Split 1-1/4" Valve: 5/16" Split 1-1/2" & 2" Valves: 3/8" Split
10	Adapter Plate	1	For Use With Series C Quadra-Powr
11	Shakeproof Washers	4	3/8" Internal Tooth
12	Hex Head Cap Screw	4	3/8"-16 x 5/8"
13	Spacer	1	Used On 1/4"-3/4" Valves Mounted To SL10 & EL8 Actuators
14	Adapter Plate	1	For Use With EJ20, EJX20, EJ50 & EJX50 Actuators
15	Hex Head Cap Screw	3	1/4"-20 x 3/4"
22	Tag	1	Supplied With Valve

Figure 2



NELES-JAMESBURY
IMO - 43

Installation, Maintenance & Operating Instructions

EL20

ELECTRIC ACTUATORS

Read these entire instructions carefully before installation or servicing.

WARNING

1. DISCONNECT POWER BEFORE REMOVING COVER.

CAUTION

WHENEVER AN ACTUATOR IS REMOVED FROM THE VALVE AND THEN REMOUNTED, THE LIMIT SWITCHES MUST BE READJUSTED. SEE ADJUSTMENT SECTION.

WHEN SERVICING A VALVE/ACTUATOR ASSEMBLY, THE BEST PRACTICE IS TO REMOVE THE ENTIRE ASSEMBLY FROM SERVICE.

MOUNTING INSTRUCTIONS

For instructions for mounting the EL20 actuator on various Jamesbury ball valves, refer to the Actuator Mounting Instructions listed in Table I.

TABLE I

ACTUATOR MOUNTING INSTRUCTIONS	
VALVE SIZE AND STYLE	AMI NUMBER
1/4" - 2" A, AF and B	1
1/4" - 2" Clincher	2
1/4" - 2" HP/HT	5
1/2" - 2" 5000 Series	8
3/4" - 1 1/2" 6000 Series	6

For copies of any of these IMO's, contact the nearest Jamesbury stocking distributor or write:

JAMESBURY CORP.
640 Lincoln Street
Worcester, Mass. 01605

ADJUSTMENT INSTRUCTIONS

(Refer to Fig. 1)

1. Remove the cover.
2. Close the valve by applying power to the common and either one or the other directional leads.
3. Adjust the cams as follows:
   a. Loosen set screws (12) in cams.
   b. Turn the lower cam clockwise until switch arm clicks into low spot immediately after high spot.
   c. Tighten the set screw in the lower cam.
   d. Turn upper cam so that center of high spot matches lower cam center of low spot (90° phase shift) and tighten set screws.
   e. Apply power and make fine adjustments if necessary. The lower cam should be adjusted so that the actuator closes the valve completely. The upper cam should be adjusted so that the actuator stops when the hole in the ball is centered within the hole in the valve.
5. Replace the gasket.
6. Replace the cover and fasten with six fillister head screws.

NOTE: Whenever an actuator is removed from the valve and then remounted, the limit switch cams must be readjusted.

INSTALLATION OF OPTIONS

1. Remove the cover.
2. Refer to Fig. 4 for wiring diagram.
3. ES-1 (TWO ADDITIONAL LEAD WIRES) LK-5018 (SEE FIG. 1)
   a. Attach the orange with red stripe lead wire to the free terminal on the lower switch, S1.
   b. Attach the orange with blue stripe lead wire to the free terminal on the upper switch, S2. Route both lead wires through the conduit.

4. ES-5 (ONE EXTRA SPDT SWITCH) LK-5034 (LK-5079 for DC)

   a. Remove the two fillister head screws (7) and two lockwashers (8) holding switches 1 and 2. Refer to Fig. 1.

   b. Place the additional switch insulator on top of switch 2 and the additional switch on top of the insulator. Refer to Fig. 3.

   c. Fasten using the 2 original lockwashers and the 2 longer fillister head screws provided in the option kit.

   d. Lead wires colored yellow and red may be placed on the terminals desired. Route lead wires through the conduit.

   e. Place the third cam on the cam shaft and adjust for desired switch indication.

   f. Switches S1 and S2 may have to be readjusted for proper opening and closing of the valve per ADJUSTMENT INSTRUCTIONS.

5. HEATER AND THERMOSWITCH - LK-5060

   a. Mount the thermoswitch on top of the limit switch using the fillister head screws (7) that hold the switches in place. Refer to Fig. 3.

   b. Place the heater around the inside of the base so that the end of the heater with the lead wires is near the conduit hole. Refer to Fig. 2.

   c. Route one lead wire through the conduit.

   d. Cut the second lead wire to approximately 4" long (save the remaining wire) such that it reaches one of the terminals on the thermoswitch. Assemble a connector and insulator to it and connect it to the thermoswitch.

   e. Assemble a connector and insulator to one end of the remaining wire from Step d and connect it to the remaining thermoswitch terminal. Route it through the conduit.

   f. Bend the tabs on the thermoswitch to approximately 45° toward the center of the actuator to insure clearance for the cover. Refer to Fig. 3.

6. Readjust the switches if necessary per ADJUSTMENT INSTRUCTIONS.

MAINTENANCE

The unit is permanently lubricated at the factory.

Under normal operating conditions the actuator requires only periodic observation to verify proper switch adjustment.

For repair or replacement of limit switches follow the precautions listed in the WARNING Section (Fig. 1).

1. Remove the cover.

2. Remove the lead wires from the switch to be repaired.

3. Remove the fillister head screws (7) and lockwashers (8) holding the switches and remove the affected switch.

4. Reassemble in reverse order and readjust per ADJUSTMENT INSTRUCTIONS. Refer to Fig. 4 for wiring diagram.

NOTE: The unit is thermally protected. If unit will not run, allow to cool before operating.

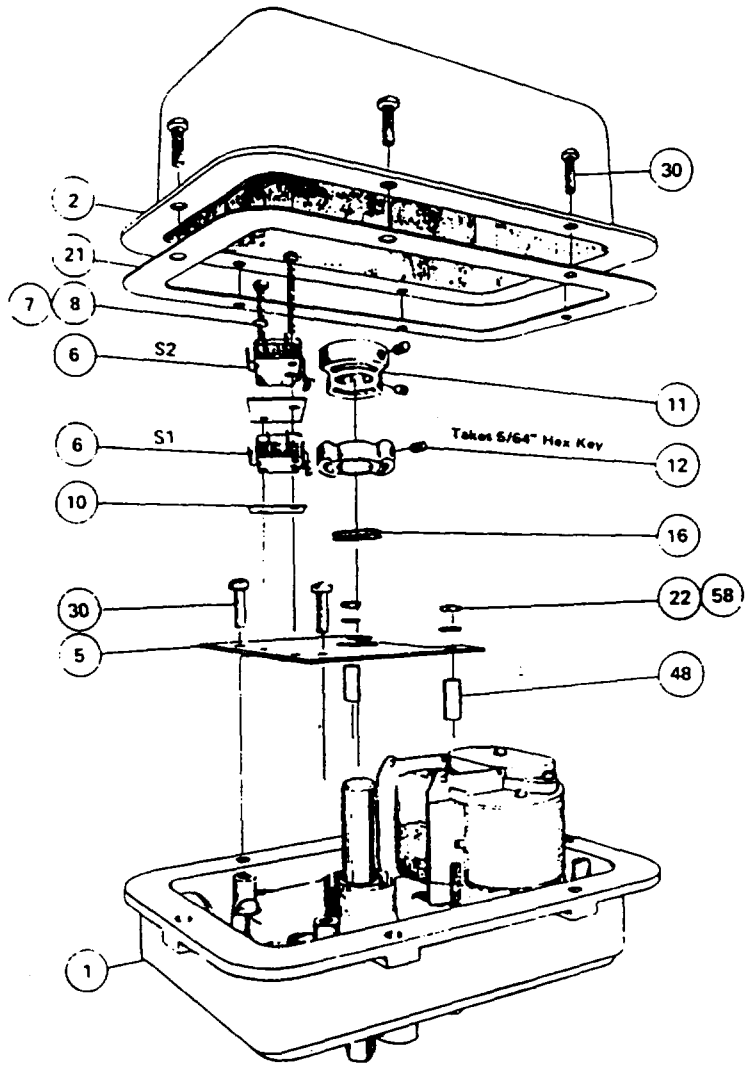


Figure 1

ITEM NO.	NO. REQD.	PART NAME
1	1	Gear Motor Base
2	1	Cover
5	1	Switch Bracket sub-assembly
6	2	Switch
7	2	Cap Screw
8	2	Lockwasher
10	2	Switch Insulator
11	2	Cam
12	4	Set Screw
16	1	Bearing
21	1	Gasket
22	2	Lockwasher
30	8	Cap Screw
48	2	Stand off Spacer
58	2	Nut (hex)

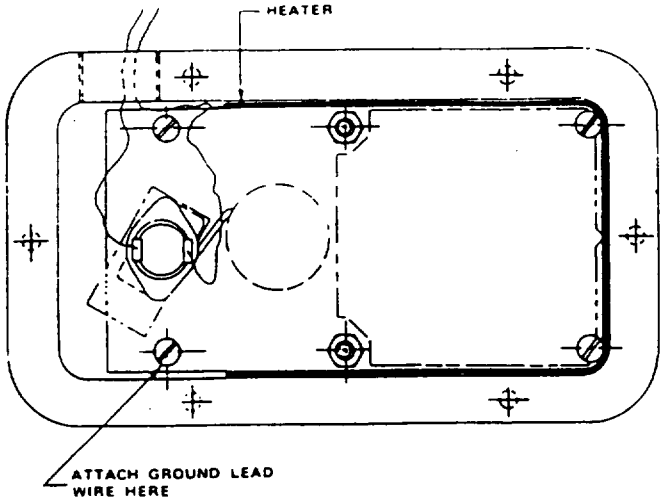


Figure 2

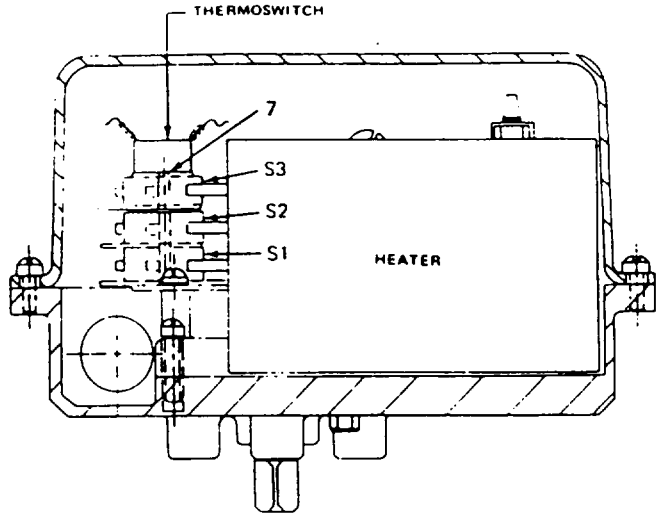
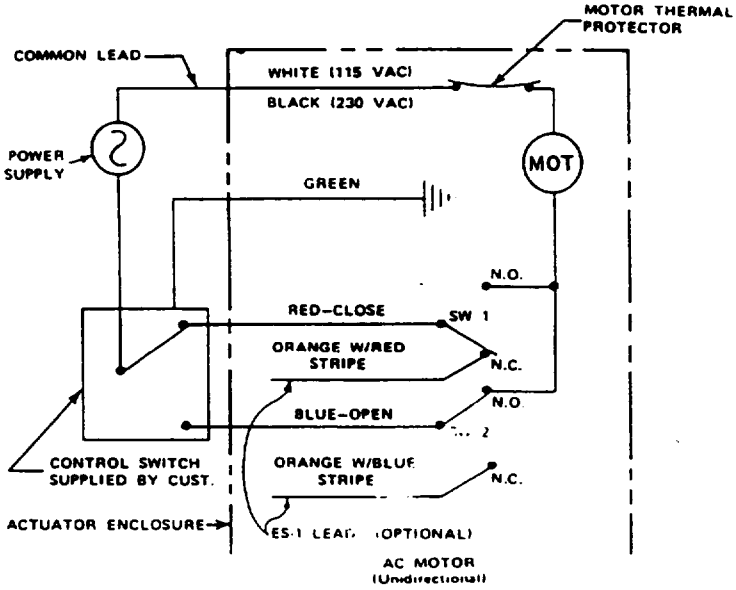
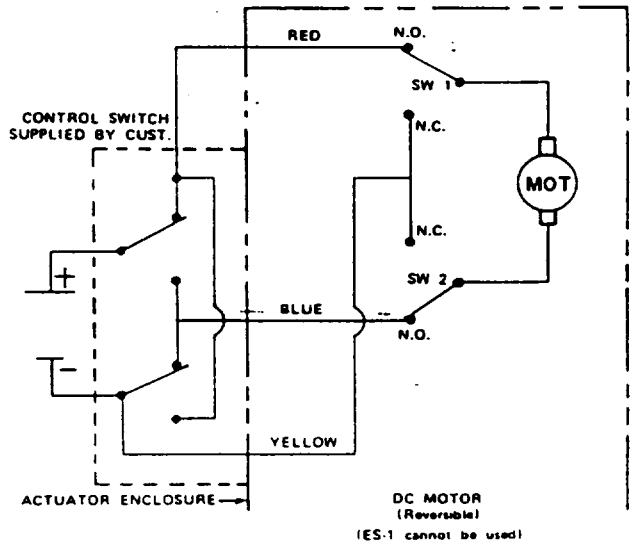
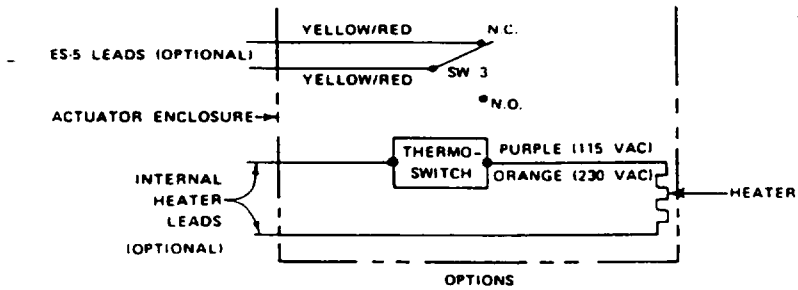


Figure 3







ELECTRIC RATING OF ES-1 AND ES-5 IN AMPERES

125 & 250 VAC	15
125 VDC	0.5
250 VDC	0.25

WIRING DIAGRAM

(ACTUATOR SHOWN IN THE CLOSED POSITION)

Figure 4

B.7 PRESSURE GAUGE

PRESSURE

Ametek/U.S. Gauge
General Purpose Steel Case Gauges

P500 & V500

For general use wherever stem mounting is desirable and the pressure medium is non-corrosive to brass, phosphor, bronze or beryllium copper. Applications include air, oil, gas and water services.

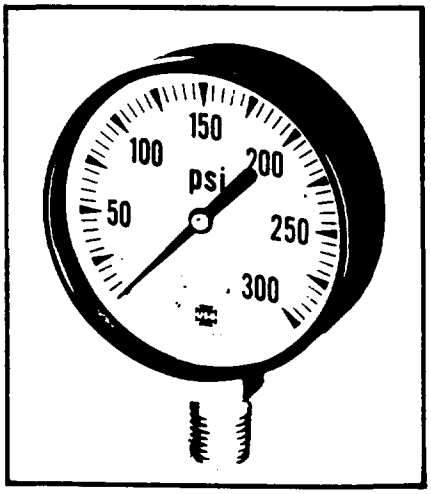
Ranges:
0-30" Hg Vac. through 0-5000 psi including pressure and vacuum.

Bourdon Tube:
phosphor bronze to 1000 psi; beryllium copper above 1000 psi.

Sizes:
2", 2½", 3½"

Mounting:
¼" NPT brass stem mount (LM) or center back mount (CBM).

Accuracy:
± 3 - 2 - 3% of span



P500 2" dial LM

ORDER NO.	RANGE PSI/kPA	PRICE
USG-143668	15/100	$12.25
USG-142642	30/200	8.30
USG-143251	60/400	8.30
USG-142643	100/700	8.30
USG-143252	160/1100	8.30
USG-142644	200/1400	8.30
USG-143648	300/2100	8.30
USG-143674	400/2800	10.70
USG-143675	600/4000	10.70
USG-144161	1000/7000	15.75

V500 2" dial LM

ORDER NO.	RANGE Hg/kPA	PRICE
USG-143659	30" Hg./-100	$12.25

P500 2½" dial LM

ORDER NO.	RANGE PSI/kPA	PRICE
USG-142597	15/100	$13.85
USG-142593	30/200	10.10
USG-142594	60/400	10.10
USG-142595	100/700	10.10
USG-142647	160/1100	10.10
USG-142596	200/1400	10.10
USG-142598	300/2100	10.10
USG-142599	400/2800	12.25
USG-142600	600/4000	12.25
USG-143676	1000/7000	18.25
USG-143677	2000/14,000	27.40
USG-143678	3000/21,000	27.40
USG-143679	5000/35,000	37.15

V500 2½" dial LM

ORDER NO.	RANGE PSI/kPA	PRICE
USG-143660	30" Hg/-100	$13.85

P500 3½" dial LM

ORDER NO.	RANGE PSI/kPA	PRICE
USG-143656	15/100	$19.50
USG-142649	30/200	17.15
USG-142650	60/400	17.15
USG-142651	100/700	17.15
USG-143657	160/1100	17.15
USG-142652	200/1400	17.15
USG-142653	300/2100	17.15
USG-143682	400/2800	17.15
USG-143683	600/4000	17.15
USG-143684	1000/7000	22.20

P500 2" dial CBM

ORDER NO.	RANGE PSI/kPA	PRICE
USG-144183	15/100	$14.50
USG-142645	30/200	13.55
USG-142646	60/400	13.55
USG-144188	100/700	13.55
USG-144189	160/1100	13.55
USG-143655	200/1400	13.55
USG-144115	300/2100	13.55
USG-144192	600/4000	13.55

NOTE: For 1½" or 4½" dial sizes and ⅛" LM or 2½" CBM mount, contact your nearest Brian Controls office.

