

**BEFORE THE ILLINOIS POLLUTION CONTROL BOARD**

PEOPLE OF THE STATE OF ILLINOIS, by LISA )  
MADIGAN, Attorney General of the State of )  
Illinois, )  
 )  
Complainant, )  
 )  
v. ) PCB No. 17-76  
PEABODY COULTERVILLE MINING, ) (Enforcement- Water)  
LLC, a Delaware limited liability )  
company )  
 )  
Respondent. )

**NOTICE OF FILING SETTLEMENT  
INVOLVING NPDES PERMIT MATTER**

TO: See attached service list (via electronic mailing)

PLEASE TAKE NOTICE that on the 8<sup>th</sup> day of June, 2017, I filed with the Illinois Pollution Control Board **Exhibit to Stipulation and Proposal for Settlement** (Stipulation previously filed without Exhibit), a copy of which is attached hereto and is hereby served upon you.

NOTIFICATION – Pursuant to 35 Ill. Adm. Code 103.306, or 35 Ill. Adm. Code 103.300(b)(2) if the Board's Procedural Rules are amended in R17-18, where a National Pollutant Discharge Elimination System (NPDES) permit is involved in the settlement, the Board will publish notice of the proposed stipulation and settlement at least 30 days prior to accepting this settlement. This settlement involves an NPDES permit and therefore a notice shall be published.

Respectfully submitted,

PEOPLE OF THE STATE OF ILLINOIS,  
BY LISA MADIGAN, Attorney General of  
the State of Illinois

By: s/Brian J. Clappier  
Brian J. Clappier  
Assistant Attorney General  
Environmental Bureau  
Illinois Attorney General's Office  
500 South Second Street  
Springfield, IL 62701

Date: June 8, 2017

**Service List**

For the Respondent

John Watson, Esq.  
300 E. Randolph Street, Suite 5000  
Chicago, Illinois 60601  
john.watson@bakermckenzie.com

**CERTIFICATE OF SERVICE**

I, Brian Clappier, an Assistant Attorney General, certify that on the 8th day of June, 2017, I caused to be served by electronic mail, the foregoing Notice of Filing and Exhibit to Stipulation and Proposal for Settlement to the parties named on the attached Service List.

s/Brian J. Clappier

BRIAN J. CLAPPIER

Assistant Attorney General

Environmental Bureau, Springfield

Illinois Attorney General's Office

500 South Second Street

Springfield, Illinois 62706

(217) 782-9031

[bclappier@atg.state.il.us](mailto:bclappier@atg.state.il.us)

[ebs@atg.state.il.us](mailto:ebs@atg.state.il.us)

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PEABODY COULTERVILLE MINING, )  
LLC, a Delaware limited liability )  
company )

Respondent. )

PCB No. 17-76  
(Enforcement- Water)

**EXHIBIT TO STIPULATION AND PROPOSAL FOR SETTLEMENT**



## GATEWAY MINE

PEABODY COULTERVILLE MINING,  
LLC

Standard Operating Procedures  
&  
Emergency Management Plan

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**PEABODY COULTERVILLE MINING, LLC**  
**Standard Operating Procedures and Emergency Management Plan**  
**Applicability**

The purpose of this Standard Operating Procedures and Emergency Management Plan is to describe the measures and procedures put into place to limit the discharge of slurry decant water from the facility as well as to prepare personnel to respond in a safe and effective manner in the event of a discharge. This plan acts as a reference for the slurry circuit water management procedures, discharge sampling procedures, as a tool to communicate these practices to facility personnel, and as a resource during emergencies.

The Plan provides guidance on the following:

1. Management of Slurry Circuit water quality including monitoring and chemical adjustment procedures.
2. Measures and procedures to limit discharges from Outfall 008 including the use of automated pumps within the East Basin and Harp Pond impoundments.
3. Sample collection procedures for discharges from Outfall 008.
4. NPDES Monitoring Procedures for the entire facility.
5. Annual employee training for the monitoring and management of the slurry circuit as well as East Basin, Harp Pond, and Outfall 008 structures.
6. Plan amendment requirements including updating the plan within 90 days of a change in facility design, construction, operation, or maintenance that affects the water management at the facility. The revised plan must be submitted to Illinois EPA within 30 days of modification.
7. Annual review of the plan and requirement to update the plan to reflect any administrative changes including personnel changes or revisions to contact information.

**PEABODY COULTERVILLE MINING, LLC**

**PART 1**

**IMMEDIATE ACTION PLAN**

## IMMEDIATE ACTION PLAN

**Immediate action** must be taken to limit the discharge of high solid content or acidic slurry decant water. In general, the following steps are taken:

1. Engage the electric and or diesel pumps in the East Basin and Harp Pond
2. If the water is acidic, treat the water within East Basin and Harp Pond with alkaline amendments including soda ash or ground limestone. Soda ash briquettes may also be placed in the Outfall 008 spillway.
3. Contact the Facility Manager or their alternate.
4. Collect a discharge sample.

**In the event of a discharge**, the following guidelines apply:

1. If the facility manager is not present, the senior on-site staff member notifies the facility manager of the discharge and initiates the response.
2. The facility manager (or senior on-site person) must ensure a discharge sample is collected.
3. The facility manager (or senior on-site person) must contact the Illinois Environmental Protection Agency and IDNR Office of Mines and Minerals within 24-hours if the discharge meets the criteria outlined below.
4. The facility manager (or senior on-site person) verifies all controls (pumps, water treatment) are in place and operating. If the facility manager is not available at the time of discharge, then the next highest staff member in seniority assumes responsibility for coordinating response activities.

### Regulatory Agency Notification

Illinois NPDES rules require the permittee to report any noncompliance that may endanger health or the environment to the Illinois Environmental Protection Agency (**618-993-7200**) and IDNR Office of Mines and Minerals (**217-782-2000**) within 24-hours of becoming aware of the circumstance. Per NPDES Permit IL0062189 the following shall be reported:

1. Any unanticipated bypass which exceeds any effluent limit in the permit
2. Any upset which exceeds any effluent limit in the permit
3. Violation of a maximum daily discharge limitation for any of the pollutants listed in the permit or any pollutant which may endanger health or the environment.

Examples include a field pH of < 6.5 under a Condition I or IV discharge event, pH of < 6.0 under a Condition II or III discharge event, or settleable solids in excess of 0.5 ml/L during a Condition II monitoring event. Please contact the Midwest Environmental Staff with any questions concerning the notification requirements associated with the discharge.

### EMERGENCY CONTACTS

NAME	FACILITY/DEPARTMENT	OFFICE NO.	CELL NO.	HOME NO.
ADAM ROBERTSON	GATEWAY NORTH	618-758-3535	618-317-7373	618-318-5670
ROGER BOWLIN	GATEWAY NORTH	618-758-3522	618-317-4926	618-317-4926
GARY WILHELM	GATEWAY NORTH	618-758-3532	618-317-4765	618-327-4425
MARJORIE WAYLAND	GATEWAY NORTH	618-758-3552	618-317-7424	618-363-4933
JEFF OLYPHANT	MIDWEST ENV.	812-922-1047	812-483-0201	812-483-0201
ANDY NELSON	MIDWEST ENV.	812-922-1045	812-483-3348	812-983-4933
KEN ROGERS	MIDWEST ENV.	812-922-1044	812-319-3180	270-212-1912

REGULATORY CONTACT INFORMATION	
AGENCY	PHONE NO.
ILLINOIS EPA MARION	618-993-7200
ILLINOIS MINE & MINERALS SPRINGFIELD	217-782-2000

**Note: Please contact members of the Midwest Environmental staff with any questions concerning the notification of regulatory agencies.**

**PEABODY COULTERVILLE MINING, LLC**

**PART 2**

**SLURRY CIRCUIT WATER MANAGEMENT PROTOCOL**

## 1.0 SLURRY CIRCUIT WATER MANAGEMENT PROTOCOL

A slurry circuit water management protocol, which includes both a pH monitoring network and multiple water treatment points, has been established to further limit the potential for acidic water to drain to the East Basin and Harp Pond. Monitoring will consist of weekly pH measurements of the relevant slurry cells and the Recirculation Lake during standard non-discharging conditions. Monitoring of water within the circuit will increase to a minimum of twice per shift during rainfall runoff events and periods of active water treatment. See Appendix A – Site Map for the slurry circuit monitoring network and water treatment points.

### 1.1 STANDARD NON-DISCHARGING CONDITIONS

The pH of the slurry circuit will be monitored weekly to verify existing water quality and evaluate if water treatment is needed to minimize potential acidic conditions. The pH will be measured at slurry Cell 2, slurry Cell 4, and the Recirculation Lake (note that Cell 5 is not currently full). The pH measurements will be recorded in the Gateway Mine Daily Inspection Log Book located in the Preparation Plant office. See Appendix B for an example Gateway Mine Daily Inspection Log Book entry.

#### ***Monitoring Procedure***

1. Calibrate the pH meter prior to each monitoring event. Follow the manufacturer's directions for meter calibration. Calibrate the pH sensor using a three point method with pH 4.0 S.U., 7.0 S.U., and 10.0 S.U. buffer solutions if available. Otherwise use the two point method, selecting the two buffer solutions that the measured values are likely to fall within (i.e. pH 4.0 and 7.0 or pH 7.0 to 10.0).
2. Collect field measurements of pH and temperature by placing meter into the water body or from a sample bottle immediately after collection.
3. Allow values to stabilize and record the measurement.
4. Record the values in the Gateway Mine Daily Inspection Log Book.

### 1.2 RAINFALL EVENTS

The pH of the slurry circuit will be measured during rainfall events to determine if water treatment is necessary and to calibrate water treatment application rates. Sodium hydroxide totes have been strategically placed at three treatment points (TP-1, TP-2, TP-3) within the slurry circuit drainage system to treat low pH water as needed. The first tote, TP-1, is located just downstream of the culvert west of the Preparation Plant. All drainage internal to slurry disposal Cells 1 through 5 ultimately drains through this culvert prior to reporting to the Recirculation Lake (note that Cell 5 is not presently full). The second tote is located at TP-2 near the Cell 2 discharge point, and will be used to treat any low pH water discharging from Cell 2. This tote is primarily for emergency situations when the pH of the water draining to the Recirculation Lake can not be maintained within the appropriate 6.5 – 8.5 S.U. range with treatment applied at point TP-1. The third tote is located at TP-3 near the inlet to the East Basin. Sodium hydroxide will only be applied at TP-3 in emergency situations when the water discharging from the Recirculation Lake remains below a pH of 6.5. Hydrated lime, crushed limestone, and soda ash may also be applied at any point within the slurry circuit to raise the pH.

### 1.2.1 DRAINAGE TO RECIRCULATION LAKE

The following monitoring procedure is applicable to precipitation runoff events that result in drainage to the Recirculation Lake.

#### ***Monitoring & Water Treatment Procedure***

1. Calibrate the pH meter prior to each monitoring event, at a minimum once per day during the monitoring period. Follow the manufacturer's directions for meter calibration. Calibrate the pH sensor using a three point method with pH 4.0 S.U., 7.0 S.U., and 10.0 S.U. buffer solutions if available. Otherwise use the two point method, selecting the two buffer solutions that the measured values are likely to fall within (i.e. pH 4.0 and 7.0 or pH 7.0 to 10.0)
2. Prior to a forecasted rain event verify that sodium hydroxide totes at the Cell 2 drainage ditch (TP-1), the culvert west of the prep plant (TP-2), and the East Basin inlet (TP-3) have sufficient sodium hydroxide available. If a tote is empty exchange it with one of the replacements maintained onsite.
3. Measure the pH at Cell 2, the Recirculation Lake, and the culvert west of the Preparation Plant to verify current pH of the water within the circuit. Take the pH measurement by placing the meter into the water body or from a sample bottle immediately after collection.
4. Once the rainfall begins start measuring the pH at the culvert pipe west of the Preparation Plant at a minimum of two times per shift. This is located immediately upstream of treatment point TP-1. The frequency of visits may need to increase during periods of active water treatment.
5. Monitoring of the pH at the culvert west of the Preparation Plant must continue twice per shift until the water level in the ditch has dropped to the baseflow mark designated on the installed staff gage (or rod). Monitoring must also continue if the pH of the water is not within the optimal 6.5 – 8.5 S.U. range.
6. If the pH measured at the culvert west of the Preparation Plant is less than 6.5 S.U. begin treatment at TP-1 to raise the pH of water draining to the Recirculation Lake to within the 6.5 – 8.5 S.U. range. Water treatment may include dripping sodium hydroxide into the discharge at treatment point TP-1 or applying soda ash briquettes or lime.
7. Upon initiation of treatment, check the pH of the water within the ditch near the inlet to Recirculation Lake to verify the pH of the treated water.
8. If using sodium hydroxide, adjust the tank valve until pH of the treated water at the inlet to the Recirculation Lake is within the 6.5 - 8.5 S.U. range. Do not exceed a pH of 9.0. If using soda ash briquettes or lime add additional material to the drainage ditch until the pH is within the optimal range.
9. Continue to check the pH at the culvert pipe and Recirculation Lake inlet twice per shift to ensure the treatment application is properly calibrated. Adjust treatment quantities as needed.
10. If you can not get the pH of the water draining to the Recirculation Lake above 6.5 S.U check the pH of the water discharging from Cell 2 and begin applying water treatment at TP-2 as necessary. Calibrate the water treatment application at both TP-2 and TP-1 to bring the pH to within 6.5 – 8.5 S.U. at the drainage ditch right before it discharges into the Recirculation Lake. Do not exceed a pH of 9.0.
11. Notify the mines environmental staff or the next shift lead of active treatment or if you are having difficulty getting the pH into the appropriate range

12. Continue to check all locations with active treatment twice per shift to maintain the optimal treatment ratio. Stop treatment at TP-2 once the discharge from Cell 2 has slowed to the point where it is no longer impacting the pH of the water at the culvert west of the Preparation Plant. Water treatment at TP-1 can cease once the water at the culvert west of the Preparation Plant has returned to between 6.5 – 8.5 S.U.
13. Notify the mines environmental staff or next shift lead of active treatment or if you are having difficulty getting the pH into the appropriate range.
14. As noted under number 5 above, monitoring of the pH at the culvert west of the Preparation Plant must continue twice per shift until the water level in the ditch has dropped to the baseflow mark designated on the installed staff gage (or rod) and the pH of the water is within the optimal 6.5 – 8.5 S.U. range.

### **1.2.2 DISCHARGE FROM RECIRCULATION LAKE**

In the event that the precipitation is significant enough to result in a discharge from the Recirculation Lake towards the East Basin then the pH of the water discharging from the Recirculation Lake must be monitored. This is to ensure that the operator is aware of any potential need for water treatment prior to the discharge water entering the East Basin. If the Recirculation Lake discharge has a pH of less than 6.5 S.U then the pH of the water at the inlet to the East Basin will need to be measured and water treatment applied at the inlet (TP-3) as necessary. Water Treatment procedures for the East Basin inlet is included in the procedure list below. For a more detailed description of water treatment for acidic water at the East Basin and Harp Pond impoundments see Part 3 Section 7.2 of the East Basin, Harp Pond, and Outfall 008 Monitoring SOP which details Emergency Water Treatment and Monitoring Procedures.

#### ***Monitoring & Water Treatment Procedure***

1. Follow monitoring procedures 1 through 14 listed previously in Section 1.2.1 under the Standard Monitoring Procedures for drainage to the Recirculation Lake during rainfall events.
2. Twice per shift when runoff from the slurry cell area is draining to the Recirculation Lake check to see if the Recirculation Lake is discharging.
3. Once discharge from the Lake is observed check the pH of the water discharging from the lake. Take the pH measurement by placing the pH meter into the water body or from a sample bottle immediately after collection.
4. If the pH of the water discharging from the Recirculation Lake is below 6.5 S.U. then the pH at the inlet to the East Basin must be checked.
5. Mobilize to the East Basin and measure the pH at the inlet of the basin.
6. If pH is less than 6.5 S.U. open the valve on sodium hydroxide tank at TP-3 to initiate drip treatment or apply soda ash briquettes or lime as necessary.
7. Check the pH at the inlet of the basin to verify the pH of the treated water.
8. Adjust the sodium hydroxide valve until pH of treated water is within the 6.5 - 8.5 S.U. range. If using soda ash briquettes or lime add additional material to the drainage ditch until the pH is within the optimal range. Do not exceed a pH of 9.0.
9. Check the pH of water at the inlet a minimum of two times per shift to ensure the treatment ratio is properly calibrated. Adjust treatment quantities as needed.