B.8 SUMP CHAMBERS AND ACCESS COVERS

(815) 726-3351
(815) 726-7661
(815) 726-2163

Concrete Products

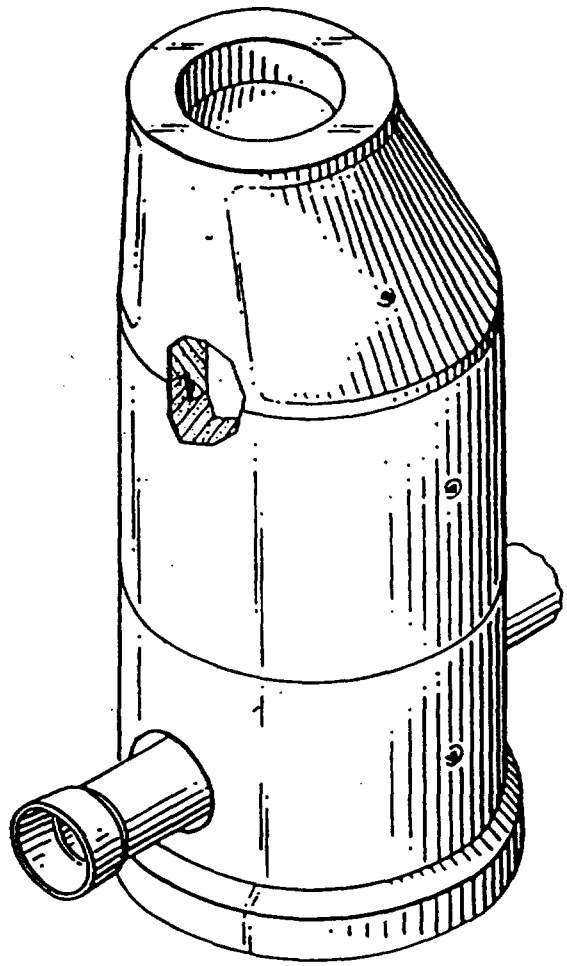
NORWALK TANK COMPANY
Mechanical Sewage System

RON PIERSON

2121 MAPLE ROAD
JOLIET, ILLINOIS 60432

- Mechanical Sewage Systems
- Septic Tanks
- Manholes
- Water Vaults
- Adjustment Rings
- Ductile Iron Watermain
- Copper
- Brass
- Clay Pipe
- PVC Pipe
- Truss Pipe
- Culvert Metal Pipe
- Flexible Pipe
- Dry Mix Products
- All Types of Fittings

Joint System For Manholes



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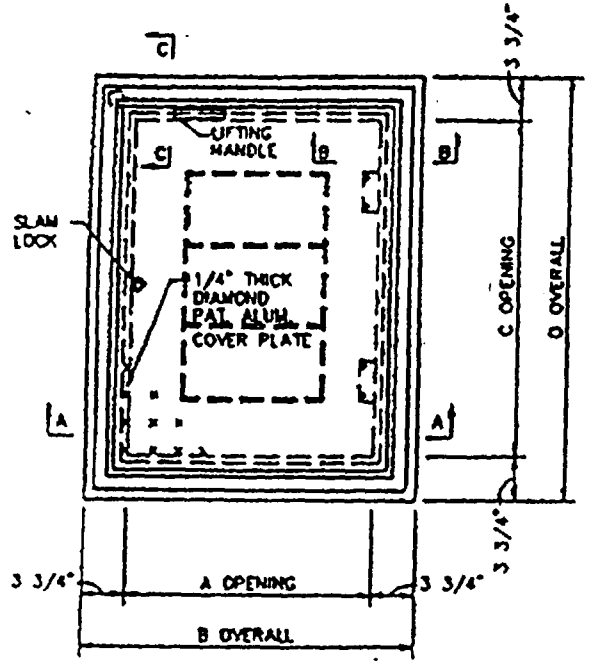


PLAN

EQUAL TO BILCO MODEL JD

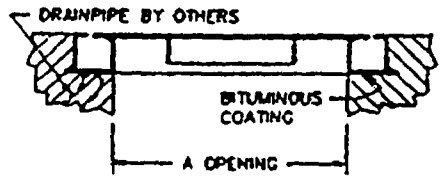
HALLIDAY PRODUCTS

SERIES W1S ACCESS DOOR

(WATERTIGHT WITH SPRING ASSIST)

STANDARD FEATURES:

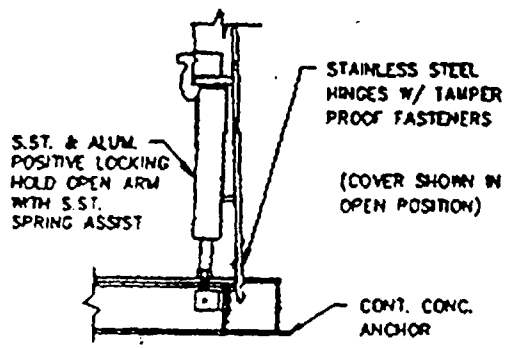
- STAINLESS STEEL COMPRESSION SPRING ASSIST
- AUTO-LOCK STAINLESS STEEL HOLD OPEN ARM WITH RELEASE HANDLE
- STAINLESS STEEL LIFTING HANDLE, HINGES AND ATTACHING HARDWARE
- STAINLESS STEEL SLAM LOCK W/REMOVABLE KEY
- CHANNEL FRAME
- BUILT-IN NEOPRENE CUSHION/GASKET
- BITUMINOUS COATING
- SINGLE LEAF CONSTRUCTION
- 300 LBS. PER SQ. FT. LOAD RATING
- 10 YEAR GUARANTEE



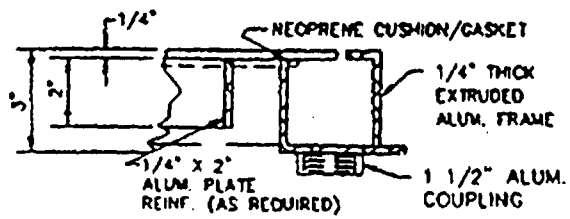
SECTION A-A

SPECIFICATIONS

THE W1S SERIES (SINGLE LEAF) ACCESS FRAMES AND COVERS AS MANUFACTURED BY HALLIDAY PRODUCTS, INC. OF ORLANDO, FLORIDA SHALL HAVE A 1/4" THICK ONE-PIECE, MILL FINISH, EXTRUDED ALUMINUM CHANNEL FRAME, INCORPORATING A CONTINUOUS CONCRETE ANCHOR. A 1 1/2" DRAINAGE COUPLING SHALL BE LOCATED IN THE FRONT LEFT CORNER OF THE CHANNEL FRAME. A BITUMINOUS COATING SHALL BE APPLIED TO THE FRAME EXTERIOR WHERE IT WILL COME IN CONTACT WITH CONCRETE. DOOR PANEL SHALL BE 1/4" ALUMINUM DIAMOND PLATE, REINFORCED TO WITHSTAND A LIVE LOAD OF 300 LBS. PSF. DOOR SHALL OPEN TO 90° AND AUTOMATICALLY LOCK WITH A STAINLESS STEEL HOLD OPEN ARM WITH AN ALUMINUM RELEASE HANDLE. FOR EASE OF OPERATION, THE HOLD OPEN ARM SHALL INCORPORATE AN ENCLOSED STAINLESS STEEL COMPRESSION SPRING ASSIST. DOOR SHALL CLOSE FLUSH WITH THE FRAME AND REST ON A BUILT-IN NEOPRENE CUSHION/GASKET. LIFTING HANDLE, HINGES AND ALL FASTENING HARDWARE SHALL BE STAINLESS STEEL. UNIT SHALL LOCK WITH A STAINLESS STEEL SLAM LOCK WITH REMOVABLE KEY. UNIT SHALL BE GUARANTEED AGAINST DEFECTS IN MATERIAL AND/OR WORKMANSHIP FOR A PERIOD OF 10 YEARS.



SECTION B-B



SECTION C-C

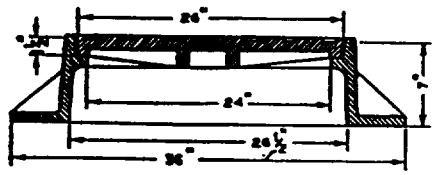
MODEL NO.	DIMENSIONS A	B	C	D	UNIT WT.
W1S2424	24"	31 1/2"	24"	31 1/2"	60 LBS.
W1S3030	30"	37 1/2"	30"	37 1/2"	71 LBS.
W1S3636	36"	43 1/2"	36"	43 1/2"	87 LBS.
W1S3048	30"	37 1/2"	48"	55 1/2"	94 LBS.
W1S3648	36"	43 1/2"	48"	55 1/2"	106 LBS.
W1S2430	24"	31 ½"	30"	37 ½"	65 LBS
W1S2448	24"	31 ½"	48"	55 ½"	74 LBS.

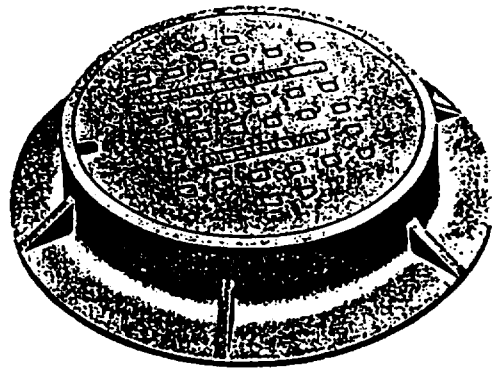
NEENAH FOUNDRY COMPANY

R-1642 Manhole Frame, Solid Lid

Heavy Duty

Total Weight 380 Pounds





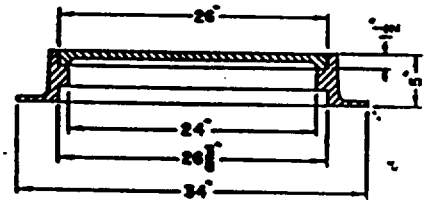
R-1642-1 Manhole Frame, Solid Lid

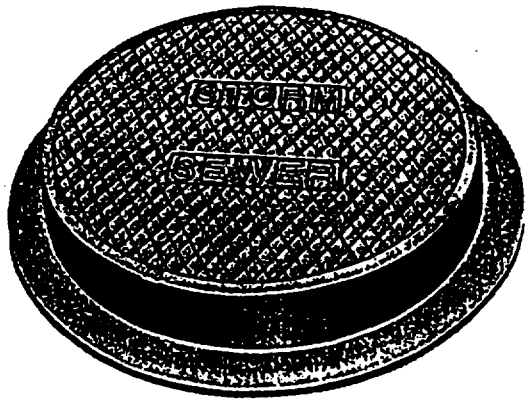
Heavy Duty

Total Weight 325 Pounds

If application requires flange at top for slab-type installation, order as R-1642-1S.

Equal # 1031 9" H. Duty

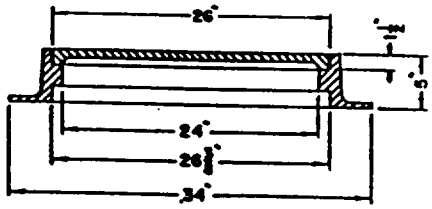


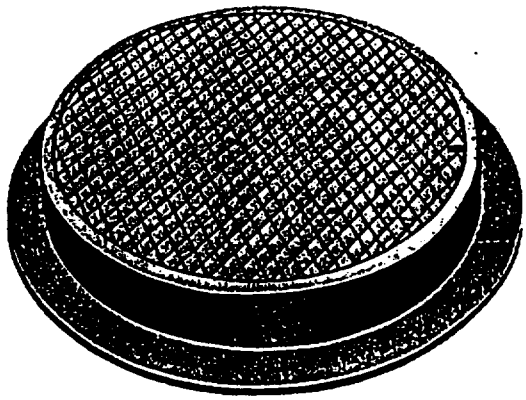


R-1642-A Manhole Frame, Solid Lid

Heavy Duty

Total Weight 325 Pounds

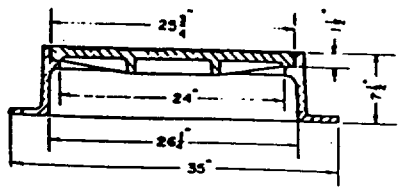


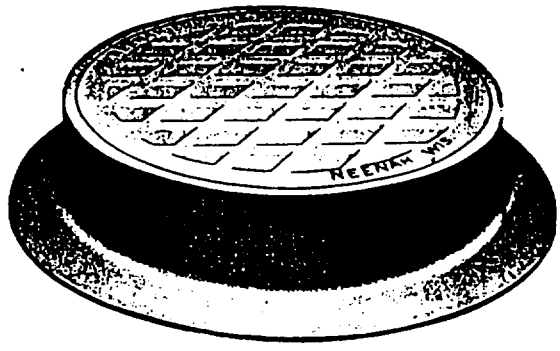


R-1643 Manhole Frame, Solid Lid

Heavy Duty

Total Weight 375 Pounds





SPECIFICATIONS

NEENAH quality construction castings conform to the following requirements. Use this data in your specifications to insure highest quality.

SUGGESTED

SPECIFICATIONS FOR CONSTRUCTION CASTINGS

GENERAL: Ferrous castings shall be as manufactured by Neenah Foundry Company or prior approved equal. They shall be of uniform quality, free from blowholes, shrinkage, distortion or other defects. They shall be smooth and well cleaned by shotblasting.

QUALITY: Metal used in the manufacture of castings shall conform to ASTM A48-83 Class 35B for Gray Iron or ASTM A536-80 Grade 65-45-12 for Ductile Iron or in the grade you specify.

FINISH: All castings shall be manufactured true to pattern; component parts shall fit together in a satisfactory manner. Round frames and covers shall have continuously machined bearing surfaces to prevent rocking and rattling.

TOLERANCES: As cast dimensions may vary one-half the maximum shrinkage possessed by the metal or +/— 1/16 inch per foot.

PAINT: Painting of castings does not provide significant added protection to cast iron, but merely changes the appearance with a colored coating. Castings are furnished unpainted. See following page for additional information.

WEIGHT: All published weights are average (and approximate) values. Deviation shall not exceed published weights by +/— 5 percent.

SUBMITTALS: Manufacturer's shop drawings shall be submitted to the engineer for approval prior to manufacture or shipping of castings to job site. The engineer shall retain the right to reject castings not conforming to this specification and/or approved submittal drawings.

Gray Iron — Best for Construction Castings

The use of gray iron offers many advantages over other materials for construction castings.

Of all the common castable ferrous materials, gray irons exhibit the best corrosion resistance and the excellent quality of high compressive strength. These are valuable qualities for load bearing street hardware.

Strength:

Gray Iron produced by Neenah Foundry is laboratory tested from specimens to verify consistent tensile strengths of 35,000 p.s.i.

Through alloying, tensile strengths can be increased to 45,000 p.s.i. if specified.

When to Use Ductile Iron

Ductile Iron is an ideal material for construction castings when standard Gray Iron castings do not have the load bearing capabilities or required impact resistance for a particular application.

While having the advantages of Gray Iron, Ductile Iron has greater strength characteristics than structural carbon steel without steel's inherent corrosion characteristics.

Ductile Iron is often used in areas subjected to loads greater than H 20 loadings such as:

Industrial facilities with forklift traffic
Container Ports
Airports

Freeway traffic or hard rubber forklift tires may also necessitate use of Ductile Iron due to impact loading.

Due to the excellent compressive strength of Class 35B Gray Iron, mating Ductile Iron lids or grates with Gray Iron frames is often the cost effective approach.

There are many factors involved in choosing a grade of Ductile Iron. When there are unusual loading conditions or locations subjected to extreme heat or cold, please consult our Product Engineering Department for recommendations.

Casting Load Bearing Capabilities

Specifiers must be certain the castings they have chosen are suitable for the intended loads. The U.S. Government prescribes a Proof Load Test Procedure under Federal Specification RR-F-621D. This is the same method used at Neenah. For details, please see page 5.

TYPICAL SPECIFICATIONS AND MECHANICAL PROPERTIES OF GRAY IRON AND DUCTILE IRON

GRAY IRON			DUCTILE IRON				
Class No.	Tensile Strength p.s.i.	Specifications	Grade	Tensile Strength p.s.i.	Yield Strength p.s.i.	Elongation	Specifications
30	30,000	ASTM A48-83	60-40-18	60,000	40,000	18% Min.	ASTM A536-80 SAE J434C
35	35,000	ASTM A48-83 AASHTO M105-82	65-45-12	65,000	45,000	12 to 20%	ASTM A536-80 SAE J434C
40	40,000	ASTM A48-83	80-55-06	80,000	55,000	6 to 12%	ASTM A536-80 SAE J434C
45	45,000	ASTM A48-83	100-70-03	100,000	70,000	3 to 10%	ASTM A536-80 SAE J434C
			CLASS A	60,000	45,000	15% Min.	MIL-I-24137 CLASS A

SPECIFICATIONS & MECHANICAL PROPERTIES FOR NON-FERROUS METALS

ALUMINUM					BRONZE				
ASTM No.	Alloy No.	Physical Properties p.s.i.			ASTM No.	Alloy No.	Physical Properties p.s.i.		
		Tensile	Yield	Elongation			Tensile	Yield	Elongation
B26	713.0	32,000	22,000	3%	B584	C87200-12A	45,000	18,000	20%
B26	319.0	23,000	13,000	1.5%	B584	C86300	110,000	60,000	12%

Most of the castings in this catalog can be furnished in aluminum or bronze.
SPECIFY BY CATALOG NUMBER

B.9 STORAGE TANK

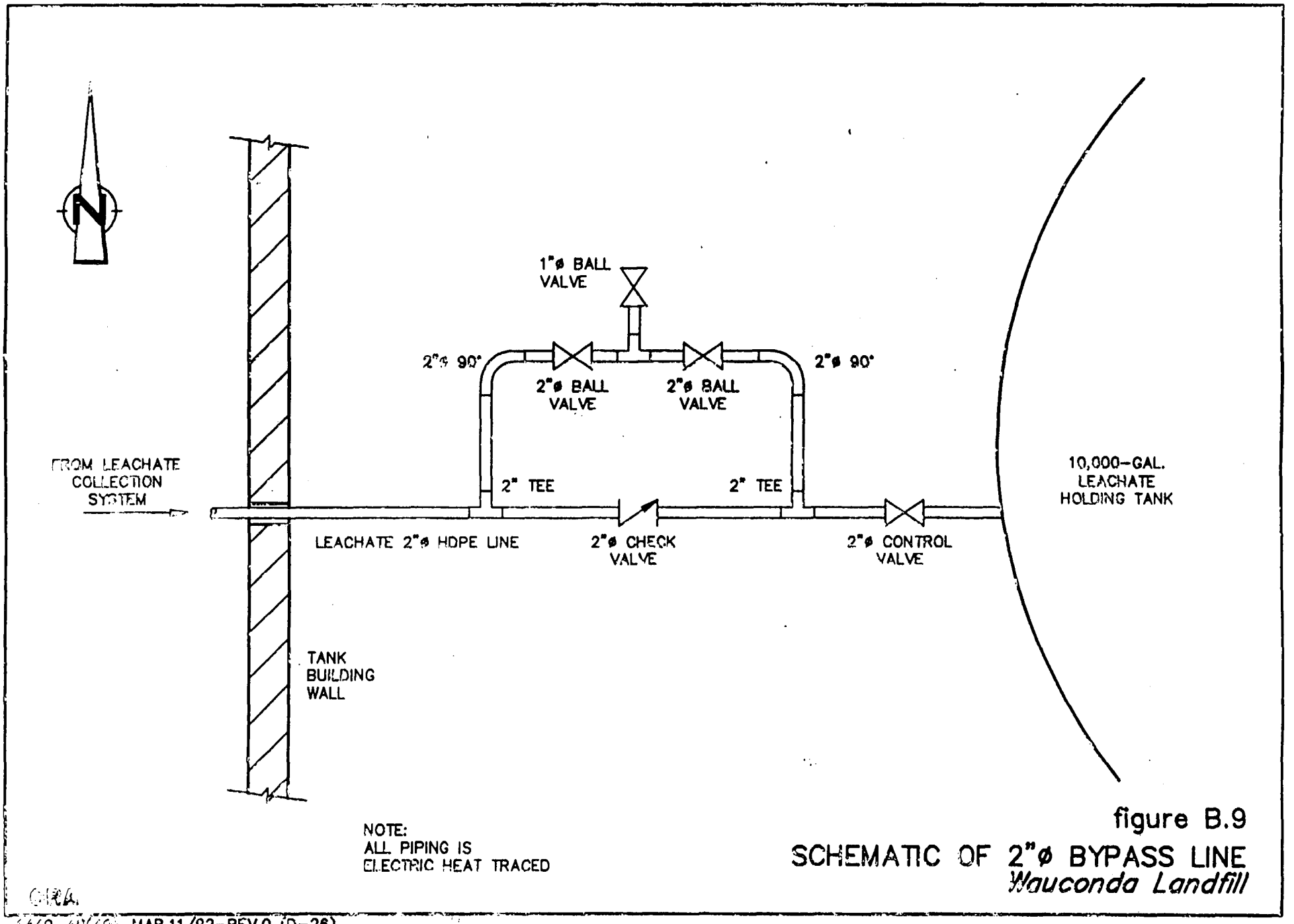
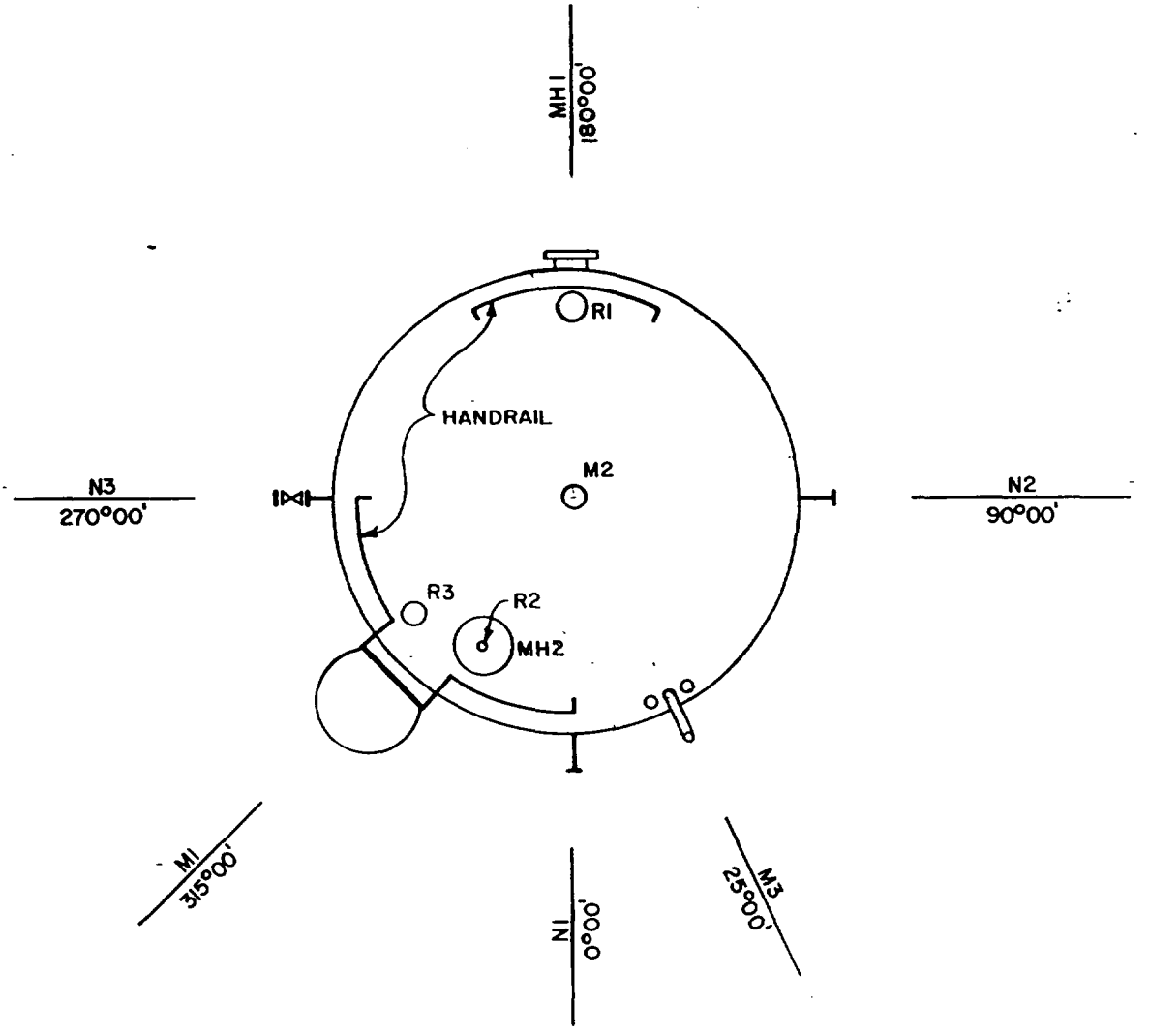


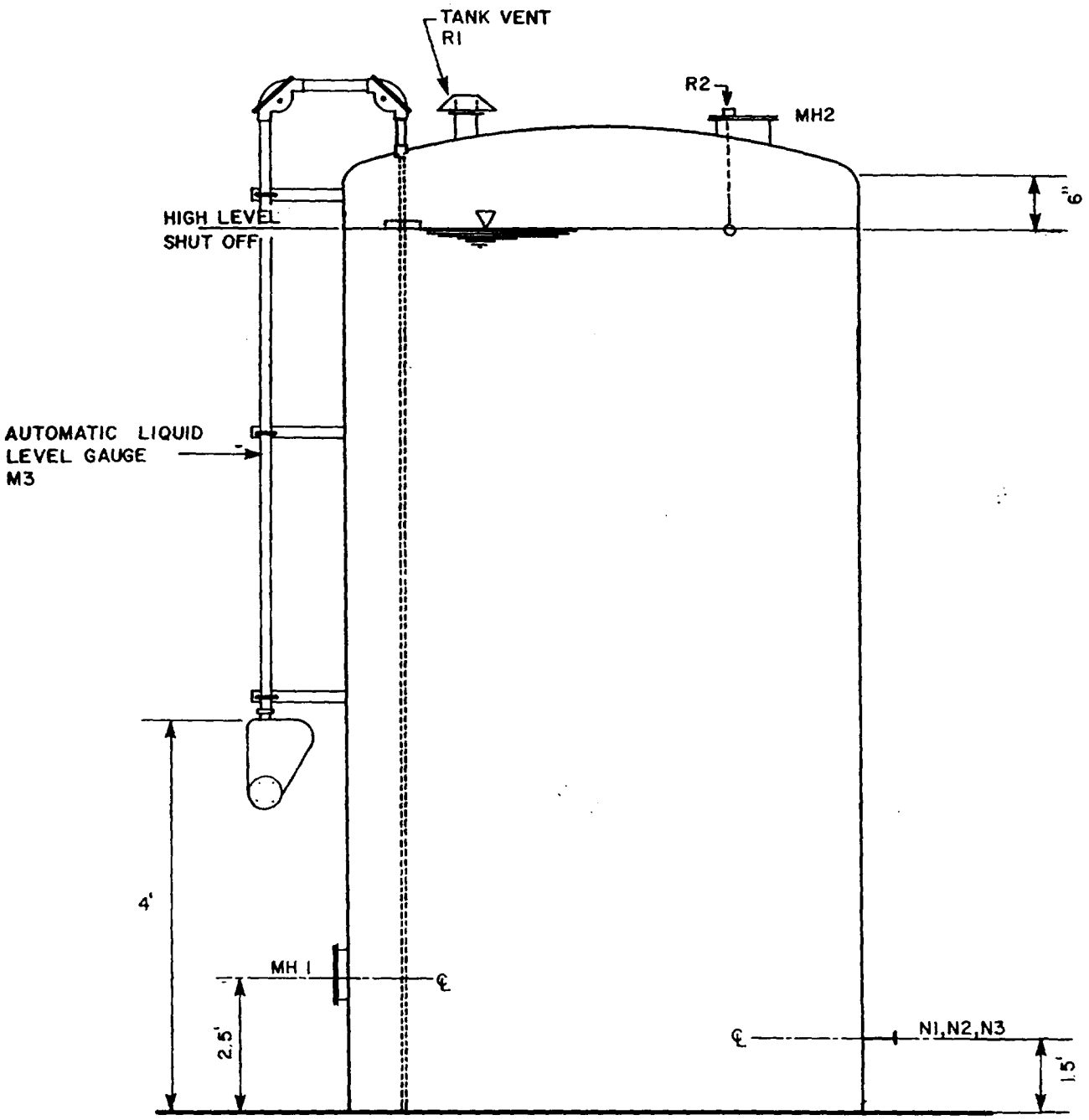
figure B.9

SCHEMATIC OF 2"ø BYPASS LINE
Wauconda Landfill

GRA



TANK ORIENTATION
N.T.S.



TANK ELEVATION

N.T.S.

(SEE TANK ORIENTATION FOR NOZZLE LOCATIONS)

DIAMETER=10'
HEIGHT= 17'
NOMINAL CAPACITY= 10,000 gal.

SDMS US EPA REGION V
FORMAT- OVERSIZED - 5
IMAGERY INSERT FORM

The item(s) listed below are not available in SDMS. In order to view original document or document pages, contact the Superfund Records Center.

SITE NAME	**WAUCONDA SAND & GRAVEL**		
DOC ID #	**155713**		
DESCRIPTION OF ITEM(S)	**BLUEPRINTS**		
REASON WHY UNSCANNABLE	**__X__OVERSIZED**	**OR**	**___ FORMAT**
DATE OF ITEM(S)	**1987-1993**		
NO. OF ITEMS	**4**		
PHASE	**RMD**		
PRP	**RMD - WAUCONDA SAND & GRAVEL**		
PHASE (AR DOCUMENTS ONLY)	**___ Remedial ___ Removal ___ Deletion Docket ___ AR** **___ Original ____ Update # ___ Volume ____ of ___**		
O.U.			
LOCATION	**Box # _____ Folder # _____ Subsection _____**		
COMMENT(S)			
APPENDIX B **BLUEPRINTS PARTIALLY SCANNED**			

(X)

U	.024 ALUMINUM FLAT 36" WIDE TRIM TO FIT
V	.024 ALUMINUM FLAT 36" WIDE CUT & FIT
W	GALVANIZED SCREWS
X	STAINLESS STEEL BANDING

:ATERS

NOTES

BOLT HOLES TO STRADDLE NATURAL [illegible]

FACE OF FLANGES TO BE SQUARE & [illegible]

PAINT: EXT PRIME
INT MOBIL 78 [illegible]

SANDBLAST: [illegible]

DESIGN PRESS: ATMOS

TEST: [illegible]

REVISIONS

△ 7/21/87

CO. CERTIFIED
[illegible]JECT MATTER,
[illegible]JECT TO THE
BE DISCLOSED
COPIED IN ANY
[illegible]T & MFG. CO.
[illegible]ANCE OF THE

LEACHATE HOLDING TANK
ANCE[illegible] 10' [illegible] VERT

Certified EQUIPMENT & [illegible]
SPRINGFIELD

DRAWN BY	DATE	SCALE	DWG. NO.
R [illegible]	6/[illegible]/87	—	2425 [illegible]
CHECKED BY	DATE		

B.10 TANK LEVEL INDICATOR

VAPOR-TIGHT LIQUID EYE-LEVEL GAUGES

- Horizontal
- Vertical
- Underground

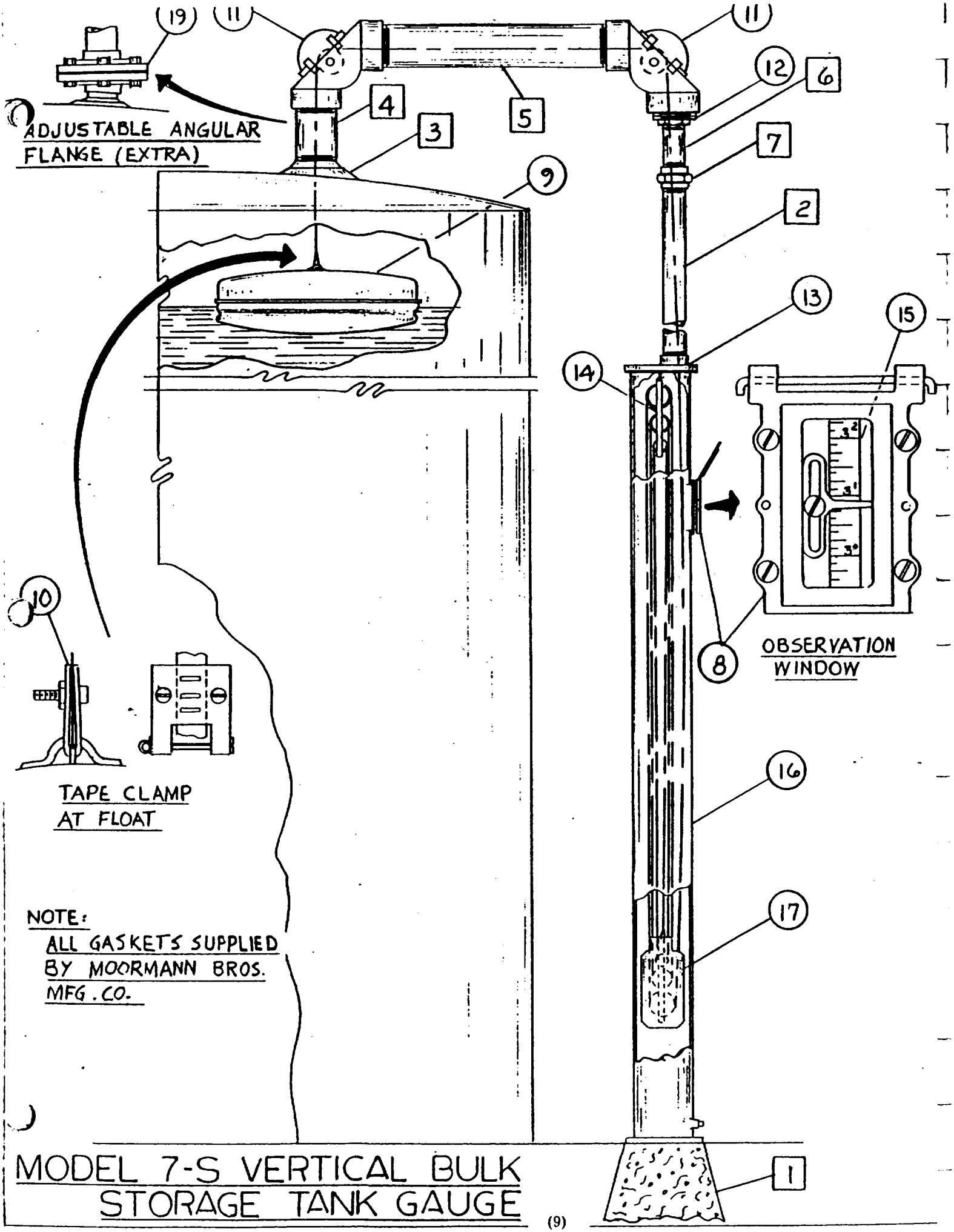
Storage Tank Gauges

- Petroleum
- Chemicals
- Petro-Chemicals
- Liquid Fertilizer
- Hot Asphalt

Distribution World-Wide

MOORMANN BROS. MFG. CO.

Div. of Engelbrecht Corporation
Telephone AC 317 932-3590
Rushville, Indiana 46173



NOTE:
ALL GASKETS SUPPLIED BY MOORMANN BROS. MFG. CO.

MODEL 7-S VERTICAL BULK STORAGE TANK GAUGE

MATERIAL LIST
Model 7-S

For All Vertical Tanks Up To & Including 35'

☐ **Material Supplied by Customer.**

1. Gauge Housing Base Support.
2. 1" Galvanized Pipe (cut to length).
3. Tank Roof Flange.
4. 2" Tank Opening Pipe.
5. 2" Galvanized Pipe (cut to length).
6. 1" Galvanized Nipple (any length).
7. 1" Galvanized Union.

◯ **Material Supplied by Moormann Bros.**

	PART NAME	PART No.	QUANTITY Per Uuit
8.	Observation Window Assembly	A-34—A-38	1
9.	Float	V-75,	1
10.	Stainless Steel Tape Clamp & Screws	V-93	1
11.	Elbow Assembly Complete	A-30, A-33	2
12.	2" to 1" Reducing Bushing		1
13.	Eccentric Cap Complete with Nuts & Bolts	V-71	1
14.	Pulley Rack Assembly	V-73	2
15.	Lufkin Stainless Steel High Visibility Tape	V-49	1
16.	Rust-Proofed Steel Gauge Housing	V-77	1
17.	Counterweight	V-72	2
18.	Condensation Drain Plug		1
	Frame & Lid Assembly for Observation Window	A-34, A-38	1
	Gaskets - Set for Observation Window	V-81, V-82	1
	Gasket - Elbow Cap	V-83	2
	Gasket - V-71 Eccentric Cap	V-84	1
	Glass - Window	V-86	1
	Stainless Steel Indicator Finger for Observation Window	V-94	1
	Wire Pin - Stainless Steel	V-96	5

"Guaranteed Accuracy in any Climatic Condition"

INSTALLATION INSTRUCTIONS - MODEL 7-S

1. Locate gauge position on ground — mark top edge of tank directly above ground location.
2. Measure, cut and thread 2" pipe (as marked on print).
3. Use pipe dope on all connections.
4. Assemble both A-30 elbows and 2" pipe as shown on print.
5. Screw (1) elbow A-30 onto 2" pipe with reducing bushing, close nipple and union as shown on print; other A-30 elbow onto 2" nipple in tank then screw other end of 2" pipe into tank elbow, make straight with tank marking.
6. Level 2" pipe, use temporary wood brace or alignment flange, if necessary.
7. Set gauge housing with eccentric cap assembled on ground directly below overhanging elbow.
8. Measure for 1" pipe (reducing bushing in elbow to eccentric cap V-71 on gauge housing) allow for threads, cut and thread 1" pipe.
9. Screw 1" pipe into elbow, then remove V-71 eccentric cap from housing and put on 1" pipe. CAUTION — Be sure eccentric cap is straight and 1" outlet is farthest away from tank.
10. Fasten pulley rack with large pulley up to eccentric cap using stainless steel pins.
11. Assemble other pulley rack in counterweights with large pulley down.
12. Place counterweight on ground directly beneath eccentric cap pulley rack.
13. Remove A-33 caps from both elbows.
14. Thread tape from tank elbow with numbers up and clip ends first through 2" pipe and over elbow pulleys down through 1" pipe and out eccentric cap, straight down and around bottom pulley in C/W and up and over top pulley in eccentric cap, down to medium pulley up and over medium pulley, down and around small pulley on C/W and up and around small pulley on eccentric cap, down and fasten to lug on counterweight pulley rack—use stainless steel pin. CAUTION—Do not thread tape over or under cross bars in pulley rack. Use caution—do not kink or bend tape.
15. Fasten tape to float with tape clamp (as per print) CAUTION — Do not fasten tape clamp too tight as this may damage tape.
16. Place eccentric cap gasket on housing top and insert counterweight assembly into housing, CAUTION — Do not allow C/W to drop or jerk as this may cause damage to bearings, also be sure the tape is in groove of pulleys and not on the edge.
17. Fasten housing to eccentric cap with observation window directly below 1" pipe.
18. Place outside strand of tape over tape guide in observation window, CAUTION — Do not bend or kink tape, and put ONLY ONE (1) strand of tape over the tape guide.
19. If tank is empty adjust tape reading at 1-3/8" (float draft) if it is partially full set reading exactly with stick, make major tape reading adjustments with the float by slipping tape through tape clamp. Minor adjustments (within 1" make with observation finger).
20. In setting the reading on the gauge, ½", ¼" or even 1/8" is not close enough, be particular, set gauge to the exact amount of liquid in tank.
21. CAUTION — Let float down in tank easily. Do not let it drop.
22. Assemble observation frame and lid A-34—A-38 place on housing, tighten for vapor-proofing.
23. Fix base for housing either, concrete, wood post, or steel plate welded to tank, CAUTION — Do not weld gauge housing to tank.
25. In most climates, condensation forms inside the tank and gauge. A drain plug has been provided for draining at the bottom of housing. In most climates this is necessary 2 times a year (spring & fall). However, in extreme cases draining is required more often.