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10. Continue to check the pH at the inlet of the East Basin a minimum of twice per shift until drainage to the basin has ceased or the pH has returned to greater than 6.5.
11. Close valve and stop sodium hydroxide drip once water draining to East Basin returns to a pH > 6.5.
12. See Part 3 Section 7.2 of the East Basin, Harp Pond, and Outfall 008 Monitoring SOP for Emergency Water Treatment and Monitoring Procedures when acidic water is present in the East Basin/Harp Pond.
13. Notify the mines environmental staff or the next shift lead if water is discharging to the East Basin, if water treatment is actively being used, or if you are having difficulty getting the pH into the appropriate range.

**PEABODY COULTERVILLE MINING, LLC**

**PART 3**

**EAST BASIN, HARP POND, OUTFALL 008  
MONITORING**

## 1.0 EAST BASIN, HARP POND, AND OUTFALL 008 MONITORING

To limit the discharge of fine refuse decant water from outfall 008 an electric pump with a pumping capacity of 1638 gallons per minute has been installed in the East Basin and an electric pump with a pumping capacity of 660 gallons per minute has been installed in Harp Pond to return water to the Recirculation Lake. A float system has been installed at both pumps to automatically engage the pumps during periods of flow into the impoundments. An automated notification system that sends email and text message to mine personnel when the pump has been engaged, turned off, or lost power has also been installed at the East Basin (see Appendix C for the FZ100 Notification System Technical Specifications). This automated system minimizes the potential for operator error by ensuring the pumps start as water enters the impoundments. A record of water levels within the East Basin and Harp Pond, rainfall amounts, and pump operation periods will also be maintained onsite to track the available freeboard and retention capacity within the dynamic system.

During periods when the pumps are operating they will be monitored twice per shift (four times per day) including on weekends and holidays. The day shift will check the pump once in the morning and once in the early afternoon. Second shift will check the pumps once in the early evening and once after midnight. The pumps can also be operated manually as needed.

### ***Monitoring Procedure***

1. Prior to the start of a forecasted rain event engage the electric pumps and drawdown any water within the East Basin and Harp Pond in preparation for inflow.
2. Record the visit, pump operation/condition, any issues encountered, and the current water level measured visually from the staff gage installed within each impoundment in the Gateway Mine Daily Inspection Log Book located in the Preparation Plant office (This is the same examination book required for federal workplace inspections).
3. Upon pumping down both impoundments switch the pumps back to the automatic position in anticipation of the inflow. Record the visit, water levels, and pump operation status in log book.
4. Upon the initiation of the rainfall begin checking the impoundment water levels once per shift. Record the visit, water levels, and pump operation status in the log book.
5. If the water level within the East Basin exceeds 11 feet on the staff gage and the pump has not yet started confirm that the float is not obstructed. If necessary turn the pump on manually. If the pump fails under manual operation have the diesel pump moved to the East Basin immediately. See Part 3 Section 7.1 for the electric pump failure emergency management procedures and Part 3 Section 2.3 for the diesel pump operation procedures. Record the visit, pump operation/condition, and the impoundment water levels in the log book.
6. Once the pump in the East Basin has started operating, check the pump twice per shift to ensure continued operation. During the visits make any necessary adjustments to the pump. Record the visit, water levels, and pump operation status in log book. If low pH water is identified as draining to the East Basin as a part of the slurry circuit monitoring procedure then follow the water treatment procedures identified in Section 7.2 of Part 3. See Part 2 Slurry Circuit Water Management Protocol for additional information about the Slurry Circuit Monitoring Procedures.
7. If the water in the East Basin is flowing into Harp Pond verify if the electric pump in Harp Pond has engaged. If the water level in Harp Pond exceeds 5 ft on the staff gage and the pump has not started pumping confirm that the float is not obstructed. If necessary turn the pump on manually. If the pump fails under manual operation have a gas pump moved to Harp Pond immediately. See Part 3 Section 7.1 for the electric pump failure emergency management procedures and Part 3 Section 2.4 for the gas pump operation procedures. Record the visit, which of the two pumps are operating, and the water level in each impoundment in the log book.
8. Once the Harp Pond pump has started operating, check the pump twice per shift to ensure continued operation. Observe the water level in the pond and increase monitoring if the water

level is nearing the spillway. If the water level in Harp Pond overtops the spillway (7 ft on Harp Pond staff gage) collect a sample of the discharge. Record all visits in the logbook and notify the mines environmental staff or the next shift lead that a discharge sample was collected. See Part 3 Section 5.0 for sample collection procedures.

9. Continue to monitor both pumps twice per shift until the floats automatically shut off the pumps. Once this occurs, manually turn on the pumps to further increase the East Basin and Harp Pond storage volumes. Record the time of the visit and the water levels in the impoundments in the log book and note that the basins are being manually pumped down.
10. Upon completion of manual pumping at the East Basin and Harp Pond, turn off the pumps and then set the pumps to automatic to activate the float system. Ensure the floats are unobstructed. Record the water level in both impoundments in the log book and note that the manual pumping is complete and that the pumps have been set to engage automatically.
11. Make note of any maintenance needs in the log book. Maintenance should be completed as soon as possible to ensure continued operation.
12. During the winter note any ice build up on the pumps and clear it as needed to continue normal operation.

## **2.0 PUMP OPERATION**

### **2.1 EAST BASIN ELECTRIC PUMP**

A Grindex Matador N submersible electric pump with a maximum pumping capacity of 1638 gallon per minute has been installed in the East Basin (see Appendix C for the pumps technical specifications and Installation, Operation, and Maintenance Manual). The control box for this pump is located at the northeast corner of the East Basin. The switch on the lower right corner of the control panel is used to toggle between the automatic, manual, and off position. The East Basin electric pump should remain in the "Auto" position unless it's being operated manually to maximize the basins available freeboard or turned off for maintenance purposes. When in the "Auto" position the float system will activate the pump once the water level in the pond reaches 11 ft (as measured from the staff gage), this water level is several feet above the base of the pump and the float system was set up this way to keep the pump from cavitating. The float system will then turn the pump off once the water returns to this level. If the pump is operated manually, special attention needs to be given to ensure that the pump does not run out of water during operation. When the pump is in operation the strobe light located on top of the control box should be flashing.

#### ***Standard Operation***

1. Approach the control box at the northeast corner of the basin and verify the switch on the lower right corner is in the "Auto" or "Manual" position. Note to operate the pump manually the switch must be turned to right past the "off" position.
2. When the pump is in operation the red strobe light located on top of the control box should be flashing.
3. If the light does not come on, verify if the pump is operating by checking the discharge end of the hose in the Recirculation Lake. If the pump is not operable check the maintenance section (Part 3 Section 6.0) and Operators Manual (Appendix C) and begin troubleshooting. Notify the shift operator of the issue encountered to determine if the diesel pump needs to be moved to the East Basin.

### **2.1.1 FLOAT SYSTEM**

An Allen Bradley 840 float switch with stainless steel float was installed in the East Basin for the automatic operation of the Matador N electric pump (see Appendix C for the float switch technical specifications). The float is located in the northeast corner near the pumps control box. The float system should engage the pump automatically when the control is set to "Auto" and the water level in the basin exceeds 11 ft on the staff gage.

#### ***Standard Operation***

1. Approach the northeast corner of the basin and visually verify the water level within the basin and the condition of the float. The pump should be operating if the water level is greater than 11 ft within the basin.
2. Visually verify that the control box and is still in place and that the float system and control box have not sustained physical damage.
3. During the winter make note of any ice around the float system and clear it away as necessary.
4. Notify the shift lead of any issues or damage encountered.

### **2.2 HARP POND ELECTRIC PUMP**

A Grindex Major N electric pump with a maximum pumping capacity of 660 gallon per minute has been installed in Harp Pond (see Appendix C for the pumps technical specifications and Instillation, Operation, and Maintenance Manual). The control box for the Harp Pond electric pump is located at the northeast corner of the pond. The switch on the lower right corner of the control panel is used to toggle between the automatic, manual, and off position. The East Basin electric pump should remain in the "Auto" position unless it's being operated manually to maximize the basins available freeboard or turned off for maintenance purposes. When in the "Auto" position the float system will activate the pump once the water level in the pond reaches 5 ft (as measured from the staff gage), this water level is several feet above the base of the pump and the float system was set up this way to keep the pump from cavitating. The float system will also turn the pump off once the water has returned to this level. If the pump is operated manually, special attention needs to be given to ensure that the pump does not run out of water during operation. When the pump is in operation the strobe light located on top of the control box should be flashing.

#### ***Standard Operation***

1. Approach the control box and verify the switch on the lower right corner is in the "Auto" or "Manual" position. Note to operate the pump manually the switch must be turned to right past the "off" position.
2. When the pump is in operation the red strobe light located on top of the control box should be flashing.
3. If the light does not come on, verify if the pump is operating by checking the discharge end of the hose in the Recirculation Lake. If the pump is not operable check the maintenance section (Part 3 Section 6.0) and Operators Manual (Appendix C) and begin troubleshooting. Notify the shift operator of the issue encountered to determine if the diesel pump needs to be moved to the Harp Pond.
4. Notify the shift operator of any issues or damage encountered.

### **2.2.1 FLOAT SYSTEM**

A Flyght ENM-10 mechanical float switch was installed in Harp Pond for the automatic operation of the Major N electric pump (see Appendix C for the float switch technical specifications). The float is located in the northeast corner near the pumps control box. The float system should engage the pump automatically when the control is set to "Auto" and the water level in the basin exceeds 5 ft on the staff gage.

#### ***Standard Operation***

1. Approach the northeast corner of the pond and visually verify the water level within the basin and the condition of the float. The pump should be operating if the water level is greater than 5 ft within the basin.
2. Visually verify that the control box and is still in place and that the float system and control box have not sustained physical damage.
3. During the winter make note of any ice around the float system and clear it away as necessary.
4. Notify the shift lead of any issues or damage encountered.

### **2.3 DIESEL PUMP**

In the event of a an electric pump failure at the East Basin a mobile 6GST diesel pump with a maximum pumping capacity of 1900 gallons per minute can be moved to supplement the pumping (see Appendix C for the pumps technical specification). If the diesel pump must be utilized in the East Basin, it will be moved to the northeast corner of the basin. Place the intake hose into the East Basin and disconnect the discharge line from the electric pump, using the quick couple, and connect it to the diesel pump.

#### ***Standard Operation***

1. Before attempting to start the unit, ensure that you are familiar with the controls. Perform all pre-start checks
2. Verify the fuel supply shut-off valve is open, and rotate the key switch to the right, once the pre-heat function countdown has completed rotate the key switch right to the spring loaded position to engage the starter motor. Release when the engine fires.
3. Once the unit has started, the air compressor or vacuum pump will start to prime the pump. If the unit does not prime, allow the engine to warm for a short period then adjust the rpm by pressing the up or down arrows on the control panel.
4. Check all gauges for normal engine operation. If operation is not normal, stop the engine and determine the cause.

#### **2.3.1 Fueling Procedure**

1. Remove the fuel cap located below the radiator on the pump, taking note of fuel level to check for abnormalities and unusual fuel consumption.
2. Insert nozzle from fuel truck and begin fueling. While fueling visually check hoses and connections to ensure no leaks are present.
3. Once finished replace fuel cap.

## **2.4 GAS PUMP**

In the event of a an electric pump failure at the East Basin a mobile Godwin GTP-80HX gas pump with a maximum pumping capacity of 238 gallons per minute (or equivalent) can be moved to the Harp Pond to supplement the pumping (see Appendix C for the pumps technical specifications). If the gas pump is to be utilized in Harp Pond have the pump moved to the northeast corner of the pond. Run the hose line on the inlet side of the pump into Harp Pond and connect the discharge end to the pvc pipe which directs water back to the Recirculation Lake.

### ***Standard Operation***

1. Before attempting to start the unit, ensure that you are familiar with the controls and any local or national safety regulations.
2. Perform all pre-start checks
3. Verify the fuel supply shut-off valve is open, and rotate the ignition switch to the run position. If the unit is cold turn the choke fully on and pull the starter rope. Repeat until motor is running. Once the engine has warmed up turn the choke off.
4. To prime the pump, remove the cap at the top of the pump unit. With a bucket or similar, pour water into the pump to begin to fill it. Once sufficiently full, the pump will prime and the cap must be re-inserted into the top of the unit.
5. Check for leaks and normal engine operation. If operation is not normal, stop the engine and determine the cause.

### **2.4.1 Fueling Procedure**

1. Turn the pump off, remove the fuel cap located on top of the pump, taking note of fuel level to check for abnormalities and unusual fuel consumption.
2. Insert nozzle from fuel tank and begin fueling. While fueling visually check hoses and connections to ensure no leaks are present.
3. Once finished replace fuel cap.

## **3.0 LOG BOOK RECORD KEEPING PROTOCOL**

A record of the period of pump operation, any discharge through outfall 008, the East Basin and Harp Pond water levels, and any pump maintenance must be maintained on-site. The time of visit, status of pump operation, impoundment water levels, and any notes about maintenance needs or servicing must be documented in the Gateway Mine Daily Inspection Log Book located in the Preparation Plant Office (this is the same examination book required for federal workplace inspections) after every visit. See Appendix B for an example entry from the Gateway Mine Daily Inspection Log Book.

Rainfall data should also be recorded in this book. See Part 3 Section 4.0 Precipitation Monitoring for additional details.

## **4.0 PRECIPITATION MONITORING**

Rainfall is measured at the rain gauge located at the Preparation Plant Office. Rainfall is collected in a cylindrical rain gauge and recorded manually. The rain gauge has the capacity to measure up to 8.5 inches of rain at 0.1 inch increments. The rain gauge should be checked daily during periods of rainfall. The gauge should be cleared of any dirt or debris and periodically checked for levelness.

**Procedure**

1. Approach rain gauge and read the rainfall quantity directly from the measuring tube.
2. Record the date, time, and rainfall quantity in the Daily Inspection Log Book located in the Preparation Plant office.
3. If rain has occurred, empty the rain gauge and then reset it for measurement of future events.

**5.0 SAMPLE COLLECTION AND PROCESSING**

In the event that a discharge occurs at outfall 008 a sample of the discharge must be collected. The sample must be collected into appropriately labeled bottles based on the outfall 008 discharge conditions required parameters. The necessary samples will be preserved within 15 minutes of collection and then placed on ice and cooled to approximately 4° C. The samples will then either be picked up by a courier or delivered to the laboratory following chain-of-custody procedures. An explanation of the four discharge monitoring conditions followed by the list of the outfall 008 water quality monitoring parameters, required sample volumes, bottle types, and required preservative for each of the four monitoring conditions is provided below. The bottle types and preservative requirements are also identified on the bottom right hand corner of the chain of custody. Sample supply kits, including blank chain of custodies, are stored in the Preparation Plant break room. An example of a completed chain of custody is provided in Appendix D

Note that due to the rarity of discharge from outfall 008 all sample types include additional bottles for the semiannual metals monitoring required under Special Condition 18 of the NPDES permit. A downstream sample should also be collected from the receiving stream if it is the first discharge from outfall 008 during the quarter. See Special Condition 13 of the NPDES permit for additional information, the bottom right corner of the Chain of Custody for the sample bottle type and lab analytical parameters, and the Site Map for the downstream sample location (Appendix A).

**5.1 OUTFALL 008 DISCHARGE MONITORING CONDITIONS**

- Condition I:** Dry weather discharge (base flow or mine pumpage).
- Condition II:** Any discharge, or increase in the volume of discharge, caused by precipitation within any 24 hour period less than or equal to the 10-year, 24-hour storm event (< 4.76 inches). Rainfall quantities can be checked at the rain gauge outside of the Preparation Plant Office.
- Condition III:** Any discharge, or increase in the volume of discharge, caused by precipitation within any 24 hour period greater than or equal to the 10-year, 24-hour storm event (> 4.76 inches). Rainfall quantities can be checked at the rain gauge outside of the Preparation Plant Office.
- Condition IV:** Any discharge continuing 24 hours after cessation of a precipitation event that resulted in a discharge.