B.11 HEAT TRACING

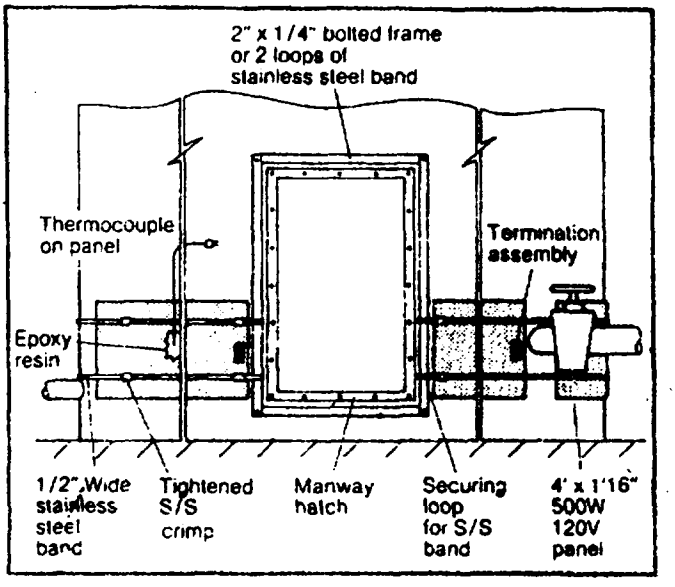
COOPERHEAT

INNOVATORS IN HEAT TRACING

Installation & Maintenance Instructions (1)

*ATTENTION: BOB PYLE * 4 PAGES IN TOTAL

'EGL' Flexi-panels for Tank & Vessel Heating



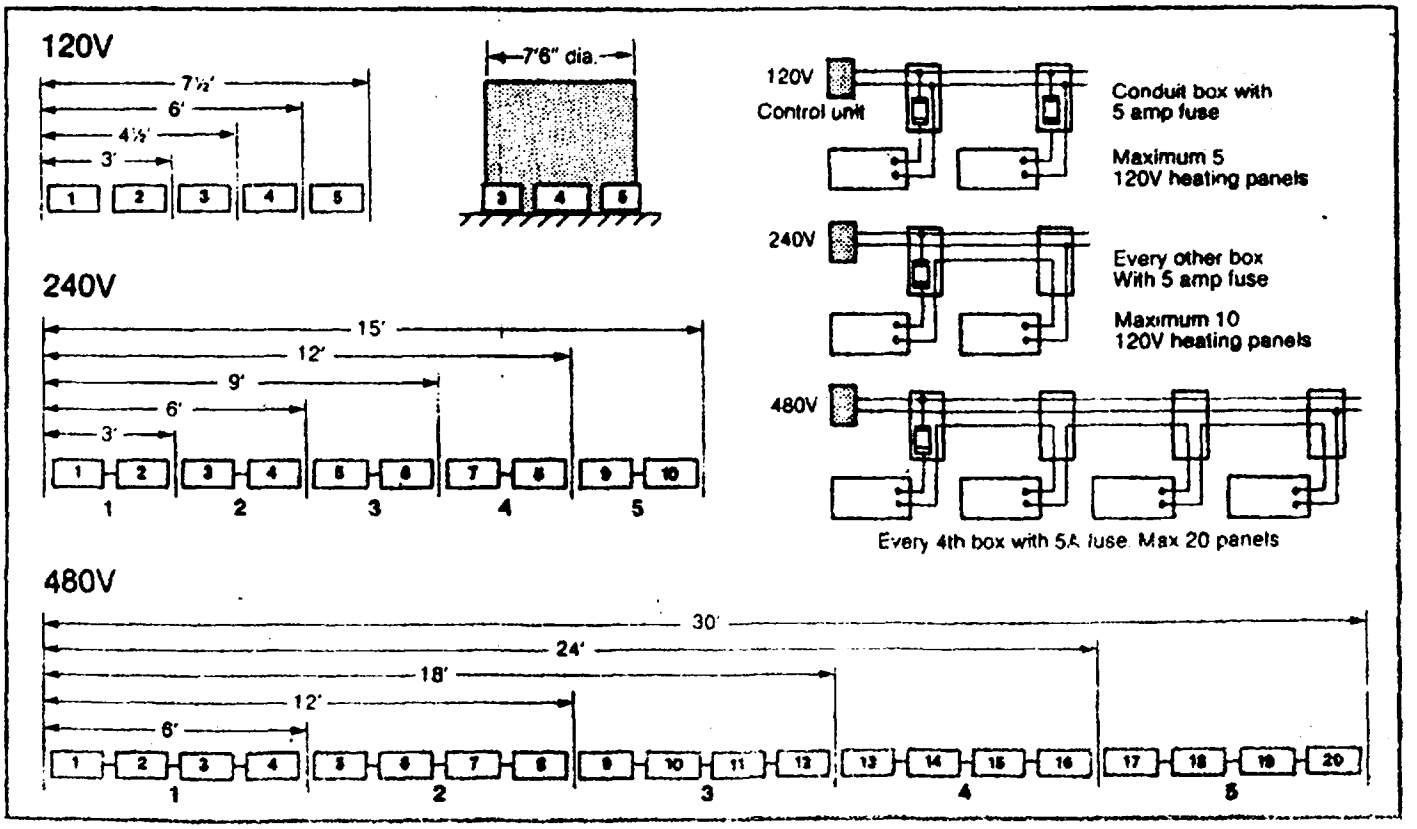
'EGL' epoxy glass laminated heating flexipanels are 4ft x 1'6" and described in sheet HTD-32. Each panel provides 500W at 120V. (240V also available.)

The first step is to make a metal frame to go around the manway and to anchor ½" stainless steel banding tape, alternatively the tape may be strapped around the manway flange as a double loop.

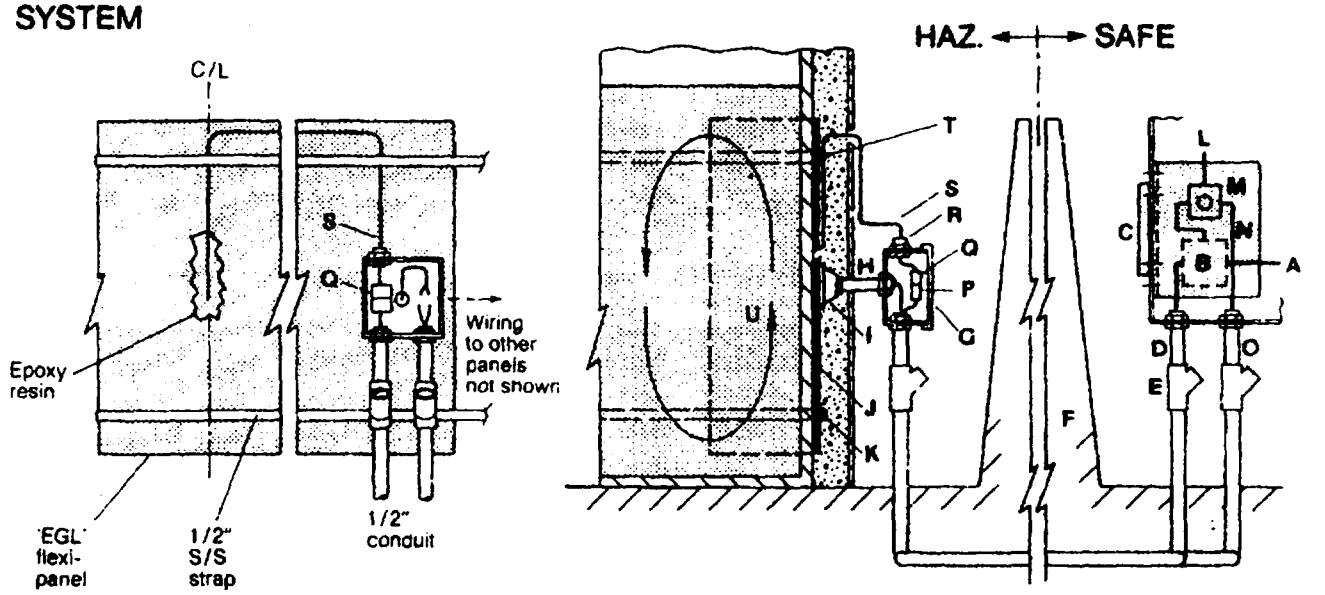
The flexipanels are placed in position around the tank, or on the underside of a horizontal vessel, and temporarily held in place with duct tape. Two ½" SS bands then secure the panels at 12" centers, the bands being tightened down with a crimping type case banding machine.

Up to 7'6" diameter, 120V is more normally selected. From 6' to 15' diameter 240V is favored and from 12' to 30' diameter 480V is preferred. Note that EGL flexipanels are suitable for 600V operation, five in series.

For Class 1 and 2, Div. 2, panels are supplied with an attached ½" NPT hub. Screw into each hub a 6" long conduit nipple and attach a weatherproof conduit box suitable for two incoming ½" conduits from underneath.



EGL-CC SYSTEM



The conduit box need not be explosion proof even if the location is hazardous. There are no arcing and sparking devices in the EGL System when solid-state CC controls are used. Use intermediate conduit instead and reduce costs.

Select a 5 amp fuse that is suitable for the voltage and is obtainable locally, one that may be part of the wiring within the conduit box and connected with insulated wire connectors ('wire nuts'). Fit one per box, 120V; one every other box, 240V; one every fourth box, 480V. Interwire the panels via the boxes as shown on page 1.

The recommended control system is the Cooperheat 'CC' electronic module which has a 25A solid-state single phase contactor controlled from a temperature controller with a 1/8" diameter stainless steel tubular thermocouple with an attached polarized plug.

Using a screwdriver to pry away the top SS band at the center of the first panel, insert the tubular thermocouple such that the tip is at the centerpoint of the panel. Using epoxy resin such as Devcon 2-ton epoxy, Duro Master-Mend or any other similar adhesive, securely attache the t/c to the panel over 5" of its length. The plug end to be in the conduit box where it attached to a polarized socket connect to the thermocouple extension cable.

Note that it is very important to connect the positive (+) wire of the extension cable (colored yellow) to the small pin (+) of the plug, via the socket. Contrary to first thought, red is negative, not positive, in thermocouple circuitry. Therefore the red wire of the t/c extension cable is (-) and connects to the large pin via the socket.

Do not run the t/c extension cable in the same conduit as the power wiring. Use a separate conduit as shown. It is only at the tank-position, where both power and t/c extension cable enter the box, that they may come together.

After two hours examine the epoxy around the t/c tip. Make certain it is a firm bond and is a part of the flexipanel itself. It will thus register the maximum temperature of the panel (at its midpoint). As the panel must be operated within its maximum temperature of 120°C (250°F) ensure that no unauthorized person can reset the CC temperature controller to a higher level.

Thermocouple circuits fail to safety. Power is switched off if the t/c circuit is broken. Thermostats, on the other hand, call for power when the capillary is damaged and breaks. Therefore thermostat control requires a second unit to lock out for high-limit control. Cooperheat's EGL-CC System does not require the second sensor.

Operating personnel should be instructed that the CC temperature controller is NOT the temperature of the tank contents. It is approximately 20°C (40°F) higher but the actual deviation should be found by an accurate thermometer strapped to the outgoing piping under its insulation and the reading taken when contents are flowing.

Sensing the panel temperature and not the tank temperature is important in that it protects against over-voltage and buildup of semi-insulating lining (impurities) on the inside wall which can affect heat transfer. In addition, high-speed pulsing of the heat via the solid-state contactor and the electronic temperature controller provides absolutely constant heat as opposed to the slow on-off pulsing via thermostatic control.

Make certain therefore that the vital thermocouple circuit is installed correctly.

EGL-CC SYSTEM (See above illustration)

A. Incoming single-phase supply from circuit breaker.
B. 25A single pole solid-state contactor, 480V maximum
C. Aluminum finned heat sink, external, for contactor.
D. ½" conduit for wiring to flexipanels from contactor.
E. ½" sealing fitting if tanks are in hazardous area.
F. Dyke around tank(s) to limit and define Div 2 area.
G. Weatherproof, nonexplosionproof conduit box.
H. 6" long ½" NPT conduit nipple between hub and box.
I. ½" NPT conduit hub epoxy resined to flexipanel.
J. 500W 120V 4ft x 1ft 6in EGL heating panel.
K. ½" stainless steel band applied by case bander.
L. 5A 120V auxiliary supply for temperature controller
M. Miniature type, electronic temperature controller.
N. Outgoing thermocouple extension cable, type KX.
O. ½" conduit to carry and protect t/c extension cable.
P. Polarized socket at the end of the t/c extn. cable.
Q. Matching polarized plug fitted to end of type K t/c
R. Conduit gland and sealing compound around t/c.
S. 1/8" diameter stainless steel tubular thermocouple.
T. Panel banding lifted 1/8" and t/c passed under
U. Base heaters provide excellent circulation in tank.

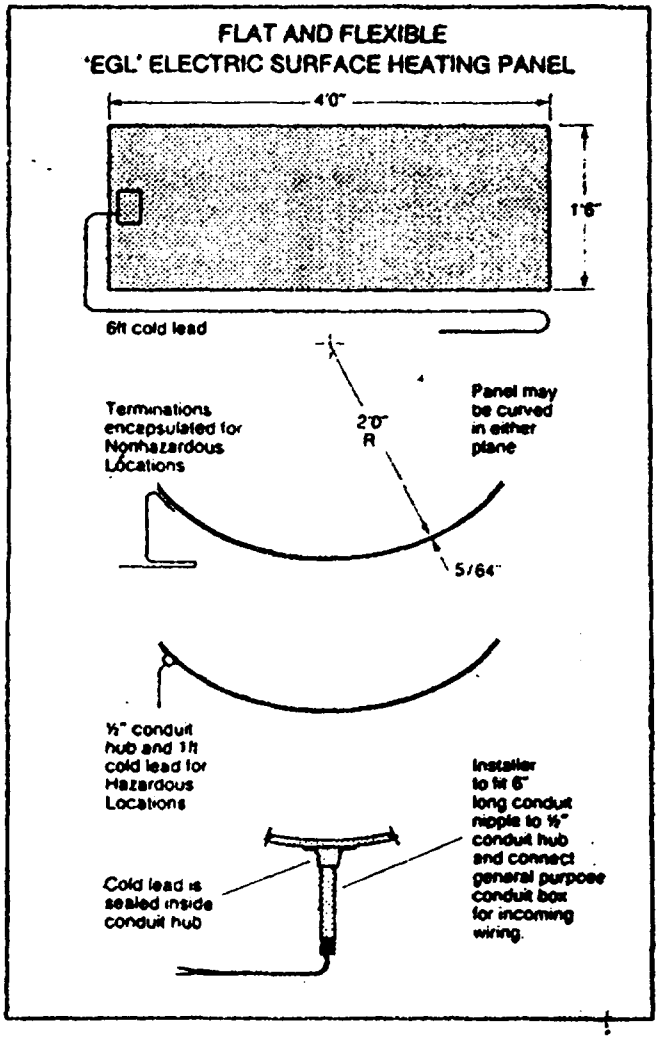
COOPERHEAT

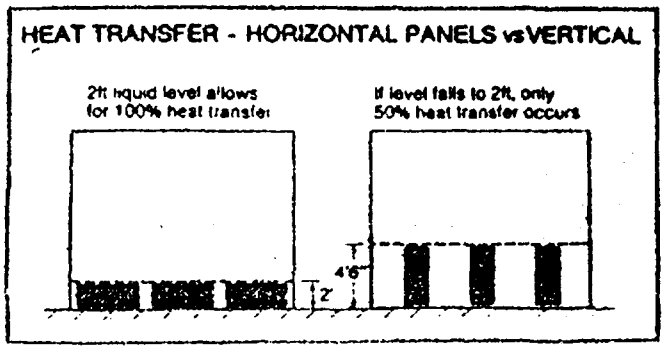
'INNOVATORS IN HEAT TRACING

'EGL' Epoxy Glass Laminated & flexible heating Panel

(3)

Electric Surface Heating of Tanks & Vessels





Specification

EGL panel size	4ft x 1ft 6in x 5/64 (80 thou) in
Power rating	500W
Power density	84Wpsf
Voltage (State either 120 or 240V)	120V: 240V
Amperage	4.2A: 2.1A
Maximum surface temperature of panel	120°C
Maximum tank or vessel temperature maintenance	100°C
Minimum diameter for panel length	3ft
Minimum diameter for panel width	4ft 6in
Heating element	Etched resistance alloy foil
Dielectric	Several layers of fine glass gauze
Bonding material	Epoxy resin
Bonding pressure	300psi
Dielectric strength	Tested at 2200V
Glass/resin ratio	60%/40%
Thermal conductivity	70% of pure glass
Waterproofness	100%
Temperature softening point	30% higher than FRP panels
Self extinguishing characteristic	100%
Absence of air bubbles in dielectric	100%
Structural strength	30% higher than FRP panels
Noxious odor at switch-on	Nil
Cold lead	6ft, Ordinary Area
Cold lead	1ft and ½" conduit hub, Hazardous Area
Color of heating panel	Dark Blue

EGL heating panels are constructed on similar lines to printed circuit boards used in the electronic industry. Instead of computer controlled etched wiring laminates, the computer is used to etch a pattern of resistance foil which is then sandwiched between layers of glass gauze using epoxy resin as the binder under pressure of 300psi.

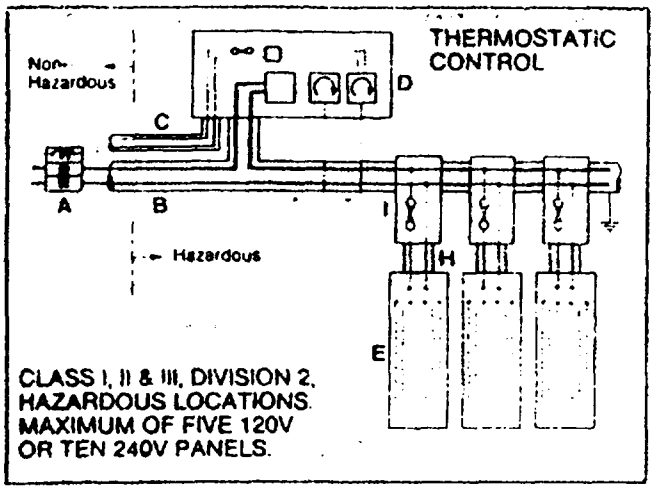
Being extremely thin (5/64"), the panel is highly flexible such that it may be strapped around 3ft diameter surfaces in its 4ft length and 4ft 6in diameter surfaces in its 1ft 6in width.

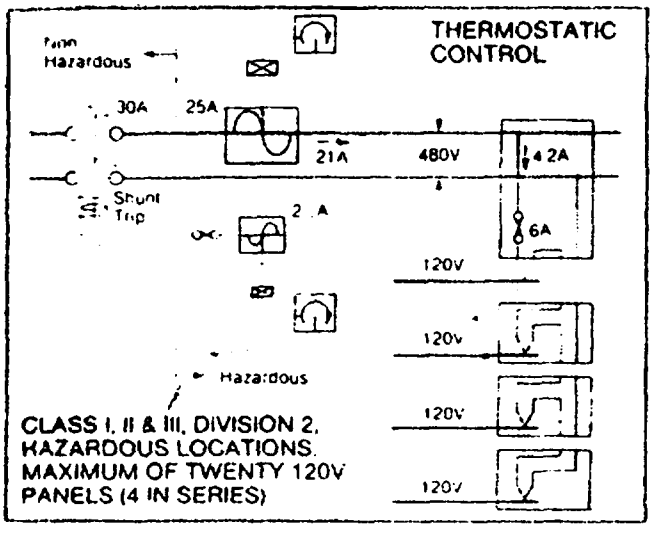
The greatest use of heating panels is for tank and vessel heating to provide temperature maintenance of the product. As the product level varies inside the tank, it is more effective to apply the heating panels at the bottom of the tank in the horizontal mode rather than the vertical model. EGL's flexibility allows this to be achieved.