**5.1.1 OUTFALL 008 MONITORING PARAMETERS, BOTTLES, & PRESERVATION**

**Condition I and IV**

Parameters: Flow, pH, temperature, acidity, alkalinity, total iron, total manganese, chloride, sulfate, total suspended solids, hardness, low level mercury, arsenic, barium, cadmium,

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chromium, chromium (hexavalent), copper, lead, manganese, nickel, phenols, selenium, silver, zinc

Bottles and Preservative: Plastic 1-Liter, Plastic 500 mL, Plastic 500 mL w/ HNO<sub>3</sub>, Plastic 250 mL w/H<sub>2</sub>SO<sub>4</sub>, Glass Amber 1-Liter, Mercury Kit

### **Condition II**

Parameters: Flow, pH, temperature, chloride, sulfate, hardness, settleable solids, low level mercury, arsenic, barium, cadmium, chromium, chromium (hexavalent), copper, lead, manganese, nickel, phenols, selenium, silver,

Bottles and Preservative: Plastic 1-Liter (for settleable solids), Plastic 1-Liter, Plastic 500 mL, Plastic 500 mL w/ HNO<sub>3</sub>, Plastic 250 mL w/H<sub>2</sub>SO<sub>4</sub>, Glass Amber 1-Liter, Mercury Kit

### **Condition III**

Parameters: Flow, pH, temperature, chloride, sulfate, hardness, low level mercury, arsenic, barium, cadmium, chromium, chromium (hexavalent), copper, lead, manganese, nickel, phenols, selenium, silver,

Bottles and Preservative: Plastic 1-Liter, Plastic 500 mL, Plastic 500 mL w/ HNO<sub>3</sub>, Plastic 250 mL w/H<sub>2</sub>SO<sub>4</sub>, Glass Amber 1-Liter, Mercury Kit

## **5.2 SAMPLE BOTTLE LABELING**

Each sample bottle must contain a descriptive label or written identification prior to laboratory submittal. Each bottle must include the facility code, sample location code, sample date, and type of preservative used (if required). The four digit facility code (1825), sample point/site ID (008), and sample bottles and preservatives are located on the chain of custody form. A description of the Chain of Custody processing procedures is included in Part 3 Section 5.9. Sample bottles will be obtained prior to the sampling event from the laboratory analyzing the samples. See Part 3 Section 5.7.2 for the primary laboratory contact information and address.

## **5.3 SAMPLE COLLECTION**

Samples from outfall 008 will be collected using the grab sampling method. This involves lowering the sample bottle directly into the main flow of the discharging water. The sample may be collected from within the water body or from the bank of the water body, provided the collector can reach the main flow of the discharge or far enough to completely lower the bottle beneath the water surface. A telescoping rod with a clean sample bottle affixed to it may be used to extend the collectors reach.

### **5.3.1 STREAM AND SEDIMENT BASIN OUTFALL SAMPLING**

When sampling the outfalls discharge an effort will be made to collect the sample from within the main flow of the channel. When sampling from within the water body the sample bottle will be lowered to just beneath the surface of the water while facing upstream (i.e. stand downstream of the sampling point). Care must be taken to avoid collecting particulates re-suspended as a result of wading into position or bumping the sample bottle

on the streambed. Under low flow conditions where discharge is too low to safely sample without disturbing the streambed sediment, boulders or rocks may be excavated allowing for sample collection from the remaining depression. Sufficient time must be allowed for the disturbed sediments to settle before sample collection within the newly formed depression. Many of the chemical constituent's analyzed for sorb onto suspended materials, thus collection of re-suspended particles will likely result in falsely elevated analyte concentrations.

### ***Procedure***

1. Obtain bottles to be used at site.
2. Approach sampling site. If required to enter the spillway for the sample, wade into water downstream of sample point in order to not stir up spillway or stream bed sediments.
3. While facing upstream remove bottle cap and insert bottle into the main flow of the channel just below the surface of the water, making sure to avoid surface debris and to fill the bottle completely.
4. Recap the sample bottle and repeat as necessary until all bottles are filled.

### **5.3.2 LOW-LEVEL MERCURY**

If Outfall 008 discharges then a low level mercury sample must be collected. Sampling for low-level mercury requires the use of the clean hands/dirty hands method, as established by EPA Method 1669, to limit sample contamination. In this method one sampler acting as clean hands conducts all operations involving contact with the sample bottle and sample collection while the other acting as dirty hands is responsible for the preparation of all activities that do not involve direct contact with the sample container. Because of the potential for contamination it is recommended that the sampling team collect the sample upwind if possible and avoid (as much as possible) airborne particles such as dust, dirt, particulate matter, vapors from automobile exhaust and cigarette smoke, and nearby corroded or rusted bridges, pipes, poles, or wires. If sampling near a road attempt to sample during low traffic hours. Avoid breathing on the sample. Also avoid areas nearby with bare soil that are subject to wind erosion.

### ***Procedure***

1. Samplers must wear talc free gloves.
2. Dirty Hands removes the sampling kit from the cooler, then opens and holds the outer bag
3. First collect the field blank.
  - a. Clean hands retrieves and removes the field blank bottle and distilled water bottle from their inner bags.
  - b. Clean hands then fills the field blank container with the deionized water, taking care not to overfill it.
  - c. Clean hands then closes the field blank bottles lid, returns the bottle to the inner bag, reseals the bag, and then inserts the sealed bag into the outer bag being held by dirty hands.
4. Second collect the sample
  - a. Clean hands retrieves and removes the sample from its inner bag.
  - b. Clean hands then fills the sample container by completely submerging bottle beneath the water, then inverting the bottle and capping it underneath the water to limit exposure to air.

- c. Clean hands then returns the bottle to the inner bag, reseals the bag, and then inserts the sealed bag into the outer bag being held by dirty hands.
5. Dirty Hands then seals the outer bag, labels it accordingly and inserts it into the cooler.
6. The lab will preserve samples and filter dissolved species as necessary.
7. Samples must be delivered to the lab within 48 hours of collection.

#### **5.4 FIELD MEASUREMENTS**

Using the multi-parameter water quality sensor (EUTECH Instruments PTTester 35 or equivalent), in accordance with the users manual, measure field pH and temperature at the outfall. Field measurements should be made insitu at the location of the water quality sample or from an additional sample container if it is not possible to safely enter the discharge stream. Temperature of the water can change rapidly therefore if it is not possible to measure the field parameters insitu then it is important the measurements be made immediately after removal from the water body. Discharge measurement procedures for sediment basin outfalls are found below in Section 5.5.

##### ***Procedure***

1. Calibrate the multi-parameter water quality sensor prior to each sampling event, if it's a single day event, or each morning of a multiple day sampling event (see manual). Calibrate the pH sensor using the three point method with pH 4.0 S.U., 7.0 S.U., and 10.0 S.U. buffer solutions.
2. Collect field measurements of pH, and temperature by placing meter into the same channel of flow or from an additional sample bottle immediately after collection.
3. Allow values to stabilize and record the measurements on the chain of custody.

#### **5.5 DISCHARGE**

An estimate of sediment basin discharge must be made during all sampling events. Discharge can be measured using the float method.

##### **5.5.1 FLOAT METHOD**

Discharge is calculated by multiplying the cross-sectional area of the stream by the streams velocity at the sampling location.

##### ***Procedure***

1. Measure the width of the channel at the sampling location (in feet).
2. Measure the average depth of the channel at the sampling location (in feet).
3. Measure two points equal distance upstream and downstream of the sample location.
4. Deploy a buoyant object into the stream channel and record the time (in seconds) it takes for the object to float the distance measured in number 3.
5. Multiply the stream width (ft), average depth (ft), and velocity (ft/sec)
6. Record value on the chain of custody.

**5.6 SETTLEABLE SOLIDS ANALYSIS**

If Outfall 008 discharges under a Condition II discharge event then settleable solids must be analyzed. Settleable solids analysis will be conducted by either Peabody Coulterville Mining, LLC personnel or their contracted laboratory and will follow EPA Method 160.5. The settleable solids test is the measurement of the volume of solids that will settle to the bottom of an Imhoff cone over a one hour time period. The test indicates the volume of solids removed by settling in the sedimentation ponds and provides information on how this process is functioning within the system. An unfiltered one liter sample will be collected from the sampling point following the appropriate sampling protocol (see Part 3 Section 5.3). If conducted by site personnel, the analysis will be completed in the office within the 48 hours maximum holding time. If submitted to the lab for analysis, the bottle must be provided to the lab within the 48-hour maximum holding time. A list of the required equipment and methods follows:

***Equipment***

1. Imhoff cone
2. Stirring rod
3. Imhoff cone rack
4. Timer

***Procedure***

1. Fill the Imhoff cone to the one-liter mark with the well mixed sample previously collected.
2. Allow sample to settle in Imhoff cone for 45 minutes
3. Gently stir the sample with the stirring rod to release suspended matter clinging to the sides of the Imhoff cone.
4. Let sample settle for an additional 15 minutes.
5. At the one hour mark, record the volume of settleable solids (in milliliters) in the Imhoff cone.

***Note***

1. **Do not include any floating solids or any voids in the settled solids as settleable matter.**
2. **The lower limit of reportable concentration is 0.2 ml/l, not 0.4 ml/l. Thus all values over 0.2 ml/l must be reported as a number, not as <0.4 ml/l. A table of proper reporting under varying concentrations follows:**

Measured Value ml/l	Reported Value ml/l
0 – 0.19	<0.2
0.2	0.2
0.3	0.3
0.4	0.4
0.5	0.5

**5.7 LABORATORY SUBMITTAL**

Samples will be analyzed by Standard Laboratories, Inc. located in Freeburg Illinois or by other qualified laboratories. Their address and contact information is listed below. Efforts should be made to submit all samples to the laboratory within 24 hours of collection to meet the required holding

times. The list of sample bottles, sample preservative, and parameters to be analyzed are included in Part 3 Section 5.1.1. A copy of the chain of custody should be made and kept for the facilities records upon submission of the samples.

Standard Laboratories, Inc.  
8451 River King Drive  
Freeburg, IL 62243  
(618) 539-5836

## 5.8 FIELD OBSERVATIONS

Field observations will be recorded in either a field notebook or in the comments or notes section of the Chain of Custody (COC). Observations will include information about conditions that could impact the results of the sampled water quality. These include, but are not limited to, items such as wildlife activity, beaver dams, flooding or backwater, and algae. Discharges from the site shall not cause excessive foam, a visible film or sheen, or contain any substance in significant enough quantities to be unsightly or deleterious or produce color, odor, or other conditions to such a degree as to create a nuisance within the receiving waters. An observation of these conditions in the field will be noted.

## 5.9 CHAIN OF CUSTODY

The Chain of Custody (COC) is a written legal document used to track the transfer of a sample from person to person. It is utilized to guarantee the identity and integrity of a sample from collection through reporting of the test result. The COC is formatted to record field information, laboratory information, and the people who handle each individual sample. A COC is created for each sampling event and is typically a one page document. An individualized COC has been created for NPDES monitoring events at Outfall 008 and includes the applicable facility code, sample location codes, and Peabody sample location identification numbers. Additionally, required field parameters, lab parameters, bottle types, and preservatives are included in the box located on the bottom right corner. The COC contains places to enter calibration information for the multi parameter field water quality meter, the sample date/time, and all relevant field measurements (ph, Temp, etc). The COC also contains several signatory lines for the relinquishment of custody of the samples and for the receipt of custody of the samples. An example of a completed COC can be found in Appendix D.

### *Procedure*

Fill out the appropriate NPDES outfall COC prior to submittal of samples to the laboratory. The applicable sample type (i.e. NPDES outfall or stream) and required parameters are identified on the bottom right hand corner of the COC.

1. pH Meter Calibration Row
  - a. Sample Date and Time
    - i. Enter the date and time the meter was calibrated.
    - ii. Note: The meter must be calibrated prior to collecting any samples.
2. Sample Location Row
  - a. Sample Date and Time
    - i. Enter the date and time of sample collection.
  - b. Grab

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- i. This column denotes the sample collection methodology and is utilized to denote that a sample was collected.
- ii. If a sample was collected mark an "x" in the cell, if sample was not collected leave the cell blank.
- c. # Containers
  - i. This column identifies the number of bottles that are shipped/delivered to the lab. This cell is utilized by the laboratory to ensure the receipt of all samples.
    1. Mark the number of sample bottles collected at each sample location that will be shipped to the lab for analysis.
    2. DO NOT record bottles that will not be shipped to the lab (i.e. settleable solids which will be analyzed by the sampler).
- d. Flow Condition
  - i. Record the flow condition (I - IV) in this cell.
  - ii. Note: If sample is collected under precipitation conditions (i.e. condition II or III) then the precipitation event statistics (Date ppt event started and ended, Rainfall total) must be recorded. Event statistics should be recorded in the designated section located in the box on the bottom right corner of the COC.
- e. Flow
  - i. Record the measured flow at the outfall of the basin or the stream sampling point in the cell. If there is no flow record a zero in the cell.
  - ii. Note: Make sure units used for the measurement match the units identified on the COC. If not convert units prior to recording the flow in the cell.  
1 CFS = 448.83 gpm
- f. pH
  - i. Under flowing condition record the field measured pH in the cell.
  - ii. Under no flow conditions leave the cell blank.
- g. Temp
  - i. Under flowing condition record the field measured Temperature in the cell.
  - ii. Under no flow conditions leave the cell blank.
- h. Settleable Solids
  - i. If settleable solids are required for the sample type, record the measured value in the cell.
  - ii. If settleable solids are not required for the sample type, leave the cell blank.
  - iii. Note: Signature on COC is verification that the sampler conducted the field test following EPA Method 160.5 and affirms the result.
- i. Sample Type
  - i. The required sample type for the sample location is identified in this column
    1. Details of the required field measurements, number of bottles to collect, type and size of bottle to use, the necessary preservative, and the laboratory analysis required are found in the bottom right corner of the COC.
- j. Comments
  - i. Any relevant comments should be included here.  
  
Note: If an unconstructed comment is included in the cell then a sample date and time must be included for the relevant sample row. This documents that that outfall was not constructed on that date.
- k. Gray Cells
  - i. Do not record or mark anything in these cells. This acts as a reminder that the subject sample point does not require this information.
- l. Signature Row
  - i. Relinquished by

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1. Sign, date, and time the COC upon relinquishing the samples to the laboratory technician, laboratory courier, or Peabody personnel.
- ii. Received by
  1. The laboratory technician, laboratory courier, or Peabody personnel must sign, date, and time these cells upon receipt of the samples.

### Note

1. Details of the required field parameters, lab parameters, and bottles for the sample types are noted on the bottom right corner of the COC.
2. Make sure measured units match units listed on the COC
3. No erroneous information may be erased from the COC. Errors must be lined out with a single dash, initialed, and the correction written in.
4. Review the COC for accuracy prior to relinquishing it.

## 6.0 EQUIPMENT MAINTENANCE

### 6.1 East Basin Electric Pump

Monthly control panel functionality will be checked by a qualified electrician. Checks shall include a visual inspection of the control panel for loose wires, carbon tracking/arcing, nuisance insects, etc. that could cause a fault in the system that would prevent activation during operation. This will include a visual inspection of the float system installed as a part of the pump system.

### 6.2 Harp Pond Electric Pump

Monthly control panel functionality will be checked by a qualified electrician. Checks shall include a visual inspection of the control panel for loose wires, carbon tracking/arcing, nuisance insects, etc. that could cause a fault in the system that would prevent activation during operation. This will include a visual inspection of the float system installed as a part of the pump system.

### 6.3 Diesel Pump

General maintenance will include checking the engine oil, coolant level, fuel filter/water bowl, air cleaner dust unloader valve and restriction indicator gauge every two weeks. A visual walk around inspection will also be completed. Additional maintenance will be conducted as recommended by the pumps manufacturer.

## 7.0 EMERGENCY SCENARIOS

### 7.1 ELECTRIC PUMP FAILURE

In the event of an electric pump failure at either impoundment a mobile gas or diesel pump will be utilized as a temporary replacement to continue to pump water back to the Recirculation Lake. If the electric pump in the East Basin fails then the portable diesel pump, with a 1900 gallon per minute maximum pumping capacity, shall be utilized. Run the intake hose into the East Basin and disconnect the discharge line from the electric pump, using the quick couple, and connect it to the diesel pump. If the electric pump in Harp Pond fails, have a gas pump moved to the northeast corner of the pond. Run the inlet line into Harp Pond and connect the discharge line to the pvc pipe which directs water back to the Recirculation Lake.

#### *East Basin Procedure*

1. Locate diesel pump and bring it to the East Basin site.

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2. Run inlet line into East Basin.
3. Disconnect the discharge line from the electric pump using the quick couple and connect the line to the discharge end of the diesel pump.
4. Start pump.
5. Once the diesel pump is operating, make any necessary adjustments to ensure continued operation. Verify that the fuel tank has greater than  $\frac{1}{4}$  tank of fuel, and refuel as necessary.
6. Record the time the diesel pump was started, the water level in the impoundments, and the current fuel level of the pump in the Gateway Mine Daily Inspection Log Book located in the Preparation Plant Office.
7. Follow the monitoring procedures identified in Part 3 Section 1.0. Continue to record time of visit, water levels within the impoundments, and the current fuel level of the diesel pump until operation is no longer required.

### ***Harp Pond Procedure***

1. Locate gas pump and bring it to the Harp Pond site.
2. Run inlet line into Harp Pond.
3. Connect discharge line of pump to the pvc return line that directs water back to the Recirculation Lake.
4. Start pump.
5. Once the gas pump is operating, make any necessary adjustments to ensure continued operation. Verify that the fuel tank has greater than  $\frac{1}{4}$  tank of fuel, and refuel as necessary.
6. Record the time the pump was started, the water level in the impoundments, and the current fuel level of the pump in the Gateway Mine Daily Inspection Log Book located in the Preparation Plant Office.
7. Follow the monitoring procedures identified in Part 3 Section 1.0. Continue to record time of visit, water levels within the impoundments, and the current fuel level of the diesel pump until operation is no longer required.

## **7.2 ACIDIC WATER**

In the event that the pH of the water entering East Basin is less than 6.5 S.U. then chemical water treatment must be employed. Water treatment should be applied at point TP-3 prior to the water entering the East Basin and Harp Pond retention cells. If sodium hydroxide is used the application rate will be calibrated to keep the pH of the water entering the East basin within the 6.5 to 8.5 S.U. range, a pH of 9.0 S.U. should not be exceeded. Soda ash briquettes or ground limestone may also be applied to the drainage ditch. During periods of application, the pH of the water within the East Basin and Harp Pond must be monitored regularly to ensure it remains within the permitted 6.5 to 9.0 S.U. pH range. If, despite treatment at TP-3, the pH in the East Basin or Harp Pond remains below 6.5 S.U. then soda ash or ground limestone will be utilized to neutralize the water. A stock of soda ash and additional sodium hydroxide tanks are maintained on site for treatment during emergency conditions.

### ***East Basin Inlet Water Treatment Procedure***

1. Measure pH of water at inlet of East Basin.
2. If pH is less than 6.5 S.U. open valve on sodium hydroxide tank to initiate drip or apply soda ash briquettes or ground limestone to the drainage ditch.
3. Check pH in the drainage ditch right at the inlet to the basin to verify the pH of the treated water.

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4. If sodium hydroxide is used adjust the totes valve until pH of treated water is between 6.5 to 8.5 S.U. at the basin inlet. Or add additional soda ash briquettes or ground limestone as needed
5. Check pH of water at the inlet at a minimum of two times per shift to ensure the treatment is properly calibrated. Adjust treatment quantities as needed.
6. If using sodium hydroxide close the totes valve to stop the sodium hydroxide drip once the pH of the water draining to East Basin (prior to treatment at TP-3) returns to within the 6.5 – 8.5 S.U. range.

### ***East Basin Water Treatment Procedure***

1. Check the pH of water present in East Basin near the spillway connecting it to Harp Pond
2. If pH in the basin remains below 6.5 S.U. apply soda ash or ground limestone to the basin
3. Let material mix with impoundment water and recheck pH
4. Continue application until impoundment pH returns to within the 6.5 – 8.5 S.U. range.
5. Check pH in basin at a minimum of two times per shift to ensure pH remains within acceptable range (6.5 – 8.5 S.U.).
6. If water has yet to overtop the East Basin spillway and it is eminent that low pH water will drain to Harp Pond place soda ash briquettes in the spillway connecting the two impoundments.
7. Restock the soda ash briquettes in the spillway as needed

### ***Harp Pond Water Treatment Procedure***

1. Upon water entering Harp Pond, check the pH of the Harp Pond water near its discharge spillway.
2. If pH of water remains below 6.5 S.U. apply soda ash or ground limestone directly to the pond.
3. Let alkaline material mix with the water and recheck the pH near the spillway. Add additional treatment until pH within the pond is within the 6.5 -8.5 S.U. range.
4. Continue to check the Harp Pond pH at a regular basis to ensure the pH remains above 6.5 and apply additional alkaline material as needed. At a minimum, when water being treated for pH at the East Basin is draining to Harp Pond, the pH at Harp Pond must be checked two times per shift.
5. If it is eminent that low pH water will discharge from Harp Pond, place soda ash briquettes in the spillway.
6. If Harp Pond discharges a sample must be collected at outfall 008. See Part 3 Section 5.0 for water sampling procedures and requirements.
7. If the pH of the discharge is not within the permitted 6.5-9.0 S.U. range then the noncompliance must be reported to both the Illinois EPA and Illinois Office of Mines and Minerals within 24 hours of the measurement. Notify the shift lead or mine management of the measured value so the noncompliance can be properly reported to the agencies.

**PEABODY COULTERVILLE MINING, LLC**

**PART 4**

**NPDES WATER SAMPLING**

## 1.0 DISCHARGE MONITORING PROTOCOLS

### 1.1 STANDARD OPERATING CONDITIONS

Per NPDES permit IL0062189, a minimum of nine samples shall be collected during each quarter when the sediment basin is discharging. During each month a minimum of one sample shall be taken during either a Discharge Condition I or IV event should such discharge condition occur. If a Condition II or III discharge event occurs (resultant from precipitation) then a minimum of three samples will be collected during the quarter. If a sufficient number of discharge events occur during the quarter than the remaining three quarterly samples may be taken during any of the four discharge conditions described above. A brief description of the discharge conditions are provided below. Additional details can be found in NPDES Permit IL0062189 (see Appendix E). Note that while the standard condition monitoring requirements are applicable to all outfalls listed in the permit it does not relieve the additional monitoring requirements associated with outfall 008. See Part 3 East Basin, Harp Pond, and Outfall 008 Monitoring for additional requirements.

Condition I: Dry weather discharge (base flow or mine pumpage).

Condition II: Any discharge, or increase in the volume of discharge, caused by precipitation within any 24 hour period less than or equal to the 10-year, 24-hour storm event (< 4.76 inches).

Condition III: Any discharge, or increase in the volume of discharge, caused by precipitation within any 24 hour period greater than or equal to the 10-year, 24-hour storm event (> 4.76 inches).

Condition IV: Any discharge continuing 24 hours after cessation of a precipitation event that resulted in a discharge.

### 1.2 MINE PUMPAGE

In the event that the mine needs to pump water from any water body or structure within the permit to another water body that results in the discharge of water from an NPDES outfall then a sample of the discharge must be collected and analyzed for Condition I water quality parameters. The alternate limits associated with precipitation based discharges (Condition II and III) do not apply. The required monitoring parameters include flow, pH, alkalinity, acidity, chloride, sulfate, hardness, total iron, total manganese, total suspended solids, and low level mercury (one sample per quarter). The list of required monitoring parameters, sample volumes, bottle types, and required preservative are provided on the chain of custody as well as the tables in Appendix F. The required monitoring parameters and NPDES water quality limits for each outfall can be found in NPDES permit IL0062189 (see Appendix E).

### 1.3 HEAVY PRECIPITATION

Discharges that occur as the result of precipitation shall be sampled and analyzed for Condition II or III parameters. A Condition II discharge is classified as any discharge, or increase in discharge, that is caused by a precipitation event that is less than the 10-year, 24-hour precipitation event (<4.76 inches). A Condition III discharge is classified as any discharge, or increase in discharge, that is caused by a precipitation event that is greater than the 10-year, 24-hour precipitation event (>4.76 inches). A determination of the type of discharge condition to monitor for will be based on the volume and duration of rainfall measured on-site. The required

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monitoring parameters for both conditions include flow, pH, chloride, sulfate, and hardness. Settleable Solids are also required to be monitored under a Condition II discharge but are not required for a Condition III discharge. The list of required monitoring parameters, sample volumes, bottle types, and required preservative are provided on the chain of custody as well as in the attached tables in Appendix F. The required monitoring parameters and NPDES water quality limits for each outfall can be found in NPDES permit IL0062189 (see Appendix E).

If a Condition II or III event is sampled the rainfall volume and duration must be recorded on the bottom right hand corner of the chain of custody. The rainfall will be measured from the on-site gauge located outside of the Preparation Plant. See Part 4 Section 2.0 for the rainfall monitoring procedure.

In addition to the above monitoring requirements the standard operating procedures for monitoring the East Basin, Harp Pond, and outfall 008 will be in effect. This will include physically checking outfall 008 twice per shift (four times per day) when the pumps in the East Basin and/or Harp Pond are engaged. See Part 3 East Basin, Harp Pond, and Outfall 008 Monitoring for additional information.

## 2.0 PRECIPITATION MONITORING

Rainfall quantity and duration must be recorded on the bottom right hand corner of the chain of custody for any Condition II or III sampling event. Rainfall is measured at the rain gauge located at the Preparation Plant Office. Rainfall is collected in a cylindrical rain gauge and recorded manually. The rain gauge has the capacity to measure up to 8.5 inches of rain at 0.1 inch increments. The rain gauge should be checked daily during periods of rainfall. The gauge should be cleared of any dirt or debris and periodically checked for levelness.

### *Procedure*

1. Approach rain gauge and read the rainfall quantity directly from the measuring tube.
2. Record the date, time, and rainfall quantity in the log book located in the Preparation Plant office.
3. If rain has occurred, empty the rain gauge and then set it back up for recording of future events.

## 3.0 SAMPLE COLLECTION AND PROCESSING

The following sections describe the sample collection process.

### 3.1 SAMPLE BOTTLE LABELING

Each sample bottle must contain a descriptive label or written identification prior to laboratory submittal. Each bottle must include the facility code, sample location code, sample date, and type of preservative used (if required). The four digit facility code (1825), sample point/site ID (008), and sample bottles and preservatives are located on the chain of custody form. A description of the Chain of Custody processing procedures is included in Part 4 Section 3.9. Sample bottles will be obtained prior to the sampling event from the laboratory analyzing the samples. See Part 4 Section 3.7 for the primary laboratory contact information and address.

### 3.2 SAMPLE COLLECTION

Surface water samples will be collected using the grab sampling method. This involves lowering the sample bottle directly into the main flow of the discharging water. The sample may be

collected from within the water body or from the bank of the water body, provided the collector can reach the main flow of the discharge or far enough to completely lower the bottle beneath the water surface. A telescoping rod with a clean sample bottle affixed to it may be used to extend the collectors reach.

### **3.2.1 STREAM AND SEDIMENT BASIN OUTFALL SAMPLING**

When sampling the outfalls discharge an effort will be made to collect the sample from within the main flow of the channel. When sampling from within the water body the sample bottle will be lowered to just beneath the surface of the water while facing upstream (i.e. stand downstream of the sampling point). Care must be taken to avoid collecting particulates re-suspended as a result of wading into position or bumping the sample bottle on the streambed. Under low flow conditions where discharge is too low to safely sample without disturbing the streambed sediment, boulders or rocks may be excavated allowing for sample collection from the remaining depression. Sufficient time must be allowed for the disturbed sediments to settle before sample collection within the newly formed depression. Many of the chemical constituent's analyzed for sorb onto suspended materials, thus collection of re-suspended particles will likely result in falsely elevated analyte concentrations.

#### ***Procedure***

1. Obtain bottles to be used at site.
2. Approach sampling site. If required to enter the spillway for the sample, wade into water downstream of sample point in order to not stir up spillway or stream bed sediments.
3. While facing upstream remove bottle cap and insert bottle into the main flow of the channel just below the surface of the water, making sure to avoid surface debris and to fill the bottle completely.
4. Recap the sample bottle and repeat as necessary until all bottles are filled.

### **3.3 FIELD MEASUREMENTS**

Using the multi-parameter water quality sensor (EUTECH Instruments PTTester 35 or equivalent), in accordance with the users manual, measure field pH and temperature at the outfall. Field measurements should be made insitu at the location of the water quality sample or from an additional sample container if it is not possible to safely enter the discharge stream. Temperature of the water can change rapidly therefore if it is not possible to measure the field parameters insitu then it is important the measurements be made immediately after removal from the water body. Discharge measurement procedures for sediment basin outfalls are found below in Section 3.4.

#### ***Procedure***

1. Calibrate the multi-parameter water quality sensor prior to each sampling event, if it's a single day event, or each morning of a multiple day sampling event (see manual). Calibrate the pH sensor using the three point method with pH 4.0 S.U., 7.0 S.U., and 10.0 S.U. buffer solutions.
2. Collect field measurements of pH, and temperature by placing meter into the same channel of flow or from an additional sample bottle immediately after collection.

3. Allow values to stabilize and record the measurements on the chain of custody.

### **3.4 DISCHARGE**

An estimate of sediment basin discharge must be made during all sampling events. Discharge can be measured using the float method.

#### **3.4.1 FLOAT METHOD**

Discharge is calculated by multiplying the cross-sectional area of the stream by the streams velocity at the sampling location.

##### ***Procedure***

1. Measure the width of the channel at the sampling location (in feet).
2. Measure the average depth of the channel at the sampling location (in feet).
3. Measure two points equal distance upstream and downstream of the sample location.
4. Deploy a buoyant object into the stream channel and record the time (in seconds) it takes for the object to float the distance measured in number 3.
5. Multiply the stream width (ft), average depth (ft), and velocity (ft/sec)
6. Record value on the chain of custody.

### **3.5 SETTLEABLE SOLIDS ANALYSIS**

If a Condition II discharge event occurs then settleable solids must be analyzed. Settleable solids analysis will be conducted by either Peabody Coulterville Mining, LLC personnel or their contracted laboratory and will follow EPA Method 160.5. The settleable solids test is the measurement of the volume of solids that will settle to the bottom of an Imhoff cone over a one hour time period. The test indicates the volume of solids removed by settling in the sedimentation ponds and provides information on how this process is functioning within the system. An, unfiltered, one liter sample will be collected from the sampling point following the appropriate sampling protocol (see Part 4 Section 3.2). If conducted by site personnel, the analysis will be completed in the office within the 48 hours maximum holding time. If submitted to the lab for analysis, the bottle must be provided to the lab within the 48-hour maximum holding time. A list of the required equipment and methods follows:

##### ***Equipment***

1. Imhoff cone
2. Stirring rod
3. Imhoff cone rack
4. Timer

##### ***Procedure***

1. Fill the Imhoff cone to the one-liter mark with the well mixed sample previously collected.
2. Allow sample to settle in Imhoff cone for 45 minutes
3. Gently stir the sample with the stirring rod to release suspended matter clinging to the sides of the Imhoff cone.
4. Let sample settle for an additional 15 minutes.
5. At the one hour mark, record the volume of settleable solids (in milliliters) in the Imhoff cone.

**Note**

1. Do not include any floating solids or any voids in the settled solids as settleable matter.
2. The lower limit of reportable concentration is 0.2 ml/l, not 0.4 ml/l. Thus all values over 0.2 ml/l must be reported as a number, not as <0.4 ml/l. A table of proper reporting under varying concentrations follows:

Measured Value ml/l	Reported Value ml/l
0 – 0.19	<0.2
0.2	0.2
0.3	0.3
0.4	0.4
0.5	0.5

**3.6 LOW-LEVEL MERCURY**

Although not anticipated, if Outfall 008 discharges under a Condition I or IV discharge event then a low level mercury sample must be collected from the outfall at a frequency of at least once per quarter. Sampling for low-level mercury requires the use of the clean hands/dirty hands method, as established by EPA Method 1669, to limit sample contamination. In this method one sampler acting as clean hands conducts all operations involving contact with the sample bottle and sample collection while the other acting as dirty hands is responsible for the preparation of all activities that do not involve direct contact with the sample container. Because of the potential for contamination it is recommended that the sampling team collect the sample upwind if possible and avoid (as much as possible) airborne particles such as dust, dirt, particulate matter, vapors from automobile exhaust and cigarette smoke, and nearby corroded or rusted bridges, pipes, poles, or wires. If sampling near a road attempt to sample during low traffic hours. Avoid breathing on the sample. Also avoid areas nearby with bare soil that are subject to wind erosion.

**Procedure**

1. Samplers must wear talc free gloves.
2. Dirty Hands removes the sampling kit from the cooler, then opens and holds the outer bag
3. First collect the field blank.
  - a. Clean hands retrieves and removes the field blank bottle and distilled water bottle from their inner bags.
  - b. Clean hands then fills the field blank container with the deionized water, taking care not to overfill it.
  - c. Clean hands then closes the field blank bottles lid, returns the bottle to the inner bag, reseals the bag, and then inserts the sealed bag into the outer bag being held by dirty hands.
4. Second collect the sample
  - a. Clean hands retrieves and removes the sample from its inner bag.
  - b. Clean hands then fills the sample container by completely submerging bottle beneath the water, then inverting the bottle and capping it underneath the water to limit exposure to air.