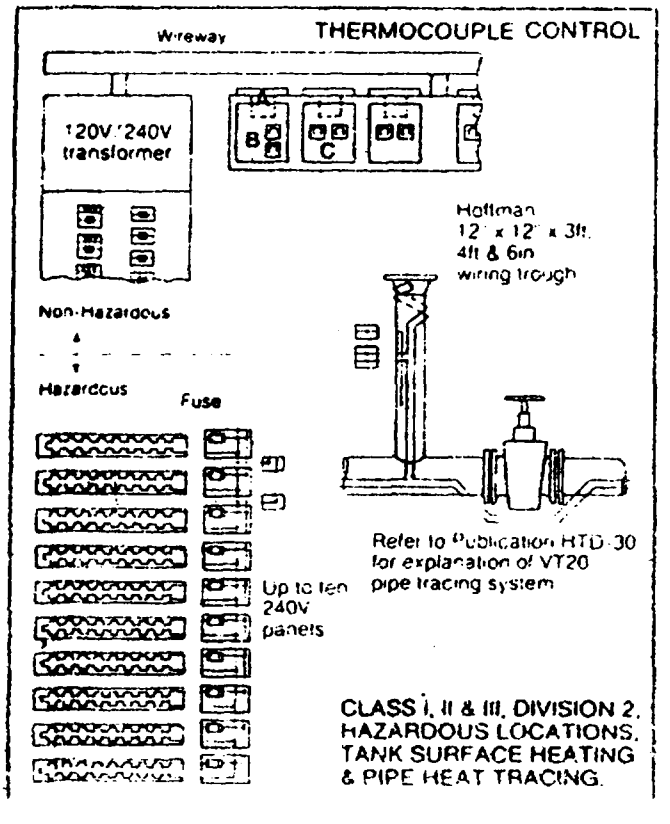
Case banding, polyester strapping or wire rope with toggle tightening may be used to pull down the panels to the outside surface of the tank. Thermal insulation is then applied.

With a low power density of only 84 Watts per square foot, the heating panel may be applied to fiberglass tanks (which resist the passage of heat) and not damage the tank wall. Similarly, on epoxy lined mild steel oil storage tanks, the lining remains undamaged when oil level falls below the top edge of the heating panels.

Continued







Up to five 120V panels may be connected off a 22 amp thermostat, the current in each panel being 4.2 amps. If any one of the panels is damaged, the others may still operate if a 6 amp fuse is crimped into the wiring which feeds each panel.

If 240V panels are selected, up to ten panels may be controlled by the 22 amp thermostat, the fuse being 3 amp per panel.

In Division 2 hazardous locations, Cooperheat offers a twin bulb thermostat which satisfies Article 501-3-1c of NEC-84 as being nonincendive.

A 30A double pole circuit breaker (A) with shunt trip is located in the nonhazardous area and feeds the NEMA-4 twin thermostat unit (D) which has a 25A solid-state contactor to switch the load. Conduit (B) interconnects conduit boxes (I) at each panel position where the individual fuse (I) is located. Cold lead from panels (E) pass via conduit nipple (H) to the boxes. High limit trip of the panels is via the second thermostat which has a 2½A solid-state relay for nonincendive trip of the 30A breaker, thus providing manual reset.

As the size of tanks increase and the number of heating panels also increase, consideration is given to connecting the panels in series off 480V. This reduces on-site transforming requirements.

Up to twenty 120V panels may be controlled via the 25A solid-state contactor thus providing up to 10kW of heat.

Due to the fact that the on-off contacts in each thermostat make and break mill amps in the gate circuit of the solid-state relays (contactors) and do not have to make and break up to 10kW of power, life expectancy is much greater.

All thermostats call for power if the capillary or bulb is broken or the bellows become punctured and most users protect against this happening by having the second high-limit thermostat, the bulb being applied by epoxy resin to the center of one of the heating panels.

The control thermocouple bulb for tank temperature is located 2" away from the edge of one of the heating panels and at the top edge level of the panels. Held on by duct tape it is preferably secured under the banding which holds on the panels.

Storage tanks and associated piping may be heated by grouping the controls in the safe area where the panel board is located and utilizing temperature controllers and thermocouples instead of thermostats. Alternatively, as Cooperheat controls are entirely solid-state and nonincendive, the controls may be placed in the hazardous area.

Cooperheat supplies CC control chassis units which have 25A solid-state relay (contactor) for panel switching or 10A triac power module, also solid-state, for the control of Cooperheat's VT20 System for pipe heat tracing.

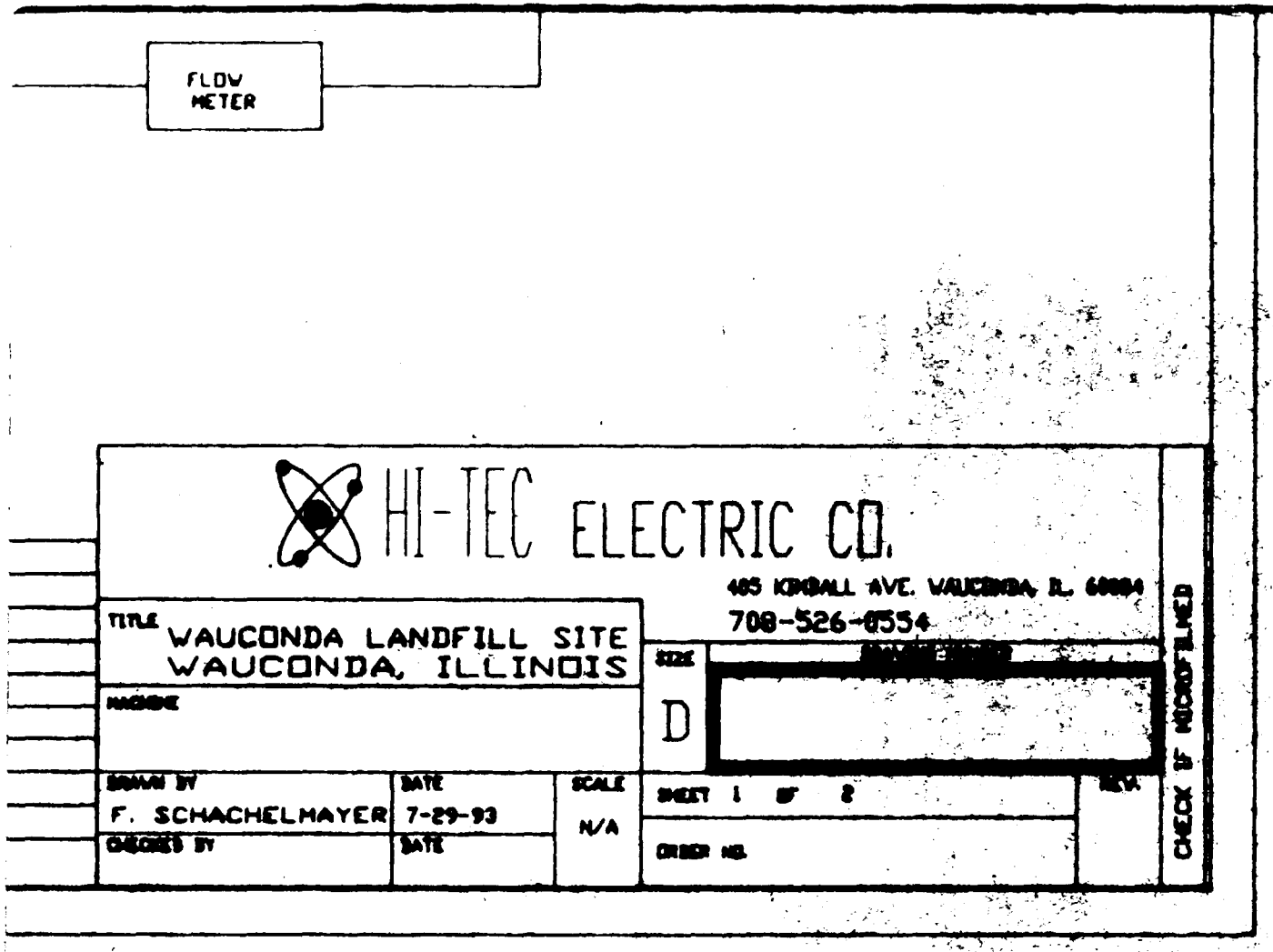
Each unit is 7" wide and takes up 9" space of a Hoffman 12" x 12" x 3ft, 4ft or 6ft wiring trough. The 25A solid-state relay with its finned heat sink is mounted in the top face of the trough and the HC10 triac power module is similarly mounted (A). This may be field-assembly work.

The facia panels are hinged such they drop down for access. They are fitted with either one or two temperature controllers for tank heating (B) or with triac power control and a temperature controller for pipe heat tracing (C).

As temperature controllers shut down the heating if thermocouple circuits open-circuit (as opposed to thermostats which do the reverse), it is not mandatory to have the second temperature controller for panel heating, although one is shown in the diagram. It opens one of the 30A DP circuit breakers shown in the panel board via its shunt trip.

High limit protection is not required for the VT20 System due to its unique feature of the power (Watts per foot) being set on the HC 10 triac module and also its individual circuit high-

B.12 ELECTRICAL


FLOW METER
HI-TEC ELECTRIC CO.
485 KIMBALL AVE. VAUCONDA, IL. 60084
708-526-0554
TITLE
WAUCONDA LANDFILL SITE
WAUCONDA, ILLINOIS
SIZE
D
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F. SCHACHELMAYER
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SCALE
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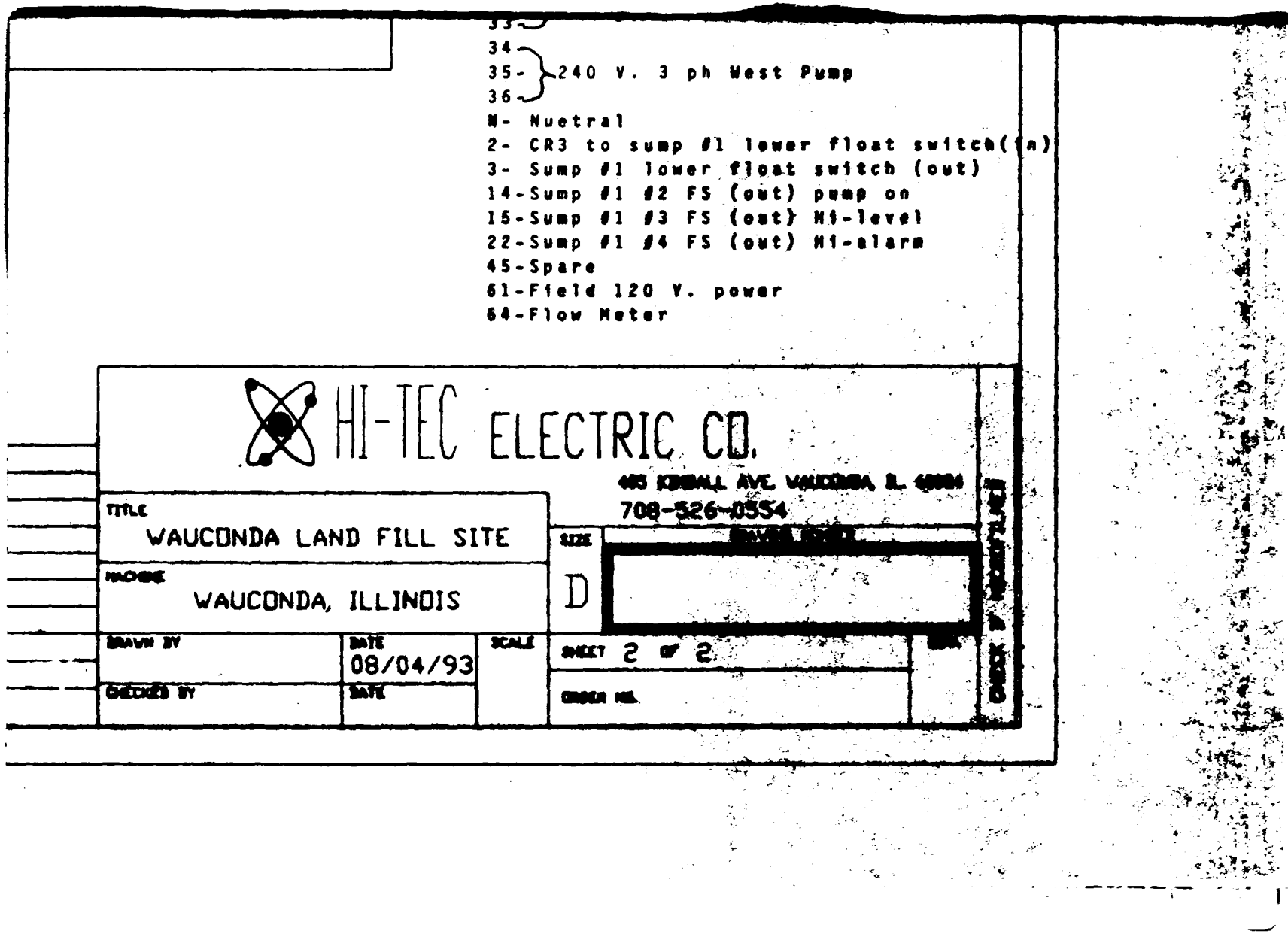
34
35-
36-
240 V. 3 ph West Pump
N- Nuetral
2- CR3 to sump #1 lower float switch(a)
3- Sump #1 lower float switch (out)
14-Sump #1 #2 FS (out) pump on
15-Sump #1 #3 FS (out) Hi-level
22-Sump #1 #4 FS (out) Hi-alarm
45-Spare
61-Field 120 V. power
64-Flow Meter
HI-TEC ELECTRIC CO.
708-526-0554
TITLE
WAUCONDA LAND FILL SITE
WAUCONDA, ILLINOIS
SIZE
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DATE
08/04/93
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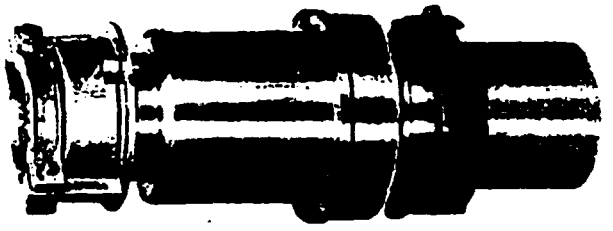
SHEET 2 OF 2

ARKTITE® Heavy Duty Plug AP Series, Model 80, Styles 1 & 2, 200/400 Ampere

IF852
Installation and Maintenance Information



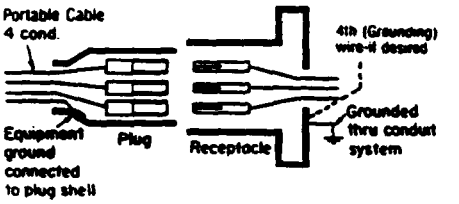
APPLICATION

AP Series ARKTITE Heavy Duty Plugs are designed to provide connection and distribution of secondary electrical power from a power source to portable or stationary electrical equipment. AP Series Plugs are compatible with Crouse-Hinds AR Series receptacles and APR Series cable connectors. Refer to Crouse-Hinds Catalog CM4000/4700 for a complete listing of compatible ARKTITE heavy duty receptacles and connectors. AP Series plugs are supplied in 3 and 4 pole designs. They are capable of carrying a maximum continuous current of 200 or 400 amperes at a rated voltage of 600 volts AC from 50 through 400 Hertz, or 250 volts DC. 200A rated AP series plugs feature load breaking capability in emergency situations at or below the plugs maximum current rating.

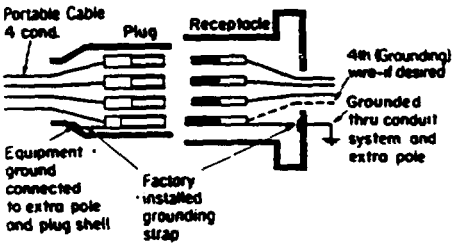
CAUTION

400A rated AP series plugs may only be connected or disconnected with electrical power OFF.

Two styles of plug grounding are available. Style 1 units have the grounding conductor connected to the plug sleeve with a pressure connector located on retaining cup. The plug sleeve and receptacle detent spring connection form the grounding path. Style 2 units contain an extra grounding contact (pole) which is also connected to the plug sleeve through a factory installed grounding strap.



Style 1
Typical 3-wire, 3-pole plug and receptacle



Style 2
Typical 3-wire, 4-pole plug and receptacle

Actual operation must comply with the information stipulated on the plug nameplate. AP Series plugs may be used in areas classified as non-hazardous in accordance with the National Electrical Code® (NEC). AP Series plugs should be installed, inspected, maintained, and operated only by qualified and competent personnel.

PLUG DISASSEMBLY

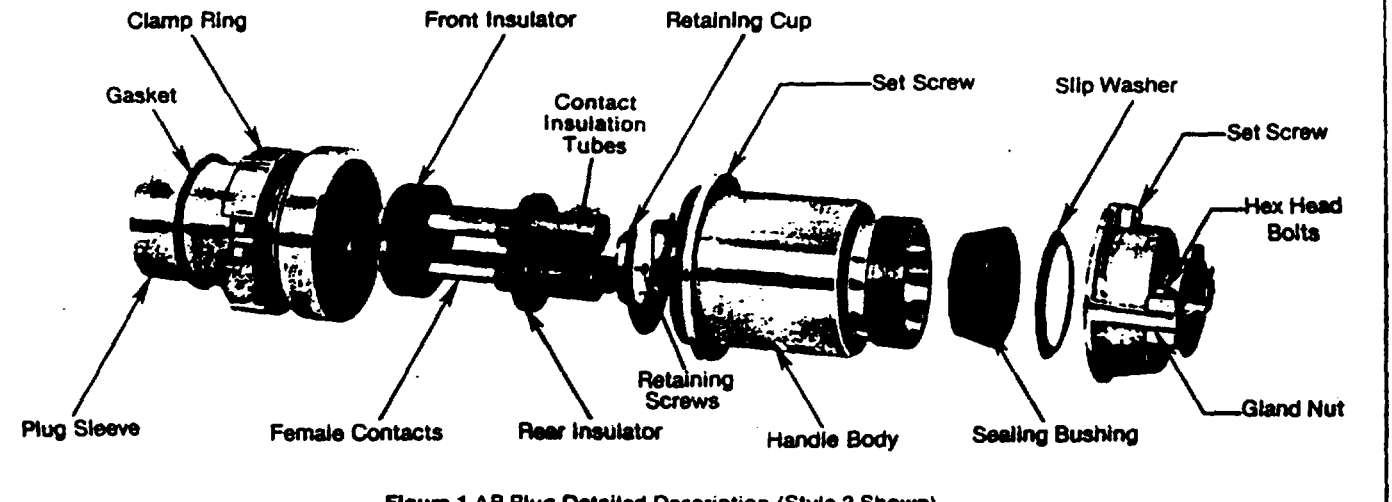


Figure 1 AP Plug Detailed Description (Style 2 Shown)

1. Loosen gland nut set screw two turns. Unscrew gland nut from handle body, remove slip washer and sealing bushing and set aside for later reassembly. See Figure 1.

2. Loosen handle body set screw one turn. Unscrew handle body from plug sleeve assembly and set aside.

3. Remove two ¼-20 hex head retaining screws that secure the retaining cup and insulator/contact assembly in the plug sleeve. Remove insulator/contact assembly. See Figure 2.

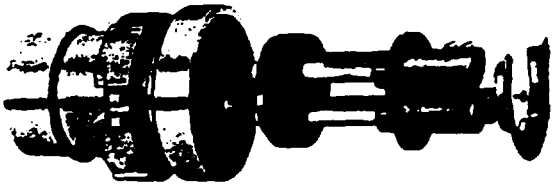


Figure 2 Insulator/Contact Assembly

4. Remove the retaining cup from insulator/contact assembly by sliding it sideways off contacts. Remove front insulator.

5. Remove the contact retaining clip from all contacts, except the ground contact in Style 2 plugs, located in front of the rear insulator. To remove the clips, insert a flat blade screwdriver between the clip and contact, then rotate screwdriver to pry off the clip. Remove the contacts from the rear insulator assembly. See Figure 3.

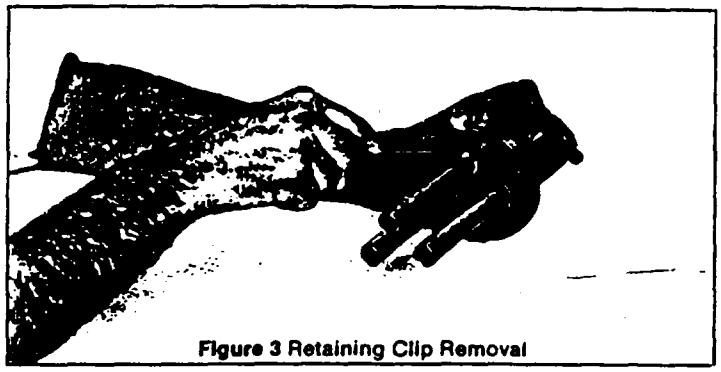


Figure 3 Retaining Clip Removal

CABLE CONNECTION

WARNING
Electrical power must be turned OFF before and during installation and maintenance.