- c. Clean hands then returns the bottle to the inner bag, reseals the bag, and then inserts the sealed bag into the outer bag being held by dirty hands.
5. Dirty Hands then seals the outer bag, labels it accordingly and inserts it into the cooler.
6. The lab will preserve samples and filter dissolved species as necessary.
7. Samples must be delivered to the lab within 48 hours of collection.

**3.7 SAMPLE PREPERATION & LABORATORY SUBMITTAL**

The sample water will be collected into appropriately labeled bottles based on the sample points required analyses and, if applicable, the discharge condition. The necessary samples will then be preserved and filtered within 15 minutes of collection, before being placed on ice and cooled to approximately 4° C. The samples will then either be picked up by a courier or delivered to the laboratory following chain-of-custody procedures. A list of commonly sampled parameters, preservation requirements, and maximum laboratory holding times are provided in the table below. A list of laboratory sample classifications, analytes, required sample volumes, bottle types, and required preservative are provided in the attached tables as well as the chain of custody (see Appendix F).

Parameters	Preservative	Temp	Max Holding Time
Metals*, Hardness	HNO <sub>3</sub> to pH <2	≤ 6 °C	6 months
Phenol, Nitrate-N, Phosphorous, Total Organic Carbon	H <sub>2</sub> SO <sub>4</sub> to pH <2	≤ 6 °C	28 days
Cyanide	NaOH to pH >10	≤ 6 °C	14 days
Sulfide	NaOH w/ ZnAc to pH >9	≤ 6 °C	7 days
Acidity, Alkalinity	-	≤ 6 °C	14 days
Sulfate	-	≤ 6 °C	28 days
Total Suspended Solids, Total Dissolved Solids	-	≤ 6 °C	7 days
Low level Mercury	Lab Preserves	≤ 6 °C	48 hrs**

**Note:**

\* Dissolved Metals Require Field Filtration

\*\*Time to transport to laboratory

Samples will be analyzed by Standard Laboratories, Inc. located in Freeburg Illinois or other qualified laboratories. Their address and contact information is listed below. Efforts should be made to submit all samples to the laboratory within 48 hours of collection to meet all holding times. A copy of the chain of custody should be made and kept for the facilities records upon submission of the samples.

Standard Laboratories, Inc.  
 8451 River King Drive  
 Freeburg, IL 62243  
 (618) 539-5836

**3.8 FIELD OBSERVATIONS**

Field observations will be recorded in either a field notebook or in the comments or notes section of the Chain of Custody (COC). Observations will include information about conditions that could

impact the results of the sampled water quality. These include, but are not limited to, items such as wildlife activity, beaver dams, flooding or backwater, and algae. Discharges from the site shall not cause excessive foam, a visible film or sheen, or contain any substance in significant enough quantities to be unsightly or deleterious or produce color, odor, or other conditions to such a degree as to create a nuisance within the receiving waters. An observation of these conditions in the field will be noted.

### 3.9 CHAIN OF CUSTODY

The Chain of Custody (COC) is a written legal document used to track the transfer of a sample from person to person. It is utilized to guarantee the identity and integrity of a sample from collection through reporting of the test result. The COC is formatted to record field information, laboratory information, and the people who handle each individual sample. A COC is created for each sampling event and is typically a one page document. An individualized COC has been created for NPDES monitoring events at Gateway Mine and includes the applicable facility code, sample location codes, and Peabody sample location identification numbers. Additionally, required field parameters, lab parameters, bottle types, and preservatives are included in the box located on the bottom right corner. The COC contains places to enter calibration information for the multi parameter field water quality meter, the sample date/time, and all relevant field measurements (ph, Temp, etc). The COC also contains several signatory lines for the relinquishment of custody of the samples and for the receipt of custody of the samples.

#### ***Procedure***

Fill out the appropriate NPDES outfall COC prior to submittal of samples to the laboratory. The applicable sample type (i.e. NPDES outfall or stream) and required parameters are identified on the bottom right hand corner of the COC.

1. pH Meter Calibration Row
  - a. Sample Date and Time
    - i. Enter the date and time the meter was calibrated.
    - ii. Note: The meter must be calibrated prior to collecting any samples.
2. Sample Location Row
  - a. Sample Date and Time
    - i. Enter the date and time of sample collection.
  - b. Grab
    - i. This column denotes the sample collection methodology and is utilized to denote that a sample was collected.
    - ii. If a sample was collected mark an "x" in the cell, if sample was not collected leave the cell blank.
  - c. # Containers
    - i. This column identifies the number of bottles that are shipped/delivered to the lab. This cell is utilized by the laboratory to ensure the receipt of all samples.
      1. Mark the number of sample bottles collected at each sample location that will be shipped to the lab for analysis.
      2. DO NOT record bottles that will not be shipped to the lab (i.e. settleable solids which will be analyzed by the sampler).
  - d. Flow Condition
    - i. Record the flow condition (I - IV) in this cell.
    - ii. Note: If sample is collected under precipitation conditions (i.e. condition II or III) then the precipitation event statistics (Date ppt event started and ended, Rainfall total) must be recorded. Event statistics should be recorded in the designated section located in the box on the bottom right corner of the COC.
  - e. Flow

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- i. Record the measured flow at the outfall of the basin or the stream sampling point in the cell. If there is no flow record a zero in the cell.
  - ii. Note: Make sure units used for the measurement match the units identified on the COC. If not convert units prior to recording the flow in the cell.  
1 CFS = 448.83 gpm
- f. pH
  - i. Under flowing condition record the field measured pH in the cell.
  - ii. Under no flow conditions leave the cell blank.
- g. Temp
  - i. Under flowing condition record the field measured Temperature in the cell.
  - ii. Under no flow conditions leave the cell blank.
- h. Settleable Solids
  - i. If settleable solids are required for the sample type, record the measured value in the cell.
  - ii. If settleable solids are not required for the sample type, leave the cell blank.
  - iii. Note: Signature on COC is verification that the sampler conducted the field test following EPA Method 160.5 and affirms the result.
- i. Sample Type
  - i. The required sample type for the sample location is identified in this column
    - 1. Details of the required field measurements, number of bottles to collect, type and size of bottle to use, the necessary preservative, and the laboratory analysis required are found in the bottom right corner of the COC.
- j. Comments
  - i. Any relevant comments should be included here. See Part 4 Section 3.8 Field Observations.
  - ii. Note: If an unconstructed comment is included in the cell then a sample date and time must be included for the relevant sample row. This documents that that outfall was not constructed on that date.
- k. Gray Cells
  - i. Do not record or mark anything in these cells. This acts as a reminder that the subject sample point does not require this information.
- l. Signature Row
  - i. Relinquished by
    - 1. Sign, date, and time the COC upon relinquishing the samples to the laboratory technician, laboratory courier, or Peabody personnel.
  - ii. Received by
    - 1. The laboratory technician, laboratory courier, or Peabody personnel must sign, date, and time these cells upon receipt of the samples.

### Note

- 5. **Details of the required field parameters, lab parameters, and bottles for the sample types are noted on the bottom right corner of the COC.**
- 6. **Make sure measured units match units listed on the COC**
- 7. **No erroneous information may be erased from the COC. Errors must be lined out with a single dash, initialed, and the correction written in.**
- 8. **Review the COC for accuracy prior to relinquishing it.**

**PEABODY COULTERVILLE MINING, LLC**

**PART 5**

**STANDARD OPERATING PROCEDURES  
&  
EMERGENCY MANAGEMENT  
ANNUAL TRAINING**

## **GATEWAY MINE**

### **Standard Operating Procedures & Emergency Management Plan**

### **Annual Training**

**Purpose:** To ensure that mine employees are thoroughly familiar with the procedures in place to manage and monitor decant water within the slurry circuit and to limit discharge from the East Basin and Harp Pond outfall. The monitoring procedures are only applicable to periods when decant water is flowing, or very close to flowing, from the active refuse impoundment.

- **Slurry Circuit Water Management:** Location of critical areas within the circuit including pH monitoring locations and water treatment points.
  - Cell 4 Auxiliary Spillway
  - Cell 2 Spillway
  - Culvert West of Preparation Plant
  - Recirculation Lake
  - Preparation Plant
  - Slurry Circuit Water Treatment Points
  - East Basin
  - Harp Pond
  - NPDES Outfall 008
  
- **East Basin and Harp Pond Monitoring:** Review of monitoring requirements and equipment in place to limit the discharge of decant water from NPDES Outfall 008.
  - Pump Locations and Operation
  - Automatic Float System
  - Frequency of Monitoring
  - Maintaining Storage Retention Volume Prior to Storm Events
  - Log Book Procedures
  - Pump Maintenance
  
- **NPDES Discharge Sample Collection:** Review of sample collection procedures in case of unexpected discharge from Harp Pond.
  - Discharge measurement
  - Field pH
  - Sample Collection
  - Sample Kits Including Bottles and Preservatives
  - Chain of Custody
  
- **Emergency Scenarios:** Review of procedures in place for managing the decant water during emergency scenarios.
  - East Basin or Harp Pond Electric Pump Failure
  - Acidic Decant Water



**PEABODY COULTERVILLE MINING, LLC**

**PART 6**

**PLAN REVIEW & MAINTENANCE**

## **1.0 PLAN REVIEW**

### **1.1 PLAN AMENDMENT REQUIREMENTS**

#### **1.1.1 TECHNICAL AMENDMENTS**

Changes to the facility design, construction, operation, or maintenance that impact the facilities management of the slurry circuit water require an amendment to the Standard Operating Procedures and Emergency Management Plan. Revisions of this nature are considered Technical Amendments. Technical Amendments to the plan must be completed within 90 days of the change of the facility, construction, operation, or maintenance and the revised plan must be submitted to Illinois Environmental Protection Agency within 30 days of the modification.

#### **1.1.2 NON-TECHNICAL AMENDMENTS**

Administrative changes to the emergency contact list or laboratory are considered Non-technical Amendments. Non-technical Amendments to the plan must be completed as soon as possible but no later than during the annual review. A change of this nature is not required to be submitted to the Illinois Environmental Protection Agency until the next technical amendment occurs.

### **1.2 SCHEDULE OF PLAN REVIEW**

Appropriate facility personnel must review the Standard Operating and Emergency Management Plan annually. Amendments to the Plan, if needed, are made throughout the year. Technical Amendments to the plan, as described above in Section 1.1.1, must be completed within 90 days of the change to facility and the revised plan must be submitted to Illinois Environmental Protection Agency within 30 days of the modification. Non-technical Amendments must be made no later than during the annual review.

### **1.3 RECORD OF PLAN REVIEW**

Plan reviews and amendments are recorded in the Plan Review Log (see following page). This log must be completed even if no amendment is made to the Plan as a result of the review. Unless a technical or administrative change prompts an earlier review of the Plan, the next scheduled review of this plan must occur by 12/31/2017.



## **APPENDIX A**

### **SITE MAP**

012

011

002  
003

008

Gateway Prep



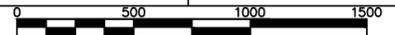
13101 Zeigler 11 Road  
Coulterville, IL 62237

Standard Operating Procedures  
&  
Emergency Management Plan

- - - - - NPDES Permit Boundary
- — — — — Pipe Structure
- — — — — Culvert Pipe
- - - - - Ditch
- 008** NPDES Outfall Number
- TP-3** Water Treatment Point
- ▲ 008DS 008 Downstream Monitoring Point

DESIGNED BY: Technical Services	COUNTRY: USA
DRAWN BY: Technical Services	STATE/PROVINCE: Illinois
APPROVED BY: JJO	GCS: NAD 27

DATE: 2017-03-06	DRAWING/SHEET: 1 of 1
SCALE: 1" = 500'	C.I.: 0'



**APPENDIX B**  
**EXAMPLE INSPECTION**  
**LOG BOOK ENTRY**

GATEWAY MINE DAILY INSPECTION OF PREP PLANT

DATE 10-6-16 TIME 8:30 Am DAY SHIFT 8-6

Oxygen Level in Raw Feed Tunnel 20.9% Methane Level in Raw Feed Tunnel 0.0%

- OK Start up horn working properly? OK Compressed gas cylinders guarded, upright and secure?
OK Adequate lighting? OK Tripping, falling, slipping hazards?
OK Walkways clear of debris? OK Tail pulley guards in place?
OK Flammable materials marked and in proper containers? OK Are all belts guarded?
OK Back alarms on mobile equipment working? OK Fire extinguishers fully charged?
OK General housekeeping? OK Safety bars across double doors?
OK Extension cords in proper condition? OK Hoist, safety chain and latch?

Action taken: Shoveled AC tunnel, got AD good graded cell S. Drump 2x Harp's gone and grade's lake are to low to Drump pumps checked slurry line OK

Other unsafe conditions noted:

Action taken:

Inspected by: Dan Johnson

GATEWAY MINE DAILY INSPECTION OF LOADOUT

DATE 10-6-16 TIME 10:15 Am DAY SHIFT 8-6

Oxygen Level in Draw Off Tunnel 20.9% Methane Level in Draw Off Tunnel 0.0%

- OK Start up horn working properly? OK General housekeeping?
OK Adequate lighting? OK Tripping, falling, slipping hazards?
OK Walkways clear of debris? OK Fire extinguishers fully charged?
OK Flammable materials marked and in proper containers?

Action taken: loaded compressed train

Other unsafe conditions noted:

Action taken:

Inspected by: Dan Johnson

GATEWAY MINE DAILY INSPECTION OF PREP PLANT

DATE 10-6-16 TIME DAY SHIFT

Oxygen Level in Raw Feed Tunnel % Methane Level in Raw Feed Tunnel %

- Start up horn working properly? Compressed gas cylinders guarded, upright and secure?
Adequate lighting? Tripping, falling, slipping hazards?
Walkways clear of debris? Tail pulley guards in place?
Flammable materials marked and in proper containers? Are all belts guarded?
Back alarms on mobile equipment working? Fire extinguishers fully charged?
General housekeeping? Safety bars across double doors?
Extension cords in proper condition? Hoist, safety chain and latch?

Action taken: Checked Harps pond OOS Grady's lake 7:30 Am, 12:30 pm 4:05 pm pumps off level low no rain

HP Cell-4(8.0) Cell-2(7.8) Grady's(7.9) Harps(7.9)

Other unsafe conditions noted: Rec Lake(8.6)

Action taken: R.B.

Inspected by:

GATEWAY MINE DAILY INSPECTION OF LOADOUT

DATE TIME DAY SHIFT

Oxygen Level in Draw Off Tunnel % Methane Level in Draw Off Tunnel %

- Start up horn working properly? General housekeeping?
Adequate lighting? Tripping, falling, slipping hazards?
Walkways clear of debris? Fire extinguishers fully charged?
Flammable materials marked and in proper containers?

Action taken:

Other unsafe conditions noted:

Action taken:

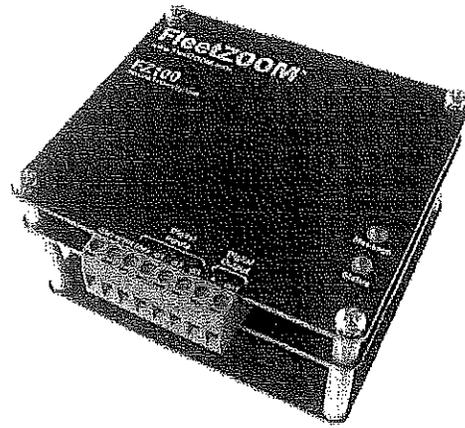
Inspected by: Ross Beali

**APPENDIX C**

**EQUIPMENT TECHNICAL  
SPECIFICATIONS & MANUALS**

# FleetZOOM®

☎ : (877) 535-ZOOM  
 ✉ : Sales@FleetZOOM.com  
 🌐 : www.FleetZOOM.com



## FZ100 Cellular Monitoring System

### Overview:

The FZ100 is a compact cellular transceiver for monitoring industrial equipment that sends live data to the monitoring web site, providing real-time status and alarms. It features 3 digital inputs and 1 digital output. In addition to alarming on status changes, the system keeps track of on-time and cycles for the digital inputs; useful for monitoring pump, fan, or compressor run times and duty cycles. The unit monitors input power voltage and provides an optional battery backup which enables the system to alarm on main power voltage level or failure and continue operating without main power.

The easy to use web site updates continuously, displaying location and operating status for all of your monitored equipment. Alarms are immediately displayed on the web site and trigger messages sent to interested personnel in your organization via SMS text messages and emails. Every event is permanently logged in the web site allowing powerful historical analysis using the built in reporting features to give equipment owners detailed insight into the operation and readiness of their equipment fleets.

Proactive service reminders are automatically generated and sent as equipment reaches service intervals based on run-time. Service logs and manuals available over the secure web site reduce paperwork and automate record keeping while providing up to the minute service records for all of your monitored equipment.

### Features:

Easy to install cellular monitoring system. A variety of optional enclosures and mounting options provide for a clean and professional installation. Unit includes a quad magnet bracket for quick mounting and templates for mounting with included standoffs.

Advanced power management employing low power idle modes enable the unit to operate in solar powered applications with minimal power draw.

No software to buy, install or maintain; all mapping and data features are accessible over the secure web site from any computer with Internet access.

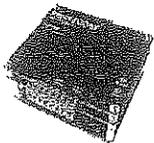
### Technical Specifications:

<b>Size</b>	4.0" x 4.3" x 2.3" in.	<b>Power</b>	9 - 32 Volts DC
<b>Radio</b>	Quad Band GPRS GSM	<b>Battery Backup</b>	Internal
<b>Transmit Power</b>		<b>Current Consumption</b>	
850 / 900 MHz	Class 4, 2 Watts	Idle	65 mA
1800 / 1900 MHz	Class 2, 1 Watt	Transmit, Average	250 mA
<b>Digital Inputs</b>	3	Peak	2.1 A
<b>Digital Outputs</b>	1	<b>Temperature</b>	
<b>Connectors</b>	5mm Terminal Blocks	Operating	-30°C to +70°C
<b>GSM Connector</b>	SMA	Storage	-40°C to +85°C
		<b>Max. Humidity</b>	95% Non-Condensing

### Radio Agency Approvals:

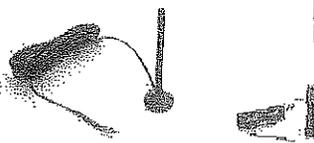
<b>FCC</b>	Part 15 Part 22 Part 24
<b>GCF</b>	Version 3.21.1
<b>PTCRB</b>	Version 3.7.1
<b>Industry Canada</b>	Yes
<b>CE Mark</b>	Yes
<b>RoHS Compliant</b>	Yes
<b>E-mark</b>	Yes

### Each Complete Monitoring System Includes:



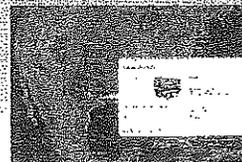
#### Digital Cellular Monitoring Unit:

- 3 Digital Inputs
- 1 Digital Output
- Connected 24x7x365



#### Low Profile or High Gain Cellular Antenna:

- 4" (Low Profile)
- 12.4" (High Gain)
- 12' Cable Length
- Magnet Mount



#### Mapping & Reporting:

- Web Accessible
- Graphical Map Overview
- Simple User Interface
- Run Service Reports
- Monitor Equipment Use

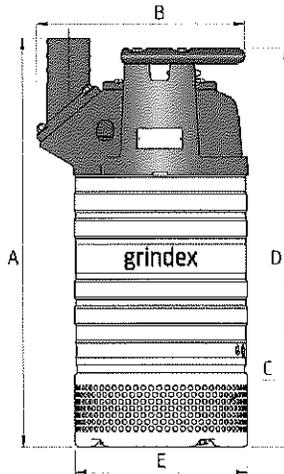


#### Alarming & Notifications:

- Equipment Status Change
- Equipment Service Needed
- SMS Text Message
- BlackBerry, PDA Message
- Email

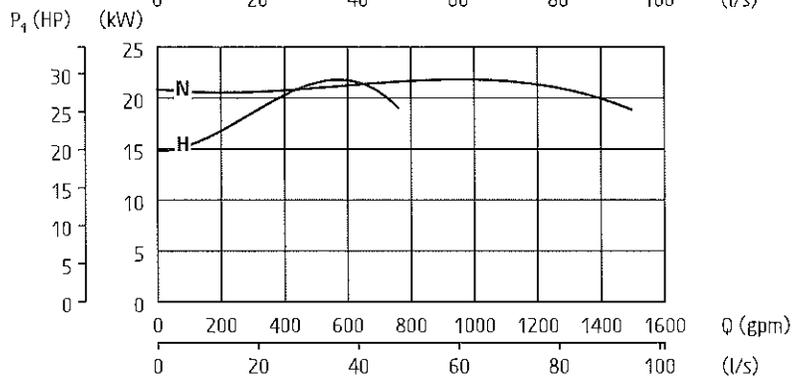
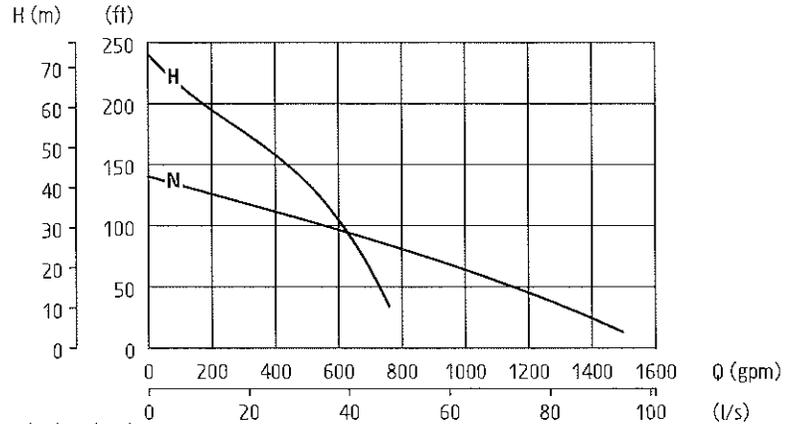
# Matador MSHA

Electrical submersible drainage pump



60 Hz	N	H
Discharge connection	6"	4"
Rated power $P_2$ [hp/kW]	27 / 20	27 / 20
Max. power consumption $P_1$ [kW]	22	22
Shaft speed [rpm]	3500	3500
Rated current at 460V	30 A	30 A
Rated current at 575V	24 A	24 A
Solids passage [inch]	0.48	0.48
Height [inch]	37.5	36.7
Diameter [inch]	20.3	19.7
Weight [lbs/kg]	318 / 144	318 / 144

Other voltages on request



ISO 9906/A

### Pump types

N: normal pressure, H: high pressure

### Classification

Electrical submersible drainage pump  
Protection class: IP 68

### Approvals

MSHA Certification No. (XP) 07-JA080006-0  
MSHA 2G system approval No. 18-A080007-0

### Electrical motor

Squirrel cage induction motor, insulation class: H (IEC 85)

### Motor protection

Thermal contacts in the stator opening temperature 284°F (140°C), air valve

### Cable - SubCab

8AWG/3-2-1-GC, 53 ft

### Limitations

Max. submersion depth: 66 ft (20 m)  
Max. liquid temperature: 104 °F (40 °C)  
Allowed pH range: 5 - 8  
Maximum liquid density: 68 lbs/ft³ (1100 kg/m³)

### Shaft seals

Cartridge seal: pre-assembled double mechanical seal running in an oil compartment  
Material lower seal: *silicon carbide - silicon carbide*  
Material upper seal: *tungsten carbide - tungsten carbide*

### Bearings

Ball bearings with C3 clearance

### Discharge connection

4-6" NPT

### Materials

Casted parts: *Aluminium*  
Outer casing: *Stainless steel*  
Stator housing: *Cast iron*  
Motor shaft: *Stainless steel*  
Impeller: *Hard-Iron™*  
Suction cover: *Hard-Iron™*  
Diffusers: *Nitrile rubber*  
Screws and nuts: *Stainless steel*  
O-rings: *Nitrile rubber*

### Accessories

Zinc anodes



Revision 2.0

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# Installation, Operation, and Maintenance Manual

8106.082/.181 Matador



Electronic Filing: Received, Clerk's Office 6/8/2017

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# Introduction and Safety

## Introduction

### Purpose of this manual

The purpose of this manual is to provide necessary information for:

- Installation
- Operation
- Maintenance



#### **CAUTION:**

Read this manual carefully before installing and using the product. Improper use of the product can cause personal injury and damage to property, and may void the warranty.

#### **NOTICE:**

Save this manual for future reference, and keep it readily available at the location of the unit.

## Safety terminology and symbols

### About safety messages

It is extremely important that you read, understand, and follow the safety messages and regulations carefully before handling the product. They are published to help prevent these hazards:

- Personal accidents and health problems
- Damage to the product
- Product malfunction

### Hazard levels

Hazard level	Indication
<b>DANGER:</b>	A hazardous situation which, if not avoided, will result in death or serious injury
<b>WARNING:</b>	A hazardous situation which, if not avoided, could result in death or serious injury
<b>CAUTION:</b>	A hazardous situation which, if not avoided, could result in minor or moderate injury
<b>NOTICE:</b>	<ul style="list-style-type: none"> <li>• A potential situation which, if not avoided, could result in undesirable conditions</li> <li>• A practice not related to personal injury</li> </ul>

### Hazard categories

Hazard categories can either fall under hazard levels or let specific symbols replace the ordinary hazard level symbols.

Electrical hazards are indicated by the following specific symbol:



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#### Electrical Hazard:

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These are examples of other categories that can occur. They fall under the ordinary hazard levels and may use complementing symbols:

- Crush hazard
- Cutting hazard
- Arc flash hazard

## Product warranty

### Coverage

Grindex undertakes to remedy the following faults in products sold by Grindex under the following conditions:

- The faults are due to defects in design, materials or workmanship.
- The faults are reported to an Grindex representative within the warranty period.
- The product is used only under the conditions described in this manual.
- The monitoring equipment incorporated in the product is correctly connected and in use.
- All service and repair work is done by personnel authorized by Grindex.
- Genuine Grindex parts are used.

### Limitations

The warranty does not cover faults caused by the following:

- Deficient maintenance
- Improper installation
- Modifications or changes to the product and installation carried out without consulting Grindex
- Incorrectly executed repair work
- Normal wear and tear

Grindex assumes no liability for the following:

- Bodily injuries
- Material damages
- Economic losses

### Warranty claim

Grindex products are high-quality products with expected reliable operation and long life. However, should the need arise for a warranty claim, please contact your Grindex representative.

### Spare parts

Grindex guarantees that spare parts will be available for 10 years after the manufacture of this product has been discontinued.

## Safety



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**WARNING:**

- The operator must be aware of safety precautions to prevent physical injury.
  - Any pressure-containing device can explode, rupture, or discharge its contents if it is over-pressurized. Take all necessary measures to avoid over-pressurization.
  - Operating, installing, or maintaining the unit in any way that is not covered in this manual could cause death, serious personal injury, or damage to the equipment. This includes any modification to the equipment or use of parts not provided by Grindex. If there is a question regarding the intended use of the equipment, please contact an Grindex representative before proceeding.
  - This manual clearly identifies accepted methods for disassembling units. These methods must be adhered to. Trapped liquid can rapidly expand and result in a violent explosion and injury. Never apply heat to impellers, propellers, or their retaining devices to aid in their removal.
  - Do not change the service application without the approval of an authorized Grindex representative.
- 



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**CAUTION:**

You must observe the instructions contained in this manual. Failure to do so could result in physical injury, damage, or delays.

---

## User safety

### General safety rules

These safety rules apply:

- Always keep the work area clean.
- Pay attention to the risks presented by gas and vapors in the work area.
- Avoid all electrical dangers. Pay attention to the risks of electric shock or arc flash hazards.
- Always bear in mind the risk of drowning, electrical accidents, and burn injuries.

### Safety equipment

Use safety equipment according to the company regulations. Use this safety equipment within the work area:

- Hard hat
  - Safety goggles, preferably with side shields
  - Protective shoes
  - Protective gloves
  - Gas mask
  - Hearing protection
  - First-aid kit
  - Safety devices
- 

**NOTICE:**

Never operate a unit unless safety devices are installed. Also see specific information about safety devices in other chapters of this manual.

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**Electrical connections**

Electrical connections must be made by certified electricians in compliance with all international, national, state, and local regulations. For more information about requirements, see sections dealing specifically with electrical connections.

**Hazardous liquids**

The product is designed for use in liquids that can be hazardous to your health. Observe these rules when you work with the product:

- Make sure that all personnel who work with biologically hazardous liquids are vaccinated against diseases to which they may be exposed.
- Observe strict personal cleanliness.

**Wash the skin and eyes**

Follow these procedures for chemicals or hazardous fluids that have come into contact with your eyes or your skin:

Condition	Action
Chemicals or hazardous fluids in eyes	<ol style="list-style-type: none"> <li>1. Hold your eyelids apart forcibly with your fingers.</li> <li>2. Rinse the eyes with eyewash or running water for at least 15 minutes.</li> <li>3. Seek medical attention.</li> </ol>
Chemicals or hazardous fluids on skin	<ol style="list-style-type: none"> <li>1. Remove contaminated clothing.</li> <li>2. Wash the skin with soap and water for at least 1 minute.</li> <li>3. Seek medical attention, if necessary.</li> </ol>

**MSHA requirements**

According to the United States of America's Code of Federal Regulations, the following requirements must be fulfilled to maintain Mine Safety and Health Administration (MSHA) permissibility of this equipment:

Subject area	Requirements
General safety	<ul style="list-style-type: none"> <li>• Frequent inspections must be made.</li> <li>• All electrical parts, portable cable, and wiring must be kept in a safe condition.</li> <li>• There must not be any openings into the casings of the electrical parts.</li> <li>• The machine frame must be effectively earthed (grounded).</li> <li>• Power wires must not be used for earthing (grounding).</li> <li>• The operating voltage must match the voltage rating of the motor.</li> </ul>

Subject area	Requirements
Service and repair	<ul style="list-style-type: none"> <li>• Inspections, service, and repairs are only allowed when the portable cable is disconnected from the power supply.</li> <li>• Work must be performed by trained personnel (preferably the manufacturer or agent) to ensure that the pump is restored to its original state of safety in regards to all flame-arresting paths.</li> <li>• Replacement parts must be exactly equal to those provided by the manufacturer.</li> <li>• When cable entries are disturbed on pump or control, they must be reassembled in the approved manner.</li> </ul> <div style="display: flex; align-items: center; margin-top: 10px;">  <div> <p><b>DANGER:</b></p> <p>Failure to restore the permissible equipment to its original state of safety will void the MSHA approval. The creation of a safety hazard will subject the owner / operator of a mine to citations and penalties under the law.</p> </div> </div>
Fastenings	All bolts, nuts, screws, and threaded covers must be properly tightened and secured.
Cables	A flame-resistant portable cable must be used. It has to bear an MSHA-assigned identification number and be adequately protected by an automatic circuit-interrupting device. Special care must be taken in handling the cable to avoid mechanical damage and wear.
Operation	Polyurethane-equipped products must not be operated dry in hazardous areas.

## Environmental safety

### The work area

Always keep the station clean to avoid and/or discover emissions.

### Waste and emissions regulations

Observe these safety regulations regarding waste and emissions:

- Dispose appropriately of all waste.
- Handle and dispose of the processed liquid in compliance with applicable environmental regulations.
- Clean up all spills in accordance with safety and environmental procedures.
- Report all environmental emissions to the appropriate authorities.

### Electrical installation

For electrical installation recycling requirements, consult your local electric utility.

### Recycling guidelines

Always recycle according to the guidelines listed below:

1. Follow local laws and regulations regarding recycling if the unit or parts are accepted by an authorized recycling company.
2. If the first guideline is not applicable, then return the unit or parts to the nearest Grindex representative.

# Transportation and Storage

## Inspect the delivery

### Inspect the package

1. Inspect the package for damaged or missing items upon delivery.
2. Note any damaged or missing items on the receipt and freight bill.
3. File a claim with the shipping company if anything is out of order.  
If the product has been picked up at a distributor, make a claim directly to the distributor.

### Inspect the unit

1. Remove packing materials from the product.  
Dispose of all packing materials in accordance with local regulations.
2. Inspect the product to determine if any parts have been damaged or are missing.
3. If applicable, unfasten the product by removing any screws, bolts, or straps.  
For your personal safety, be careful when you handle nails and straps.
4. Contact the local sales representative if there is any issue.

## Transportation guidelines

### Precautions



---

**DANGER:**

Disconnect and lock out electrical power before installing or servicing the unit.

---



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**WARNING:**

- Stay clear of suspended loads.
  - Observe accident prevention regulations in force.
- 

### Position and fastening

The unit can be transported either horizontally or vertically. Make sure that the unit is securely fastened during transportation, and cannot roll or fall over.

### Lifting



---

**WARNING:**

Crush Hazard.