1. Establish a wiring pattern.

WARNING
Before assembling an AP Series plug, a wiring pattern must be established. The same colored wire must be put into the same numbered contact on all plugs and receptacles in a system. This will assure correct system polarity and reduce the possibility of equipment damage and/or personal injury due to misphasing or shorts.

ARKTITE plugs and receptacles are polarized so plug enters receptacles only one way. Contact recesses in insulating bodies are identified by number. This assures proper polarity of conductors through plug and receptacle or cable connector.

To ensure uniformity of the system follow these instructions or use your own established standards. Electrical continuity testing is required to verify proper polarization.

Connect wires, identified by color in first column of Table 1, to contacts identified by number noted in columns to the right. White wire is connected to contact identified by #2. Connect other contacts in accordance with color of wires.

Conductors are identified by the color of insulation on each individual conductor. These colors agree with those given in Section 210-5 of N.E. Code for multi-wire branch circuits; an additional wire in the cable, uninsulated or identified green, is for grounding and complies with Sections 250-42 and 250-45 of N.E. Code. If conductors are not identified with exactly these colors, these colors may be assumed in making proper connections. If the conductors are all alike except one, that one is to be assumed to be white and the others to be in the same relative locations at the other end of same cable. If any doubt exists on identification, test them out electrically.

TABLE 1

Color of Wire in Cable	Numbers On Insulator Body	
3 Pole	**Style 1**	**Style 2**
White*	Contact #2	Contact #2
Black	Unnumbered Contact	Contact #1
Red (Style 1 only)	Contact #1	
Green**	Grounding Lug on Retaining Cup	Grounding Contact
4 Pole	**Style 1**	**Style 2**
White*	Contact #2	Contact #2
Black	Unnumbered Contact	Contact #3
Red	Contact #1	Contact #1
Yellow/Russet (Style 1 only)	Contact #3	
Green**	Grounding Lug on Retaining Cup	Grounding Contact

NOTE: All installations must be electrically tested to assure proper polarity of conductors between plugs, receptacles and connectors.

*White wire must not be used for grounding. If portable cable contains an uninsulated wire, or one identified green, this wire is for grounding the portable device. If no green or bare wire is in the portable cable, another wire may be connected through plug and receptacle connections to conduit or some other non-current-carrying conductor permanently grounded in accordance with Article 250 of the National Electrical Code.
**Use the pressure type termination

2. Make sure that the diameter of the cable to be attached to the plug is compatable with the AP Series plug strain relief and bushing. Refer to Tables 2 and 3 for AP Series plug catalog numbers and the corresponding cable diameters that they will accommodate.

TABLE 2 200 AMPERE AP PLUG

Catalog No. (.56" Dia. Wire Well)	Cable Diameter Accommodated (Inches)	Catalog No. (.75" Dia. Wire Well)	Cable Diameter Accommodated (Inches)
AP20355	.875 to 1.375	AP203511	1.375 to 1.875
AP20357	1.375 to 1.875	AP203512	1.875 to 2.500
AP20358	1.875 to 2.500	AP204511	1.375 to 1.875
AP20455	.875 to 1.375	AP204512	1.875 to 2.500
AP20457	1.375 to 1.875	AP204513	2.500 to 3.000
AP20458	1.875 to 2.500	AP203610	.875 to 1.375
AP20365	.875 to 1.375	AP203611	1.375 to 1.875
AP20367	1.375 to 1.875	AP203612	1.875 to 2.500
AP20368	1.875 to 2.500	AP204611	1.375 to 1.875
AP20465	.875 to 1.375	AP204612	1.875 to 2.500
AP20467	1.375 to 1.875		
AP20468	1.875 to 2.500		

TABLE 3 400 AMPERE AP PLUG

Catalog No. (.84" Dia. Wire Well)	Cable Diameter Accommodated (Inches)	Catalog No. (1.25" Dia. Wire Well)	Cable Diameter Accommodated (Inches)
AP40357	1.375 to 1.875	AP403510	2.500 to 3.000
AP40358	1.875 to 2.500	AP403512	3.000 to 3.500
AP40457	1.375 to 1.875	AP404510	2.500 to 3.000
AP40458	1.875 to 2.500	AP404512	3.000 to 3.500
AP40367	1.375 to 1.875	AP403610	2.500 to 3.000
AP40368	1.875 to 2.500	AP403612	3.000 to 3.500
AP40467	1.375 to 1.875	AP404610	2.500 to 3.000
AP40468	1.875 to 2.500	AP404612	3.000 to 3.500

3. Loosen hex head bolts on cable clamps and slide gland nut over cable. Slide slip washer over cable with bevel towards the gland nut.

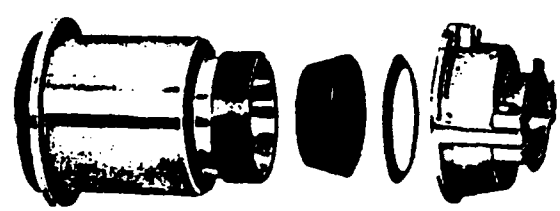
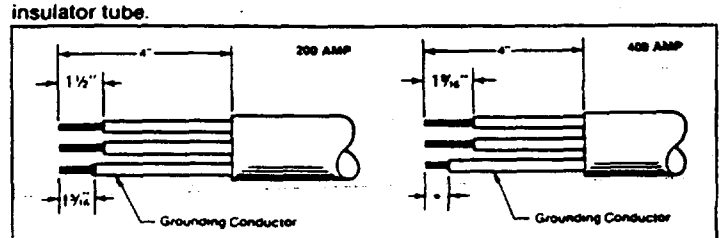


Figure 4 Gland Nut/Handle Body Detail

4. Slide sealing bushing (selected from bushings packed with unit) that has smallest inside diameter that will pass over the cable. Slide over cable with large end towards gland nut. Slide handle body over cable. See Figure 4.

5. Strip outer cable jacket and then conductor insulation to the dimensions shown in figure 5. These dimensions will allow the conductor cable to bottom in the contact wire well and the cable insulation to extend into the insulator tube.



*Strip ¾" For Use With STYLE 1 Wire Well
All Others — Strip 1-9/16".

Figure 5 Cable Insulation

CAUTION

Do not cut into the individual conductor insulation when removing the outer cable jacket. Do not damage the conductor when removing its insulation.

6. Connect the conductors (except the grounding conductor) into each contact wire well by either crimp (preferred) or solder method, following the established system wiring pattern. Grounding conductors are not crimped or soldered but held securely with two pressure connector screws.

Crimp Connection:

Proper crimp termination may require the use of a wire well reducer to ensure a complete metal fill in the crimped joint. Tables 4 and 5 list the various wire well reducers and crimping dies to be used with each wire well contact and conductor size.

Figure 6 Wire Well Reducer Installation

Select the proper wire well reducer (supplied with AP Series plugs ordered with a "T" suffix on the catalog number), and insert into the contact wire well. See Figure 6. Insert the conductor and crimp the connection in two places using a Thomas & Betts hex crimp die recommended in Tables 4 and 5. Crimp near bottom of wire well first making sure that the reducer is fully inserted in wire well. Refer to Figure 7.

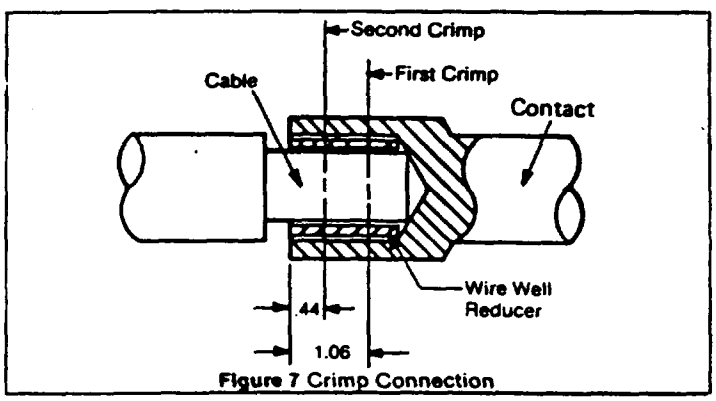


Figure 7 Crimp Connection

Inspect the crimp connection. The contact must securely grip the conductor without any cracks or tears in the wire well. Remove any flash raised by crimping.

TABLE 4 200 AMPERE CONTACTS

CONTACT I.D.	CABLE SIZE AWG/MCM	CONDUCTOR CONSTRUCTION CLASS	STRANDS	DIA.	REDUCER REQUIRED O.D.	I.D.	T & B* DIE NO.
.56	1	B	19	.332	.555	.469	54
		H	259	.378	.555	.469	54
		I	210	.367	.555	.469	54
.56	1/0	B	19	.373	.555	.469	54
		H	259	.424	.555	.469	54
		I	266	.441	.555	.469	54
.56	2/0	B	19	.418	.555	.469	54
		H	259	.477	.555	.500	54
		I	342	.500	none required		54
.56	3/0	B	19	.470	none required		54
		H	427	.535	none required		54
		I	418	.549	none required		54
.56	4/0	B	19	.528	none required		54
.75	4/0	H	427	.602	.745	.672	66H
		I	532	.613	.745	.672	66H
.75	250	B	37	.575	.745	.672	71H
		H	427	.653	.745	.672	66H
		I	637	.682	none	required	66H

*Use in Thomas & Betts Crimp Tools, Catalog #13642 (Head) #13604 (Pump)

TABLE 5 400 AMPERE CONTACTS

CONTACT I.D.	CABLE SIZE AWG/MCM	CONDUCTOR CONSTRUCTION CLASS	STRANDS	DIA.	REDUCER REQUIRED O.D.	I.D.	T & B* DIE NO.
.84	350	B	37	.681	.830	.735	87H
		H	427	.772	none required		87H
		I	882	.800	none required		87H
.84	400	B	37	.728	.830	.735	87H
		H	427	.826	none required		87H
		I	980	.831	none required		87H
.84	500	B	37	.813	none required		87H
1.25	500	H	427	.923	1.240	.950	115H
		I	1,225	.941	1.240	.950	115H
1.25	600	B	61	.893	1.240	.950	115H
		H	703	1.022	1.240	1.040	115H
		I	1,470	1.027	1.240	1.040	115H
1.25	700	B	61	.964	1.240	1.040	115H
		H	703	1.106	none required		115H
		I	1,729	1.184	none required		115H
1.25	750	B	61	.998	1.240	1.040	115H
		H	703	1.145	none required		115H
		I	1,862	1.235	none required		115H
		M	18,788	1.207	none required		115H

*Use in Thomas & Betts Crimp Tools, Catalog #13642 (Head) #13604 (Pump)

Solder Connection:

Reliable solder connections require the use of proper soldering techniques.

Remove insulation from conductor as shown in Figure 5 and wire brush contact wire well.

Hold contact in insulated vise with wire well in upright position. Heat and pre-tin the wire well using a 60-40 rosin core solder. Do not fill well with solder.

NOTE: A high heat source (750° F) is required for good soldering. Use a high current resistance type. A torch may be used only if the surrounding conductor insulation is adequately protected.

Insert conductor into wire well as far as possible while applying heat to the well. Add solder by melting on conductor until well fills and a smooth concave surface of solder forms between the cable and well lip.

Remove heat but continue to hold the conductor and contact rigid until solder solidifies. A good solder connection is indicated by a bright shiny solder surface.

PLUG ASSEMBLY

1. Place retaining cup around rear insulator insulation tubes.

2. Following the system wiring pattern, push each contact into position in the rear insulator body. Insert the green or grounding conductor into the grounding contact wire well at the same time. Securely tighten the two pressure connector screws to 30 in. lb. torque.

NOTE: NEC prohibits soldering of the grounding conductor in the grounding contact.

3. Install the contact retaining clips onto each contact when fully inserted into rear insulator body. See Figure 8.

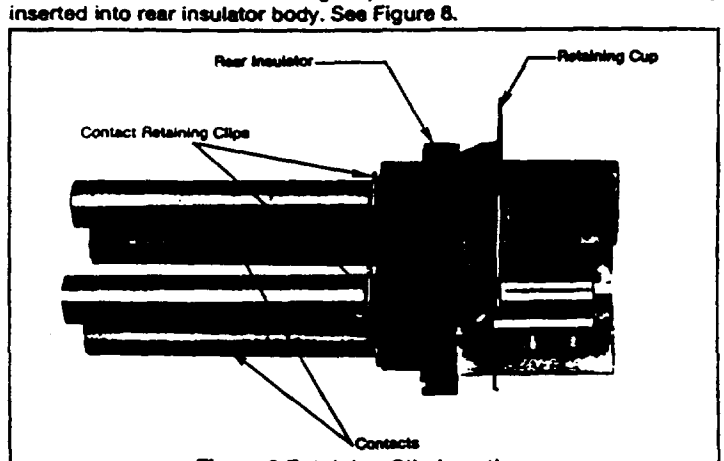


Figure 8 Retaining Clip Locations

4. Slide front insulator over contacts making sure that polarizing grooves are aligned. Slide plug sleeve over contact assembly with polarizing grooves sliding over alignment key until insulators seat on the inside boss.

5. Install two slotted ¼-20 hex head screws through holes in retaining cup into sleeve. Torque to 30 in. lb.

NOTE: The grounding strap from the grounding contact in Style 2 plugs is also attached to the sleeve with one of these screws. The strap is to be placed on top of the retaining cup. Refer to Figure 9.

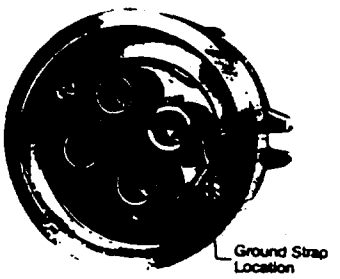


Figure 9 Grounding Strap Location

6. Slide handle body up cable and thread into plug sleeve until bottomed on O-ring gasket. Torque to 10 lbs. ft. minimum. Tighten set screw on handle body flange to 25 in. lbs. torque.

7. Slide sealing bushing and slip washer into place in handle body. Screw gland nut onto end of handle body tight enough to firmly squeeze bushing against cable. While tightening the gland nut, push in on cable to relieve strain on the wire terminals. Tighten gland nut set screw to 25 to 35 in. lbs. torque.

8. Tighten the cable clamp hex head bolts to 25 to 35 in. lbs. torque completing reassembly of the plug.

SPECIAL FEATURES

AP Series plugs with special features are identified through the addition of a suffix to the Catalog Number.

Suffix T: Plug is supplied with wire well reducers for crimp termination.
Suffix S4: Plug interior is rotated 22-1/2 degrees for special polarity application.
Suffix S22: Reversed contacts: Plug is assembled with recessed male contacts.

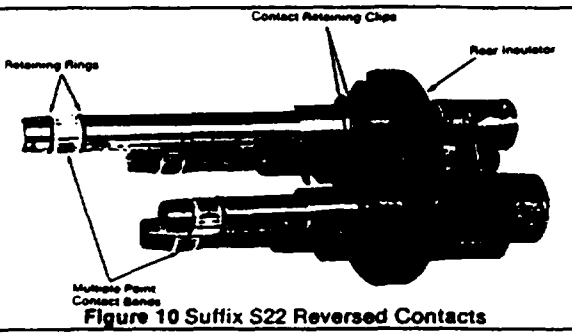


Figure 10 Suffix S22 Reversed Contacts

CAUTION
The multiple point bands and their retaining rings on the S22 reversed contacts must not be removed. Inspect and replace if broken, damaged, or missing. Plug will not operate properly without all bands and retaining rings intact. Each band is secured with two rings - one on each end.

AP Series plugs with special features such as reversed contacts (Suffix S22) and rotated interiors (Suffix S4) are compatible only with receptacles and cable connectors built with the same special feature. Always compare catalog numbers located on unit nameplates if in doubt.

WARNING
If any parts of the plug, receptacle, or connectors appear to be missing, broken, or show signs of damage,
DISCONTINUE USE IMMEDIATELY.
Replace with the proper replacement part(s) or properly repair the item(s) before continuing service.

ELECTRICAL TESTING

Do not connect to power until the following electrical tests have been performed:

- Make continuity checks of wiring to verify correct phasing and grounding connections.
- Check insulation resistance to be sure system does not have any short circuits or unwanted grounds.

NOTE: The National Electrical Manufacturers Association (NEMA) publication No. PB1.1-1979 indicates that an insulation resistance of less than 1 megohm on an open circuit is an unsafe condition that must be investigated and corrected prior to turning the power on.

MAINTENANCE

Electrical and mechanical inspection of all components must be performed on a regular schedule determined by the environment and frequency of use. It is recommended that inspection be performed a minimum of once a year.

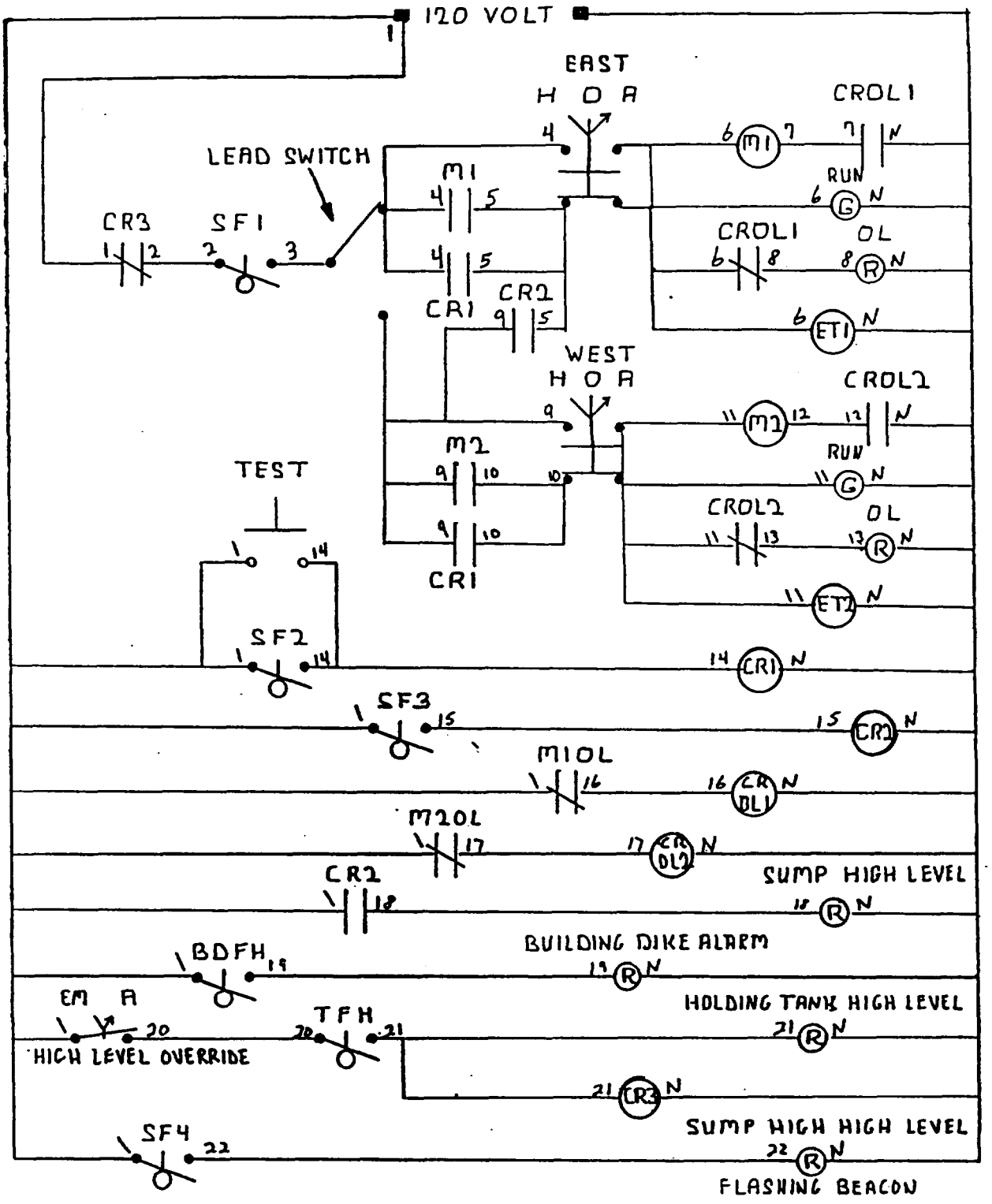
1. Inspect all contact terminators for tightness. Discoloration due to excessive heat is an indicator of a possible problem and should be thoroughly investigated and repaired as necessary.
2. Inspect interior insulation for surface contamination or physical damage such as cracked or broken segments. Contaminated insulators should be cleaned and broken insulators replaced.
3. Check grounding and bonding for correctness of installation and secureness of connection.
4. Check gaskets for deterioration and replace if necessary.
5. Clean exterior surfaces making sure nameplates remain legible.
6. Inspect the multiple point contact bands and retaining rings on the Suffix S22 reversed contacts. Replace if broken, damaged or missing. Do not operate without all bands and retaining rings intact.
7. Inspect cable clamp tightness to ensure proper cable gripping.
8. Check tightness of all screws before using.
9. Inspect metal housings and replace those which are cracked or broken.