- Always lift the unit by its designated lifting points.
  - Use suitable lifting equipment and ensure that the product is properly harnessed.
  - Wear personal protective equipment.
  - Stay clear of cables and suspended loads.
- 

Lifting equipment and tackle should always be inspected before starting work.

---

## Temperature ranges for transportation, handling and storage

### Handling at freezing temperature

At temperatures below freezing, the product and all installation equipment, including the lifting gear, must be handled with extreme care.

Make sure that the product is warmed up to a temperature above the freezing point before starting up. Avoid rotating the impeller/propeller by hand at temperatures below the freezing point. The recommended method to warm the unit up is to submerge it in the liquid which will be pumped or mixed.

---

**NOTICE:**

Never use a naked flame to thaw the unit.

---

### Unit in as-delivered condition

If the unit is still in the condition in which it left the factory - all packing materials are undisturbed - then the acceptable temperature range during transportation, handling and storage is:  $-50^{\circ}\text{C}$  ( $-58^{\circ}\text{F}$ ) to  $+60^{\circ}\text{C}$  ( $+140^{\circ}\text{F}$ ).

If the unit has been exposed to freezing temperatures, then allow it to reach the ambient temperature of the sump before operating.

### Lifting the unit out of liquid

The unit is normally protected from freezing while operating or immersed in liquid, but the impeller/propeller and the shaft seal may freeze if the unit is lifted out of the liquid into a surrounding temperature below freezing.

Units equipped with an internal cooling system are filled with a mixture of water and 30% glycol. This mixture remains a flowing liquid at temperatures down to  $-13^{\circ}\text{C}$  ( $9^{\circ}\text{F}$ ). Below  $-13^{\circ}\text{C}$  ( $9^{\circ}\text{F}$ ), the viscosity increases such that the glycol mixture will lose its flow properties. However, the glycol-water mixture will not solidify completely and thus cannot harm the product.

Follow these guidelines to avoid freezing damage:

1. Empty all pumped liquid, if applicable.
2. Check all liquids used for lubrication or cooling, both oil and water-glycol mixtures, for the presence of water. Change if needed.

## Storage guidelines

### Storage location

The product must be stored in a covered and dry location free from heat, dirt, and vibrations.

---

**NOTICE:**

- Protect the product against humidity, heat sources, and mechanical damage.
  - Do not place heavy weights on the packed product.
- 

### Long-term storage

If the unit is stored more than six months, then the following apply:

- Before operating the unit after storage, it must be inspected with special attention to the seals and the cable entry.
- The impeller/propeller must be rotated every other month to prevent the seals from sticking together.

# Product Description

## Products included

Pump model	Approvals
Matador 8106.181	Standard
Matador 8106.082	

## Pump design

The pump is submersible, and driven by an electric motor.

## Intended use

The product is intended for moving waste water, sludge, raw and clean water. Always follow the limits given in *Application limits* (page 45). If there is a question regarding the intended use of the equipment, please contact a Grindex representative before proceeding.



### WARNING:

In explosive or flammable environments, only use Ex- or MSHA-approved products.

### NOTICE:

Do NOT use the pump in highly corrosive liquids.

For information about pH, see *Application limits* (page 45).

## Particle size

The pump can handle liquid containing particles that correspond to the holes in the strainer.

Number of holes	Hole dimensions
476	Diameter 12.0 mm (0.47 in)

For more information about the strainer, see *Dimensions and weights* (page 47).

## Pressure class

N	Medium head
H	High head

## Impeller type

Wear resistant

## Monitoring equipment

The following applies to the monitoring equipment of the pump:

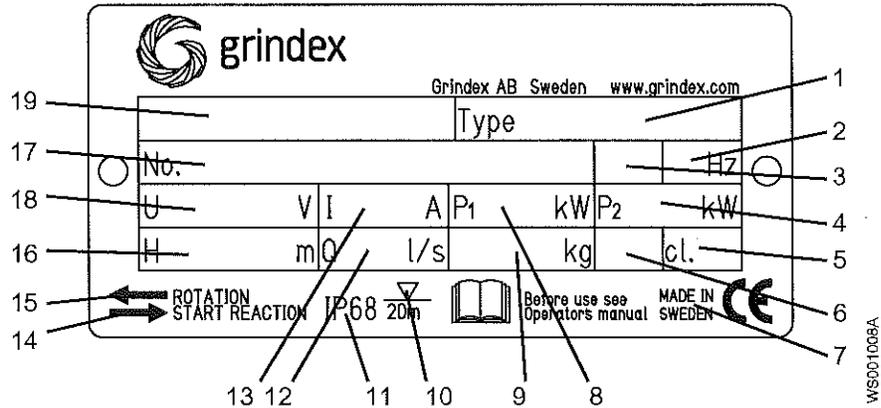
- The stator incorporates thermal contacts connected in series that activate the alarm at overtemperature.
- The thermal contacts open at 140°C (284°F) and close at 105°C (221°F).

## The data plate

### Introduction

The data plate is a metal label located on the main body of the pump. The data plate lists key product specifications.

### The data plate



1. Pump type number
2. Frequency
3. Phases, type of current
4. Rated shaft power
5. Thermal class
6. Locked rotor code-letter
7. Country of origin
8. Maximum power consumption
9. Product weight
10. Maximum submersion depth
11. Degree of protection
12. Maximum capacity
13. Rated current
14. Direction of the start reaction
15. Direction of the impeller rotation
16. Maximum head
17. Serial number
18. Rated voltage
19. Pump model

### Warning plate

Pumps without built-in motor protection have an additional data plate. This pump must be used with separate overload protection in accordance with technical data.

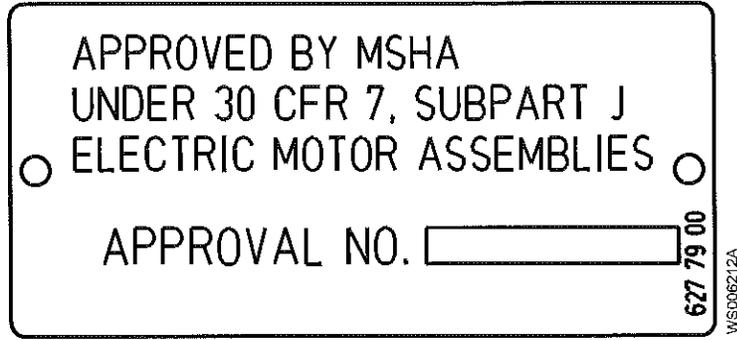


WS0006204A

Product Description

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**The MSHA approval plate**



# Installation

## Install the pump


**DANGER:**

Disconnect and lock out electrical power before installing or servicing the unit.


**WARNING:**

- Do not install the starter equipment in an explosive zone unless it is explosion-proof rated.
- Do not install CSA-approved products in locations that are classified as hazardous in the national electric code, ANSI/NFPA 70-2005.
- Vent the tank of a sewage station in accordance with local plumbing codes.
- Make sure that the unit cannot roll or fall over and injure people or damage property.


**WARNING:**

Electrical shock hazard. Check that the cable and cable entry have not been damaged during transport before installing the pump.

**NOTICE:**

- Never force piping to make a connection with a pump.

These requirements apply:

- Use the pump dimensional drawing in order to ensure proper installation.
- Provide a suitable barrier around the work area, for example, a guard rail.
- Check the explosion risk before you weld or use electric hand tools.
- Remove all debris from the inlet piping system before you install the pump.
- Always check the impeller rotation before lowering the pump into the pumped liquid.

### Sedimentation prevention

In order to avoid sedimentation when the pumped liquid contains solid particles, the velocity of the liquid in the discharge line must exceed a certain value. Choose applicable minimum velocity from the table, and choose proper dimension of the discharge line accordingly.

Mixture	Minimum velocity, meter per second (feet per second)
Water + coarse gravel	4 (13)
Water + gravel	3.5 (11)
Water + sand, particle size <0.6 mm (0.024 in)	2.5 (8.2)
Water + sand, particle size <0.1 mm (0.004 in)	1.5 (4.9)

For more permanent installations with a heavily contaminated pumped liquid, a settling pump-sump is recommended.

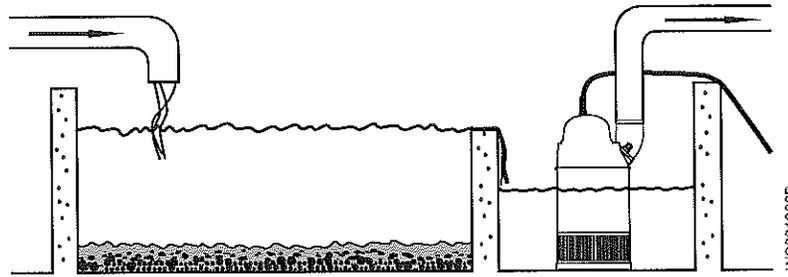
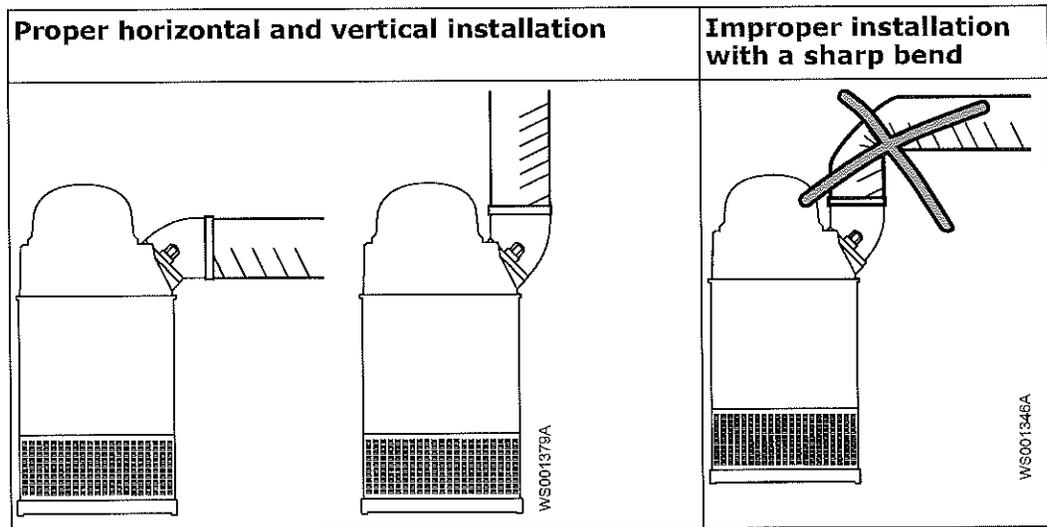


Figure 1: Settling pump-sump

### Discharge line requirements

The discharge line can be run vertically or horizontally, but must be without sharp bends.



### Fasteners



#### WARNING:

- Only use fasteners of the proper size and material.
- Replace all corroded fasteners.
- Make sure that all fasteners are properly tightened and that there are no missing fasteners.

### Install

The pump is transportable and intended to operate either completely or partially submerged in the pumped liquid. The pump is equipped with a connection for hose or pipe.

These requirements and instructions only apply when the installation is made according to the dimensional drawing.

1. Run the cable so that it has no sharp bends, is not pinched, and cannot be sucked into the pump inlet.
2. Connect the discharge line.

The discharge line can be run vertically or horizontally, but must be without sharp bends.

3. Lower the pump into the sump.

The cable must not be used for this purpose. You should attach a rope or similar to the handle or the eyebolts for lowering and lifting the pump.

Heavier pumps must be lifted and lowered down by crane. Suspend the pump by the lifting handle or the eyebolts with chains or wires.

4. Place the pump on the base and make sure it cannot fall over or sink. The base should consist of a plank, a bed of coarse gravel, or a cut-down and perforated oil drum.

Alternatively, the pump can be suspended with a lifting chain just above the sump bottom. Make sure that the pump cannot rotate at startup or during operation.

5. Connect the motor cable and the starter and monitoring equipment according to the separate instructions.

Matador MSHA: Make sure that the impeller rotation is correct. For more information, see *Check the impeller rotation: Pumps without built-in motor protection* (page 20).

Matador: Make sure that the phase sequence is correct. For more information, see *Check the phase sequence: Pumps with built-in motor protection* (page 21).

## Make the electrical connections

### General precautions



#### Electrical Hazard:

- A certified electrician must supervise all electrical work. Comply with all local codes and regulations.
- Before starting work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.
- Leakage into the electrical parts can cause damaged equipment or a blown fuse. Keep the end of the motor cable above the liquid level.
- Make sure that all unused conductors are insulated.
- There is a risk of electrical shock or explosion if the electrical connections are not correctly carried out or if there is fault or damage on the product.



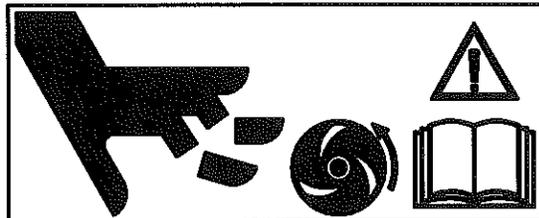
#### WARNING:

Do not install the starter equipment in an explosive zone unless it is explosion-proof rated.



#### CAUTION:

If the pump is equipped with automatic level control and/or internal contactor, there is a risk of sudden restart.



W3006209A

### Requirements

These general requirements apply for electrical installation:

- The supply authority must be notified before installing the pump if it will be connected to the public mains. When the pump is connected to the public power supply, it may cause flickering of incandescent lamps when started.
- The mains voltage and frequency must agree with the specifications on the data plate. If the pump can be connected to different voltages, then the connected voltage is specified by a yellow sticker close to the cable entry.
- The fuses and circuit breakers must have the proper rating, and the pump overload protection (motor protection breaker) must be connected and set to the rated current according to the data plate and if applicable the cable chart. The starting current in direct-on-line start can be up to six times higher than the rated current.
- The fuse rating and the cables must be in accordance with the local rules and regulations.
- If the rated current of the pump is the same or close to the ampere rating of the fuses and circuit breakers, then the fuses and circuit breakers are required to have characteristics for motors.
- If intermittent operation is prescribed, then the pump must be provided with monitoring equipment supporting such operation.
- The thermal contacts/thermistors must be in use.

### Cables

These are the requirements to follow when you install cables:

- The cables must be in good condition, not have any sharp bends, and not be pinched.
- The sheathing must not be damaged and must not have indentations or be embossed (with markings, etc.) at the cable entry.
- The cable entry seal sleeve and washers must conform to the outside diameter of the cable.
- The minimum bending radius must not be below the accepted value.
- If using a cable which has been used before, a short piece must be peeled off when refitting it so that the cable entry seal sleeve does not close around the cable at the same point again. If the outer sheath of the cable is damaged, then replace the cable. Contact a Grindex service shop.
- The voltage drop in long cables must be taken into account. The drive unit's rated voltage is the voltage measured at the cable connection point in the pump.
- The screened cable must be used according to the European CE requirements if a Variable Frequency Drive (VFD) is used. For more information, contact your Grindex representative (VFD-supplier).
- For SUBCAB cables, the twisted pair copper foil must be trimmed.

### Earthing (Grounding)



---

#### Electrical Hazard:

- You must earth (ground) all electrical equipment. This applies to the pump equipment, the driver, and any monitoring equipment. Test the earth (ground) lead to verify that it is connected correctly.
  - If the motor cable is jerked loose by mistake, the earth (ground) conductor should be the last conductor to come loose from its terminal. Make sure that the earth (ground) conductor is longer than the phase conductors. This applies to both ends of the motor cable.
  - Risk of electrical shock or burn. You must connect an additional earth-(ground-) fault protection device to the earthed (grounded) connectors if persons are likely to come into physical contact with the pump or pumped liquids.
-

**Earth (ground) conductor length**

The earth (ground) conductor must be 200mm (7.9 in) longer than the phase conductors in the junction box of the unit.

**Connect the motor cable to the pump**



**CAUTION:**

Leakage into the electrical parts can cause damaged equipment or a blown fuse. Keep the end of the motor cable above the liquid level.

1. Check the data plate to see which connections are required for the power supply.
2. Connect the motor cable conductors, including earth (ground), to the terminal or starter unit.
3. Make sure that the pump is correctly connected to earth (ground).
4. Firmly tighten the cable entry into its bottom-most position.  
The seal sleeve and the washers must conform to the outside diameter of the cables.