In addition to these required maintenance procedures, we recommend an Electrical Preventive Maintenance program as described in the National Fire Protection Association Bulletin NFPA No. 70B.

ELECTRICAL RATING

Maximum Voltages: 600 VAC @ 50-400 Hz, 250 VDC
Maximum Continuous Current: 200 or 400 Amperes.

CROUSE-HINDS ELECTRICAL CONSTRUCTION MATERIALS
Division of Cooper Industries, Inc. • Syracuse, New York 13221 • USA



ALL SWITCHES SHOWN IN AUTO POSITION.
ALL FLOAT SWITCHES SHOWN IN OPEN POSITION.
SF1 - SUMP FLOAT LOWEST LEVEL.
SF2 - Sump FLOAT SECOND LEVEL, STARTS LEAD PUMP.
SF3 - Sump FLOAT HIGH LEVEL, STARTS SECOND PUMP
SF4 - SUMP FLOAT HIGH HIGH LEVEL, TURNS ON BEACON.
BDFH - BUILDING DIKE FLOAT HIGH LEVEL.
TFH - HOLDING TANK HIGH LEVEL FLOAT.

B+K ELECT. CONT. INC.
1503 MICHAELS ST.
CRETE ILLINOIS 60417
708-672-5320

DWG. NO. 2750-1A

WAUCONDA LANDFILL

DWG. APPROVED AND ACCEPTED BY:
DATE: 3/9/92 NAME: Richard H. Olson

DATE: 2-9-92

B & K ELECTRICAL CONTRACTING, INC.
1503 MICHAEL'S STREET
CRETE, IL 60417
(708) 672-5320 OR 349-6586

Wauconda Landfill Project
Sump pumping system
Wauconda Illinois

SEQUENCE OF OPERATION FOR AUTOMATIC MODE

SELECT EAST OR WEST PUMP OPERATION USING THE "LEAD SELECTOR SWITCH".
PLACE BOTH HAND/OFF/AUTO SWITCHES IN THE AUTOMATIC POSITION.
PLACE "HOLDING TANK HIGH LEVEL OVERRIDE SWITCH" IN THE AUTOMATIC POSITION.
AUTOMATIC OPERATION MODE SELECTION IS NOW COMPLETE.
SYSTEM WILL NOW OPERATE AS FOLLOWS:

- liquid level rises in sump pit and makes SF1 float switch.
- liquid level continues to rise in sump pit and makes SF2 float switch.
- when SF2 is made, CR1 relay pulls in starting the pump which was selected by the lead switch.
- lead pump will continue to run until liquid levels drops below SF1 float switch.
- if lead pump will not keep up with liquid level and water continues to rise, SF3 will make and pull in CR2 relay, which will start the second pump.
- both pumps will continue to run until liquid level drops below SF1 float switch.
- if both pumps will not keep up with liquid level, SF4 will make, lighting the red rotating beacon light located at the control cabinet near street.
- if you are pumping to the holding tank, when high level is reached in the tank, the high level float switch (TFH) located on top of the holding tank will make, pulling in CR3 relay and will shut down either or both pumps.
- by placing the "high level override switch" in the emergency position, you will override the high level float on the holding tank and will be able to continue pumping operation. **YOU MUST REMEMBER THAT WITH THE "HIGH LEVEL OVERRIDE SWITCH" IN THE EMERGENCY POSITION, THE HOLDING TANK HIGH LEVEL ALARM IS BY-PASSED AND WILL HAVE NO EFFECT ON THE PUMPS OR THE LEVEL INDICATION IN THE HOLDING TANK.**

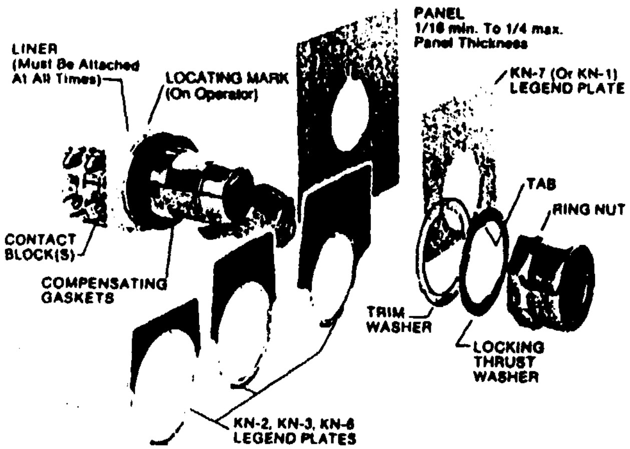
B & K ELECTRICAL CONTRACTING, INC.
1503 MICHAEL'S STREET
CRETE, IL 60417
(708) 672-5320 OR 349-6586

Wauconda Landfill Project
Sump pumping system
Wauconda Illinois

SEQUENCE OF OPERATION FOR MANUAL MODE

SELECT EAST OR WEST PUMP OPERATION USING THE "LEAD SELECTOR SWITCH".
PLACE PUMP SELECTED BY LEAD SWITCH IN THE HAND POSITION.
PLACE SECOND PUMP IN THE OFF OR THE AUTO POSITION. if second pump is placed in the auto position, it will operate as in the auto mode and turn on when SF3 makes. if second pump is placed in the off position it will not operate.
PUMPS WILL ONLY OPERATE IF THERE IS LIQUID PRESENT IN THE SUMP PIT AND SF1 IS MADE.
BOTH PUMPS WILL NOT OPERATE IN THE HAND POSITION UNLESS SF3 IS MADE.
CARE SHOULD STILL BE TAKEN IN REGARDS TO THE "HIGH LEVEL OVERRIDE SWITCH". NORMAL OPERATING POSITION MUST BE IN THE AUTO POSITION.
MANUAL OPERATION MODE SELECTION IS NOW COMPLETE.

CLASS 9001 TYPE KS__K KEY OPERATED SELECTOR SWITCH OPERATOR UNDERWRITERS LABORATORIES LISTED FOR USE ON A FLAT SURFACE OF TYPE 1, 2, 3, 3R, 4, 6, 12 AND 13 ENCLOSURES



A. Installation of Operator to Panel Using Class 9001 Type KN-2, KN-3 or KN-6 Legend Plates.
See Cam Replacement Instructions Before Installing Contact Blocks.
1. Mount only Class 9001 Type KA Contact Block to the operator. Tighten Mounting Screws to 5-8 in. lb.
CAUTION: Mount a maximum of 2 contact units to momentary (spring operated) operators. Mount a maximum of 4 contact unit, 2 in tandem and 2 side by side on maintained operators.
2. Remove the ring nut, locking thrust washer and trim washer from the operator.
3. Discard the locking thrust washer and trim washer.
4. Retain the required number of compensating gaskets (determined from Figure 1) on the operator.
5. Insert the operator into the panel from the rear with the locating mark at the top.
6. Install the required Legend Plate on the operator by aligning the tab with slots in the operator and panel.
7. Install the ring nut on the operator and tighten with a Class 9001 Type K-95 ring nut wrench. Recommended tightening torque: 6-8 pound-feet.

B. Installation of Operator to Panel Using Class 9001 Type KN-1 and KN-7 Legend Plates.
Follow steps A1, A2, A4 and A5 above.
6. Install the Legend Plate on the operator.
7. Install the locking thrust washer on the operator by aligning the tab with the slots in the operator, Legend Plate and panel.
8. Install the ring nut on the operator and tighten with a Class 9001 Type K-95 ring nut wrench. Recommended tightening torque: 6-8 pound-feet.

C. Installation of Operator to Panel Without Legend Plate Follow steps A1, A2, A4 and A5 above.
6. Install the trim washer on the operator.
7. Install the locking thrust washer on the operator by aligning the tab with the slots in the operator, trim washer and panel, then follow step B8 above.

30072-100-17J

MINIMUM CENTERLINE SPACINGS

	Vertical	Horizontal
Without Legend Plate	1.56	2.25
With Legend Plate		Consult your Square D Digest

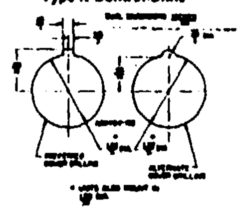
GASKET SELECTION CHART	
Panel Thk.	No. of Gaskets
1/16	4
1/8	3
3/16	2
1/4	1

Figure 1

CLASS 9001 TYPE K-95 RING NUT WRENCH

Figure 2

Mounting Hole for All Type K Control Units



HOLE PUNCH

The 1.22 diameter hole required to mount Type K operators may be cut with Greenlee knockout punch No. 730-S. The notch may be cut with Greenlee punch No. 730-K. Both punches are available through electrical wholesalers.

Figure 3

SQUARE D

	KS88K		H		4	OO	XO	OOXO
					3	OX	OO	OXOO
					2	OO	OX	OOOX
					1	XO	OO	XOOO
	34K		D		2	[illegible]	[illegible]	[illegible]

B.13 BUILDING ENCLOSURE

DRAWN DPM	DATE 7-24-87
CHECKED EJS	JOB NO. 8717200
SCALE NOTED	

PLAN, SECTIONS AND DETAILS

LEACHATE HOLDING TANK
ENCLOSURE
WAUCONDA LANDFILL SITE
WAUCONDA, ILL
SEVENSON CONTAINMENT CORP

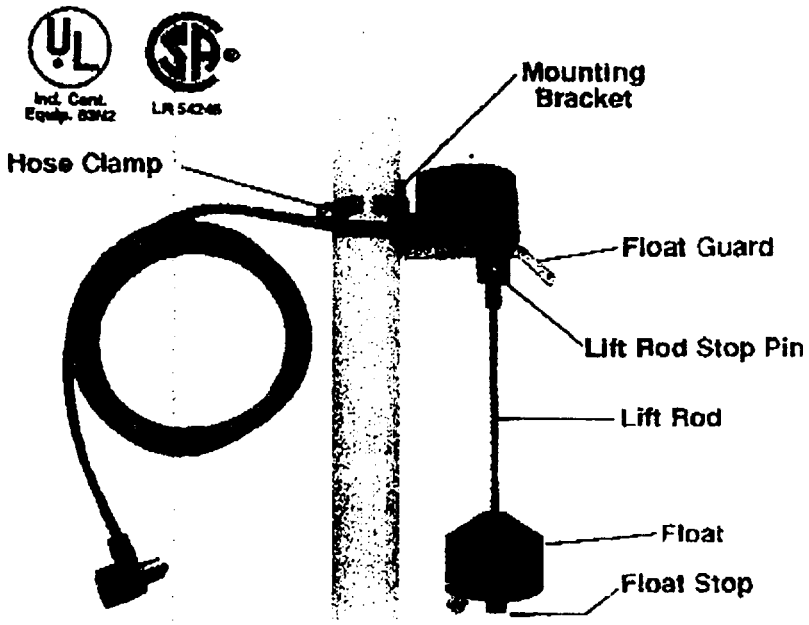
URS COMPANY, INC.

S-2

B.14 MISCELLANEOUS COMPONENTS

SJE VERTICALMASTER Pump Switch

Provides automatic pump operation in confined areas.

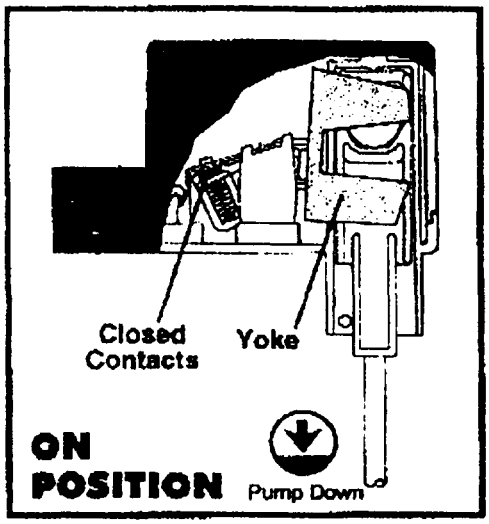


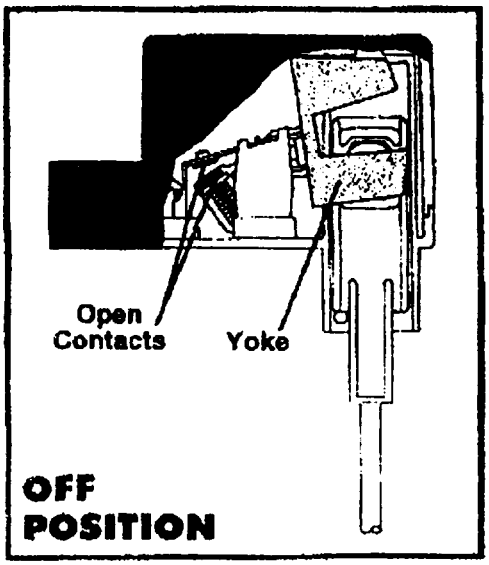
FEATURES:

- Magnetically activated
- Heavy duty contacts
- Adjustable pumping range of $^{3}/_{4}$ to 6 $^{1}/_{2}$ inches
- Not sensitive to turbulence
- Available in pump down models only
- Two year limited warranty
- UL Listed for water and sewage and CSA Certified

U.S. PATENT Nos. 5,155,311
CANADIAN PATENT Pending

The SJE VerticalMaster™ pump switch is designed to operate in applications with limited space. It works well in small sump chambers, effluent applications, and laundry trays, as well as in large tanks. The SJE VerticalMaster™ pump switch is capable of directly controlling pumps up to 1/2 HP at 120V and 1 HP at 230V. It is designed for easy attachment and is available in pump down models only.





SPECIFICATIONS

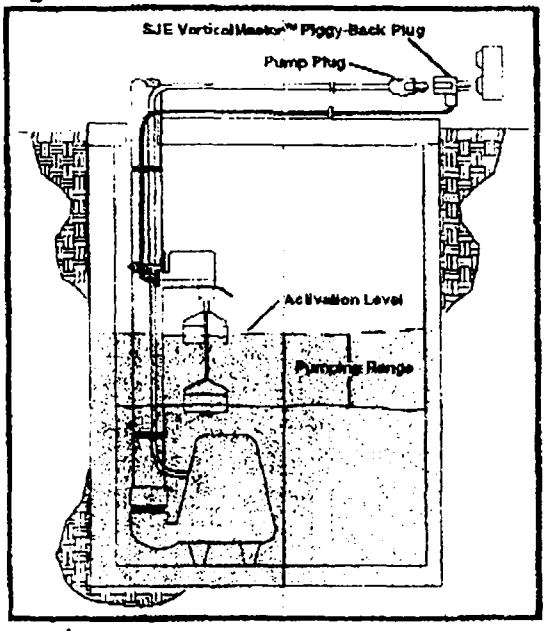
CABLE: Flexible 16 gauge, 2 conductor SJOW-A (UL), SJOW (CSA) water-resistant
MOUNTING BRACKET & HOSE CLAMP: Stainless steel
LIFT ROD: Injection molded acetal plastic
FLOAT STOP: Neoprene
SWITCH AND FLOAT HOUSING: Impact resistant, non-corrosive PVC plastic for use in liquids up to 140°F (60°C).
overall dimensions: 12 inch (30.5 cm) high x 4 inch (10.2 cm) wide
switch housing dimensions: 2 inch (5 cm) high x 2.8 inch (7.1 cm) wide (excluding cable entrance)
float housing dimensions: 2.3 inch (5.8 cm) high x 2.7 inch (6.9 cm) wide
NOTE: This pump switch must be used only with pumps equipped with integral thermal overload protection.
ELECTRICAL:

Voltage/Phase	Maximum Pump Running Current	Maximum Pump Starting Current	Recommended Pump HP
120 VAC	13 amps	60	1/2 HP or less
230 VAC	13 amps	60	1 HP or less

NOTE: Model without plug (for direct wiring) may be used in either 120V or 230V applications within specified amp ratings.

SJE VerticalMaster™ Pump Switch Installation Instructions

Figure A



WARNING: Tank must be vented in accordance with local plumbing codes. Do NOT install pump switch in locations classified as hazardous in accordance with the National Electrical Code, ANSI/NFPA 70-1993.

This product **must** be installed in accordance with national and local electrical codes.

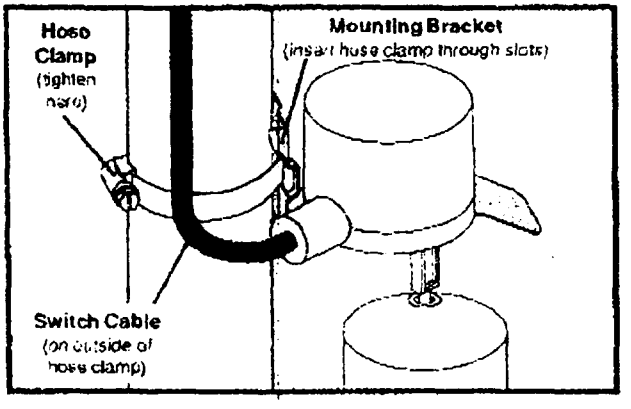
- Read these instructions carefully and retain with warranty card when installation is complete.
- Do not remove label from switch cable.

To avoid electrical hazards, follow these precautions:

- Turn off power source before installing or adjusting this device. Failure to turn off power could result in serious or fatal electrical shock.
- Do not connect this product while standing on a wet or damp surface.
- Electrical outlet must NOT be located in the pump chamber.
- Electrical outlet voltage, piggy-back plug voltage, and pump plug voltage must match. (All must be 120V or 230V.)

Caution: In a 230V pump installation, one side of the line going to the pump is always "hot." This condition exists regardless of whether the pump switch is on or off.

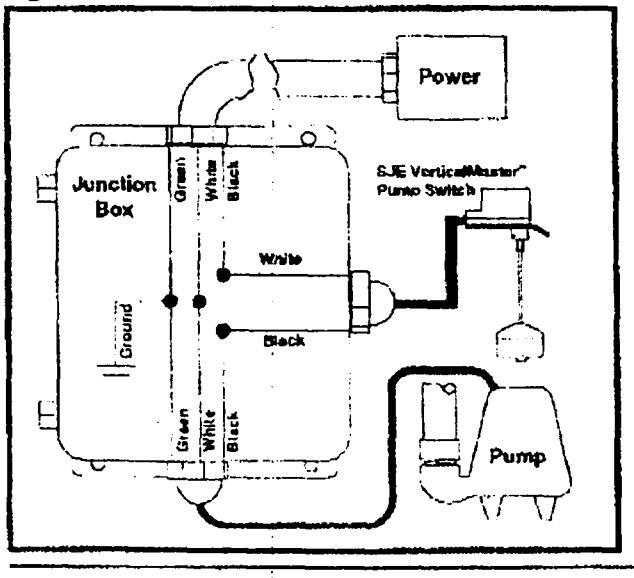
Figure B



PIGGY-BACK PLUG INSTALLATION

1. Piggy-back plug must be removed from electrical outlet **before** installing or servicing the pump and/or switch.
2. Determine desired activation level and pumping range for your installation. (See Figure A.) Pumping range can be adjusted by moving the float stop up or down the rod. Note: Switch should not be mounted in direct line of incoming liquid.
3. Insert hose clamp through slots in mounting bracket. (See Figure B.)
4. Position hose clamp around discharge pipe with bracket gripping tabs against pipe. Cable should remain on the outside of the hose clamp. (See Figure B.)
5. Tighten the hose clamp securely.
6. Secure pump cable and switch cable to discharge pipe.
7. Plug piggy-back plug into outlet. (See Figure A.)
8. Plug pump into piggy-back plug.
9. Check your installation. Allow pump to cycle several times to ensure proper pump range.

Figure C: Direct Wire Installation



DIRECT WIRE INSTALLATION

(Piggy-back plug may be removed for direct wire installation.)

1. Turn off circuit breaker. To avoid hazards, and for convenience, install the double pole disconnect (breaker) near the pump installation.
2. Determine desired activation level and pumping range for your installation. (See Figure A.) Pumping range can be adjusted by moving the float stop up or down the rod. Note: Switch should not be mounted in direct line of incoming liquid.
3. Insert hose clamp through slots in mounting bracket. (See Figure B.)
4. Position hose clamp around discharge pipe with bracket gripping tabs against pipe. Cable should remain on the outside of the hose clamp. (See Figure B.)
5. Tighten the hose clamp securely.
6. Secure pump cable and switch cable to discharge pipe.
7. Direct wire pump switch according to Figure C.
8. Check your installation. Allow pump to cycle several times to ensure proper pump range.

S.J. ELECTRO SYSTEMS, INC.
Built With Pride - Employee Owned
P.O. Box 1619, County Rd 6, Detroit Lakes, MN 56502 USA
Phone: (218) 847-1317 Fax: (218) 847-4617

P/N 1003602C 07/94
Printed in USA


C

APPENDIX C

STANDARD REPORTING FORMS

(1) MONTHLY RECORD OF LEACHATE TRANSFER TO HAULAGE VEHICLE

(2) SAMPLE WASTE MANIFEST FORM

(3) REGULAR, MONTHLY AND ANNUAL INSPECTION REPORT

LEACHATE TRANSFER RECORD - WAUCONDA LANDFILL SITE

MONTH OF _____, ____

DATE	TIME	TANK LEVEL BEFORE LOADING (feet)	TANK LEVEL AFTER LOADING (feet)	VOLUME LOADED TO TANK TRUCK (gallons)	NAME OF CONTRACTOR PERSONNEL

STATE OF ILLINOIS

ENVIRONMENTAL PROTECTION AGENCY DIVISION OF LAND POLLUTION CONTROL

P.O. BOX 19276 SPRINGFIELD, ILLINOIS 62794-9276 (217) 782-6761

FOR SHIPMENT OF HAZARDOUS AND SPECIAL WASTE

State Form LPC 62 8/81 IL532-0610

PLEASE TYPE (Form designed for use on elite (12-pitch) typewriter.)

EPA Form 8700-22 (Rev. 9-88)

Form Approved. OMB No. 2050-0039, Expires 9-30-92

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.	Manifest Document No.	2. Page 1 of	Information in the shaded areas is not required by Federal law, but is required by Illinois law.

3. Generator's Name and Mailing Address — Location If Different

A. Illinois Manifest Document Number IL 3836597

B. Illinois Generator's ID

4. "24 HOUR EMERGENCY AND SPILL ASSISTANCE NUMBERS"

5. Transporter 1 Company Name	6. US EPA ID Number	C. Illinois Transporter's ID	D. ( ) Transporter's Phone
7. Transporter 2 Company Name	8. US EPA ID Number	E. Illinois Transporter's ID	F. ( ) Transporter's Phone
9. Designated Facility Name and Site Address	10. US EPA ID Number	G. Illinois Facility's ID	H. Facility's Phone ( )

GENERATOR

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.					EPA HW Number X X / Authorization Number
b.					EPA HW Number X X / Authorization Number
c.					EPA HW Number X X / Authorization Number
d.					EPA HW Number X X / Authorization Number

J. Additional Descriptions for Materials Listed Above

K. Handling Codes for Wastes Listed Above In Item #14

G = Gallons Y = Cubic Yards

15. Special Handling Instructions and Additional Information

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name	Signature	Date Month Day Year

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date Month Day Year

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.

Printed/Typed Name	Signature	Date Month Day Year

In case of a spill call the Illinois ...

This Agency is authorized to require, pursuant to Illinois Revised Statute, 1989, Chapter 111 1/2, Section 1004 and 1021, that this information be submitted to the Agency. Failure to provide this information may result in a civil penalty against the owner or operator not to exceed $25,000 per day of violation. Falsification of this information may result in a fine up to $50,000 per day of violation and imprisonment up to 5 years. This form has been approved by the Forms Management Center.

Week Beginning: _____ Days since previous inspection: _____

WAUCONDA LANDFILL SITE INSPECTION REPORT - PART I

Regular (R): _____ Monthly (M): _____ Annual (A): _____

Inspector(s): (1) _____ Company: _____
(2) _____ _____

Date of Inspection: _____ Time of Inspection: _____

Temperature: _____
Precipitation: _____

	Complete By	*Required Frequency*	*Yes*	*No*	*Not Check*
A. <u>Leachate Collection/Forcemain and Electrical System:</u>					
1. Electrical Control Panel					
a. Is the panel functioning	Village	R	___	___	___
b. Has system operated without any fault alarms noted or reset made	Village	R	___	___	___
c. Hour meter: East _____ West _____	Village	R	___	___	___
2. Sump 1 Pumping Chamber					
a. Pump E and W operational? Pumping to Sewer or Tank.	Village	R	___	___	___
b. Are pumps E and W free of unusual noises or vibration?	Village	R	___	___	___
c. Valves and pipe watertight?	Village	R	___	___	___
d. Sump liquid level below high-high level?	Village	R	___	___	___
e. Is sump free of any indication of overflow?	Village	R	___	___	___
f. Sump covers secure?	Village	R	___	___	___
g. Level switches secure?	Village	M	___	___	___
h. Sump free of debris?	Village	M	___	___	___
i. Sump vent open?	Village	M	___	___	___
3. Sump 2 Chamber					
a. Chamber and Piping intact?	Village	R	___	___	___
b. Tank has not been backflowed to Sump 2 since previous inspection?	Village	R	___	___	___
4. Meter Chamber					
a. Chamber and piping intact and pumped dry?	Village	R	___	___	___
b. Meter functional?	Village	R	___	___	___
Meter Reading _____ gpm _____ total gal					
5. Drain Chamber and components intact and dry?	Village	M	___	___	___
6. Air release chamber intact and dry?	Village	M	___	___	___
7. Village MH 12-24 intact?	Village	M	___	___	___
8. Buried pipe alignment free of encumberance?	Village	M	___	___	___
9. Is vegetative cover intact over LC drain and FM?	Village	M	___	___	___
10. Is Mutton Creek free of any signs of leachate seepage?	Village	M	___	___	___
11. Has the system operated without any servicing this month?	Village	M	___	___	___

B. <u>Comments/Follow-up Items To Above</u>

_____

_____

_____

Inspector(s) Signature

(1) _____ (2) _____

Week Beginning: _____ Days since previous inspection: _____

WAUCONDA LANDFILL SITE INSPECTION REPORT - PART II

Regular (R): _____ Monthly (M): _____ Annual (A): _____

Inspector(s): (1) _____ Company: _____

(2) _____ _____

Date of Inspection: _____ Time of Inspection: _____

Temperature: _____
Precipitation: _____

	Complete By	*Required Frequency*	*Yes*	*No*	*Not Check*
A. <u>Aboveground Tank and Enclosure Bldg</u>					
1. Containment floor and tank wall dry?	SC	R	____	____	____
2. Tank free of signs of leakage?	SC	R	____	____	____
3. Piping/valving free of signs of leakage?	SC	R	____	____	____
4. Tank has not been backflowed to sumps since last inspection?	SC	R	____	____	____
5. Is the backflow system secure and off?	SC	R	____	____	____
6. No high level alarm since last inspection?	SC	R	____	____	____
7. Tank and piping insulation secure?	SC	R	____	____	____
8. Pipe heat tracing operating?	SC	R	____	____	____
9. Tank pad heaters operating?	SC	R	____	____	____
10. Is tank top free of signs of overfilling?	SC/CRA	M	____	____	____
11. Is concrete free of damage and spalling?	SC/CRA	M	____	____	____
12. Is building structure in good condition?	SC/CRA	M	____	____	____
13. Tank vent open and clear?	SC/CRA	M	____	____	____
14. Sump liquid level indicator operational?	SC/CRA	M	____	____	____
Tank level: _____					
B. <u>Truck Turnaround</u>					
1. Entrance gate and lock secure?	SC	R	____	____	____
2. External above ground piping for truck loading					
a. free of leakage?	SC	R	____	____	____
b. suction line valve closed?	SC	R	____	____	____
c. insulation secure?	SC	R	____	____	____
d. heat tracing operating?	SC	R	____	____	____
3. Loading pad free of liquids?	SC	R	____	____	____
4. Turnaround area intact?	SC/CRA	M	____	____	____
5. Entrance culvert intact?	SC/CRA	M	____	____	____
6. Concrete sump/pad intact?	SC/CRA	M	____	____	____
C. <u>Leachate Collection System</u>					
1. Meter sump pump operational?	SC	R	____	____	____
2. Review Village inspection checklist?	SC	R	____	____	____
3. Pump run times E _____ W _____					
4. Meter Reading _____ gpm _____ total gal					

WAUCONDA LANDFILL SITE INSPECTION REPORT - PART II

Regular (R): _____ Monthly (M): _____ Annual (A): _____

	Complete By	*Required Frequency*	*Yes*	*No*	*Not Check*
D. Landfill Cap and Perimeter					
1. Cover intact and free of erosion?	SC/CRA	M	___	___	___
2. Vegetation cover intact?	SC/CRA	M	___	___	___
3. Perimeter fence and gates intact?	SC/CRA	M	___	___	___
4. Is cover free of surface water ponding?	SC/CRA	M	___	___	___
5. Is cover free of exposed refuse or leachate leaks?	SC/CRA	M	___	___	___
6. Is cover free of animal burrows?	SC/CRA	M	___	___	___
7. On-Site access road to sump 1 driveable?	SC/CRA	M	___	___	___
8. On-Site access road to permit landfill driveable?	SC/CRA	M	___	___	___
9. Grid-pattern walk-over of cap (attach notes)	SC/CRA	A	___	___	___
E. Gas Vents and Monitoring Wells					
1. Are vents and wells properly locked and secure?	SC/CRA	A	___	___	___
2. Bleed hole in casing clear?	SC/CRA	A	___	___	___
3. Is well free of blockage?	SC/CRA	A	___	___	___
4. Depth to bottom of well consistent?	SC/CRA	A	___	___	___
5. Protective posts in place and secure?	SC/CRA	A	___	___	___
6. Are labels legible?	SC/CRA	A	___	___	___
F. Personal Protective Equipment					
1. PPE supplies adequate and maintained	SC/CRA	M	___	___	___
2. Spent materials properly disposed	SC	M	___	___	___

G. Well Liquid Level to Top of Pipe (Monthly)

1. LW501 : _____
2. LW502 : _____
3. LW503 : _____
4. LW504 : _____
5. Permit Manhole : _____

H. Comments/Follow-up Items To Above

_____

_____

_____

Inspector(s) Signature

(1) _____ (2) _____


D

APPENDIX D

LIST OF PROJECT CONTACTS

WAUCONDA LANDFILL - CONTACT PHONE LIST

COMPANY	FUNCTION	PHONE	CONTACT	ADDRESS	CITY
EMERGENCY NUMBERS					
Ambulance, Police, Fire	**Emergency**	**911**			**Wauconda, Il.**
Emergency Disaster Agency		800-782-7860			
Emergency Response Unit		217-782-3637			
Good Shepard Hospital	non-emergency medical	847-381-9600		450 W.Hwy.Rt. 22	Barrington, IL 60010
National Response Center	spill reporting	800-424-8802			
Poison Control Center	poison information	708-942-5969			
CONTRACTORS					
Action Fence Co.	fence repairs	847-358-9100	Don Zeigler	Rand & Lake Cook Rds.	Palatine, IL 62560
American Power Rodding	LCS cleaning	847-526-3800	Dan Peterson	1000-110 N. Rand Road	Wauconda, IL 60084
Countryside Landfill	non-haz waste disposal	847-223-2722		Rt. 83	Grayslake, IL 60030
B & K Electrical Contractor	electrical repairs	708-672-5320	Larry Breer	Page 708-953-5405 1503 Michael St.	Crete, IL 60417
Berger Excavating	cap maintenance	847-526-5456	Neil/Dale Berger	1003 Washington St.	Wauconda, IL 60084
Berger Excavating	cap maintenance	847-337-4407	Neal Berger (car)		Wauconda, IL 60084
Berger Excavating (FAX)	cap maintenance	847-526-4204	Neil/Dale Berger		Wauconda, IL 60084
Blackledge Land Surveying	survey monuments	847-367-1370	Larry Faith	528 West Street	Libertyville, IL 60048
C.I.D.	leachate disposal	312-646-3099	Barb Bowman	P.O.Box 1309	Calumet City, IL 60409
Commonwealth Edison		800-334-7661			Libertyville, IL
Community Sewer & Septic	LCS tank repairs	847-526-9910	Bob Pruchniak	P.O. Box 874	Wauconda, IL 60084
Consolated Power Roding	LCS cleaning	708-932-7209	Ronald Miles	912 Westwood	Addison, IL 60101
Heritage Remediation	LCS/cap maintenance	708-378-1600	Tim Lutz/Larry Malik		Romeoville, IL 60441
Heritage Remediation	leachate collection system	708-378-1600	Dave Hughes	(leachate collection system)	Romeoville, IL 60441
Hi Tec Electrical	electrical repairs	847-526-0554	Frank Schacelmayer	405 Kimbell Ave.	Wauconda, IL 60087
Lee Jensen Sales Co.	culvert pipe testing	815-459-0929	Dave Nelson	7316 Teckler Boulevard	Crystal Lake, IL 60014
Metropolitan Pump Co.	LCS pumps	800-323-1665	Jeff	1400 Bluff Road	Romeoville, IL 60441
OH Material Co.	LCS/cap maintenance	708-963-0005	Dwight Rueter	1001 Warrenville Rd. Suite 400	Lisle, IL 60532
Ozinga Transport	leachate truck transport	708-361-5451	Rich Jousma		
Ozinga Transport	leachate truck transport	708-626-9334	Rich Jousma (pager)		
Pesz Snow Removal	snow plowing	847-639-9321	Joe Pesz	4705 S. Roberts Rd.	Island Lake, IL 60042
Smith Engineering	surveying	815-385-1778	Kevin Wagner/Bob Wegener	4500 Prime Parkway	McHenry, IL 60050
Smith Engineering (FAX)	surveying	815-385-1781	Kevin Wagner/Bob Wegener		
Suburban Landscaping	landscaping	708-259-6839	Shawn	1500 Barbury Lane	Mt. Prospect, IL 60056
Tree-Landscape Service	landscaping	847-526-8083	Gene Murdock	1013 Highland Ave.	Wauconda, IL 60084
TruGreen/ChemLawn	cap maintenance (grass)	847-658-8770	Alex Tokar/Dave Snellman		
Waste Management	leachate truck transport	708-409-3510	Art Hart		
Waste Management	leachate truck transport	312-740-9995	Art Hart (pager)		
CONTACTS					
Larry Buechel	WTG Technical Coordinator	414-253-8626		W124 N9355 Boundary Road	Menomonee Falls, WI 53051
Larry Buechel (FAX)	WTG Technical Coordinator	414-255-3798			
Harold Brown	Neighbor	847-526-5315		28975 Garland Road	Wauconda, IL 60087
Covers	Neighbor	847-526-0224	Jim Covers	28464 Garland Road	Wauconda, IL
CRA - Chicago	engineer	312-380-9933	Steve Wanner	8615 W. Bryn Mawr Avenue	Chicago, IL 60631
CRA - Chicago (FAX)	engineer	312-380-6421	Steve Wanner		
CRA - Chicago (Home)	engineer	847-526-9409	Steve Wanner		
CRA - St. Paul	engineer	612-639-0913	Steven Voss	1801 Old Highway 8, Suite 114	St. Paul, MN 55112
CRA - St. Paul	engineer	612-639-0913	Ron Frehner	1801 Old Highway 8, Suite 114	St. Paul, MN 55112
CRA - St. Paul (FAX)	engineer	612-639-0923	Ron Frehner/Steven Voss		
CRA - St. Paul (Home)	engineer	612-434-4562	Steven Voss		
CRA - St. Paul (Home)	engineer	612-490-3448	Ron Frehner		N2V1C2
Gary Gengel	WTC Chairman	612-334-2795			
Hedgepath Landscaping		847-487-7284	Phil Hedgepath	1207 Garland Road	Wauconda, IL 60084
Hedgepath Landscaping (pager)		847-626-3611	Phil Hedgepath		
IEPA		217-782-6760	Eric Runkle		Springfield, IL 62708
IEPA	LCS reporting	708-338-7900	Chris Kallis	1701 South First Avenue, Suite 600	Maywood, IL 60153
IEPA	LCS reporting	708-338-7900	Karen Katamay	1701 South First Avenue, Suite 600	Maywood, IL 60153
Lake County D.O.T.	Bonner Road access	847-362-3950	Roy Mauck		
Lake County Health Dept.		708-360-6747		3010 Grand Ave.	Waukegan, IL 60085
Lake County Health Dept.		847-526-1125		118 S. Main St.	Wauconda, IL 60084
Murphy's Auto Parts		847-526-8730	Dave Murphy	Garland Road	Wauconda, IL 60084
Oplinger's Consulting	Past Custodian	847-639-3577	Dick Oplinger	151 Sherwood Drive	Cary, IL 60013
Stanek's	Neighbor	847-526-2968	Jim Stanek		Wauconda, IL
USEPA		312-886-5867	Diane Spencer	230 S. Dearborn St.	Chicago IL 60604
Wauconda Landfill Site	Leachate Tank Building	847-526-7208		1213 Garland Road	Wauconda, IL 60084
Wauconda Public Works	LCS - O&M	847-526-9610	Jeffery Kuester	302 Slocum Lake Road	Wauconda, IL 60084
Wauconda Public Works	LCS - O&M	847-526-9610	Rick Burns	Home 847-526-3625	Pager 314-6514
Wauconda Public Works	LCS - O&M	847-526-9610	Jeff Maute	Home 847-526-9114	Pager 314-6515
Wauconda Public Works	LCS - O&M	847-526-9610	Tim Werner	Home 847-487-1412	Pager 205-8712
Wauconda Township Supv.		847-526-2531		505 Bonner Road	Wauconda, IL 60084
Wauconda Village Hall (FAX)		847-526-8809	Jeff Kuester		Wauconda, IL 60084
Wauconda WWTP	LCS - O&M	847-526-9612	Fred Voytovich		Wauconda, IL 60084
Weather		312-353-4684			
Ken Winkley	Site Custodian	847-776-5392	phone/FAX	131 South Brockway	Palatine, IL 60067
Ken Winkley (celluar)	Site Custodian	847-207-3079			
Ken Winkley (pager)	Site Custodian	708-939-4736			