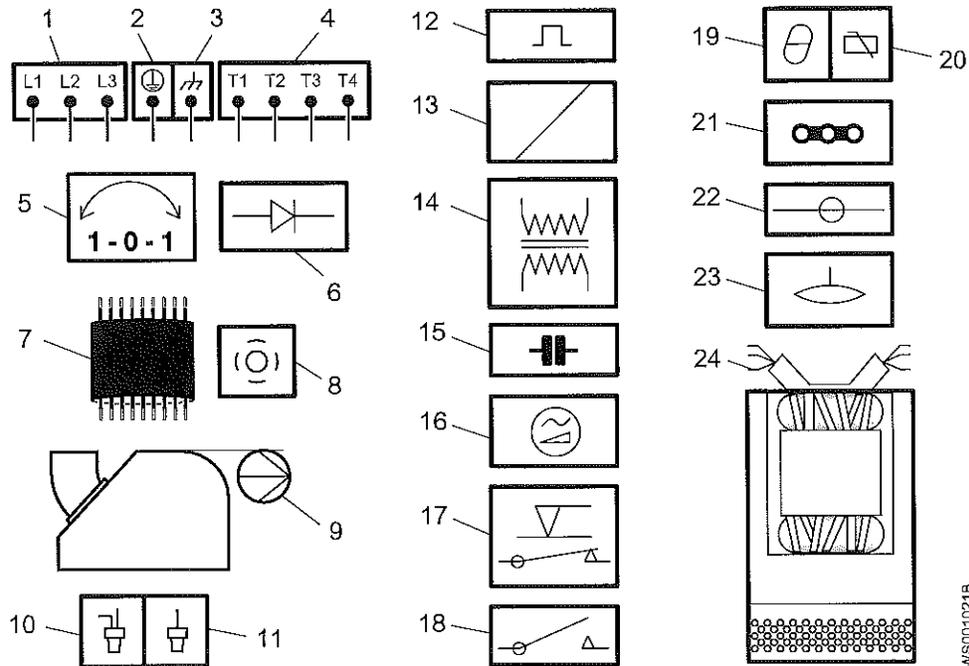


**WARNING:**

Do not install the starter equipment in an explosive zone unless it is explosion-proof rated.

**Cable charts**

**Connection locations**



1	Starter equipment and main leads (L1, L2, L3)	13	Coil
2	Earth (ground)	14	Transformer
3	Functional ground	15	Capacitor

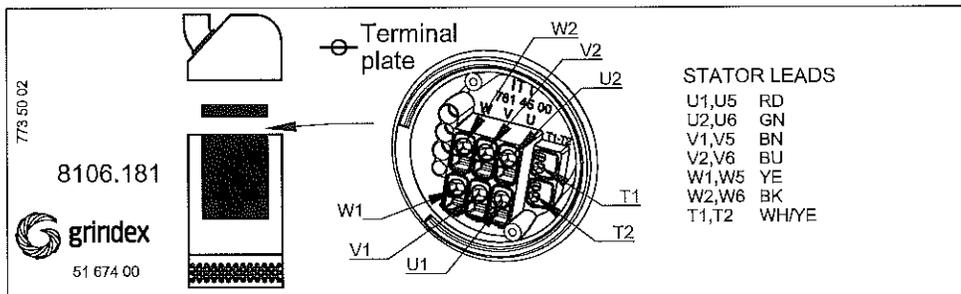
Installation

4	Control leads (T1, T2, T3, T4)	16	Softstarter
5	Phase shifter	17	Level regulator
6	Diode	18	Contactora, start relay or thermal relay
7	Motor cable	19	Thermal detector in stator
8	Screen	20	Thermal detector in main bearing
9	Pump	21	Jumper
10	Crimp connection	22	Terminal board, terminal plate
11	Crimp isolation	23	Leakage sensor
12	Motor protector	24	Stator leads (U1, U2, U5, U6, V1, V2, V5, V6, W1, W2, W5, W6, Z1, Z5, Z6)

**Color code standard**

Code	Description
BN	Brown
BK	Black
WH	White
OG	Orange
GN	Green
GNYE	Green-Yellow
RD	Red
GY	Grey
BU	Blue
YE	Yellow

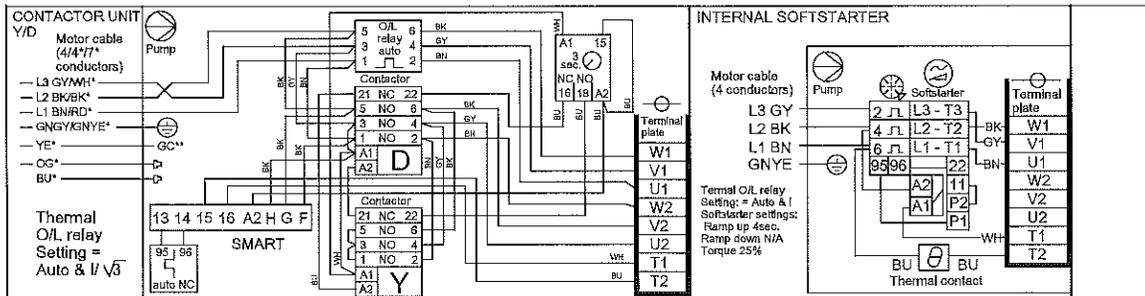
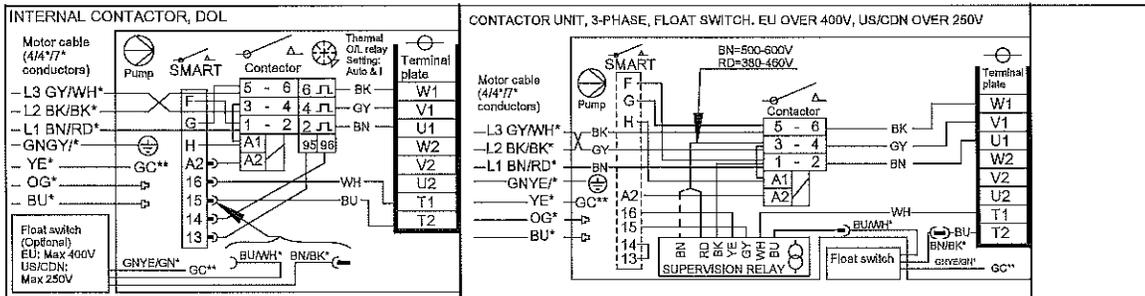
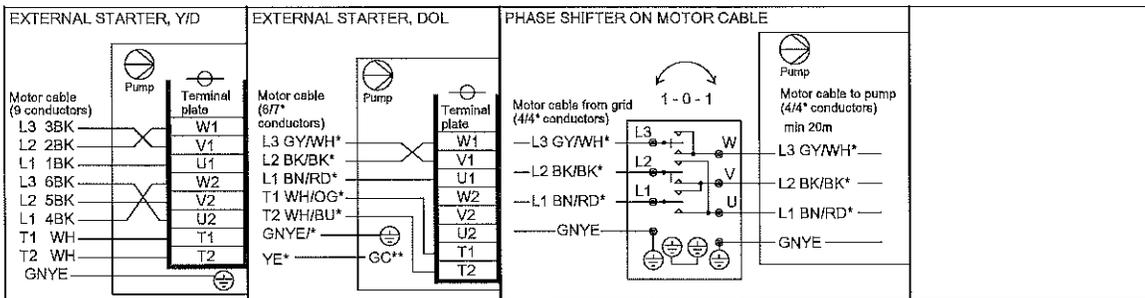
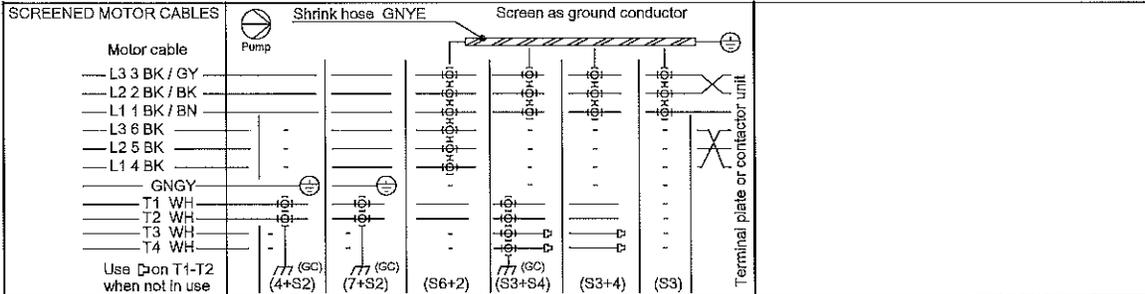
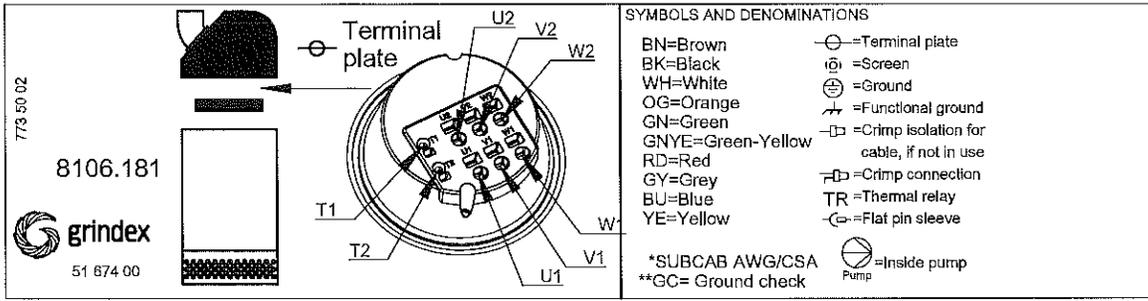
**Stator leads and thermal contacts connection to the terminal plate**



STATOR LEADS AND THERMAL CONTACTS										
Terminal plate	3 leads Y	6 leads D	6 leads Y	6 leads Y/D	9 leads Y serial	9 leads Y //	12 leads Y //	12 leads D serial	12 leads D //	
W1	W	W1 V2	W1	W1	W1	W1 W5	W1 W5	W1 V6	W1 W5	V2 V6
V1	V	V1 U2	V1	V1	V1	V1 V5	V1 V5	V1 U6	V1 V5	U2 U6
U1	U	U1 W2	U1	U1	U1	U1 U5	U1 U5	U1 W6	U1 U5	W2 W6
W2				W2	W2 W5			W2 W5		
V2				V2	V2 V5			V2 V5		
U2				U2	U2 U5			U2 U5		
T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1
T2	T2	T2	T2	T2	T2	T2	T2	T2	T2	T2
				W2		W2	W2	W2	W2	W2
				V2		V2	V2	V2	V2	V2
				U2		U2	U2	U2	U2	U2

WS004662B

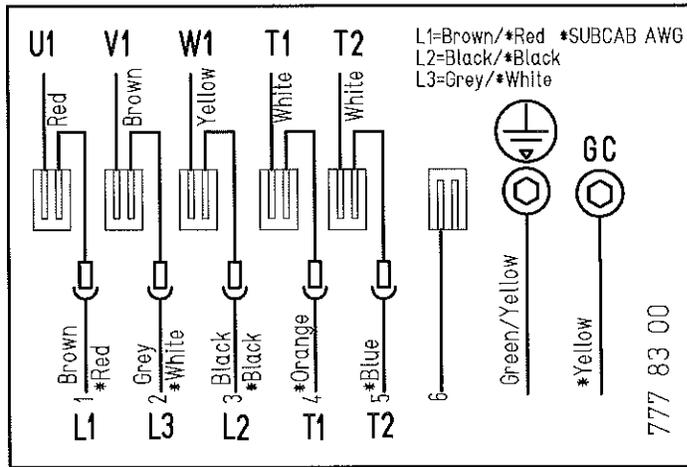
Motor cable and starter unit connection to the terminal plate



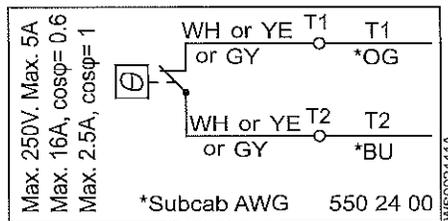
WS004933B

## Cable charts, MSHA version

Motor 60 Hz, 3-phase, 440-480V Y or 575-600V Y



WS004859A



## Check the impeller rotation: Pumps without built-in motor protection

Follow this procedure if your product does not have the rotation control SMART™ or softstarter.



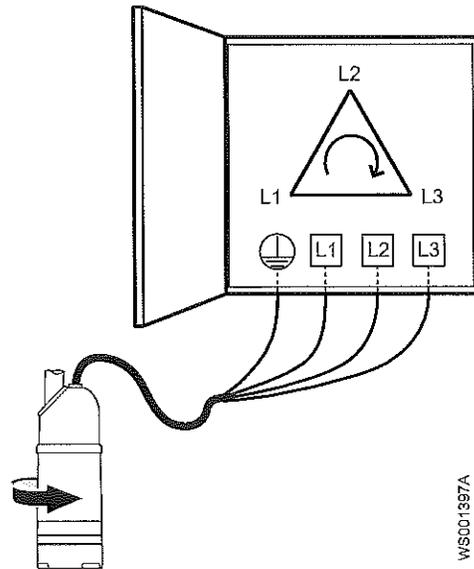
### WARNING:

The starting jerk can be powerful.

Check the direction of rotation each time the cable has been re-connected and after phase or total supply failure.

1. Start the motor.
2. Stop the motor.
3. Check that the impeller rotates in the correct direction.

The correct direction of impeller rotation is clockwise when you look at the pump from above. When started, the pump will react in the opposite direction to the impeller rotation.



**Figure 2: Start reaction**

4. If the impeller rotates in the wrong direction, then do the following:
  - If the motor has a 3-phase connection, then transpose two phase conductors and repeat this procedure from step 1.

For 3-phase pumps with external starters or without built-in motor protection, the phases must be shifted on the output terminal of the starter.

## Check the phase sequence: Pumps with built-in motor protection

Follow this procedure if your product is equipped with the rotation control SMART™ or softstarter.



### **WARNING:**

The starting jerk can be powerful.

The correct direction of impeller rotation is clockwise when you look at the pump from above. When started, the pump will react in the opposite direction to the impeller rotation.

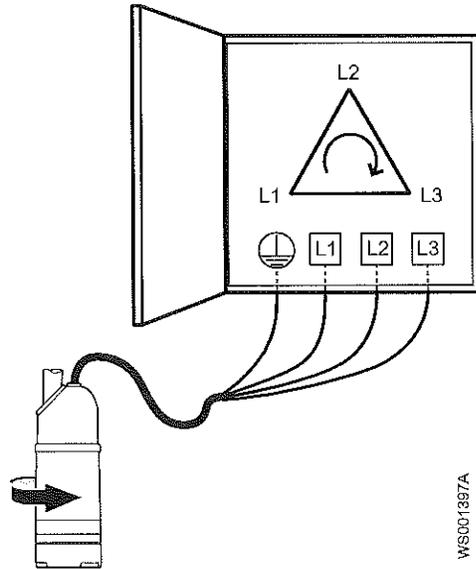
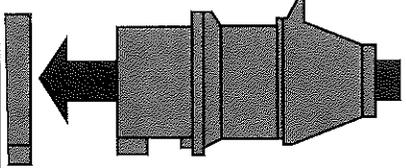
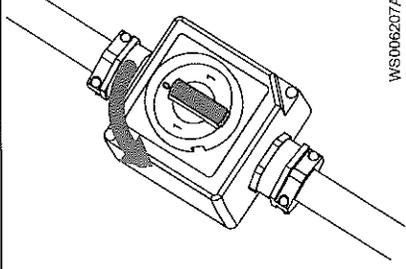


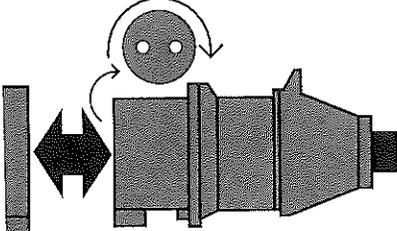
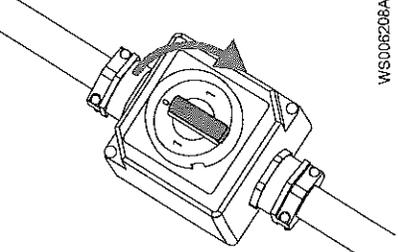
Figure 3: Start reaction

1. Connect the pump to power as follows:

Condition	Action
The pump has a CEE plug with internal phase shifter.	Connect the plug.  WS006205A
The pump has a phase shifter with an on/off switch.	Turn the knob on the phase shifter in either direction.  WS006207A
The pump has neither a CEE plug with internal phase shifter, nor a phase shifter with an on/off switch.	1. Connect the pump to power. 2. Switch on the power.

The pump should start. If it does not, then continue to the next step.

2. If the pump does not start and the fuses are correct, then shift two phases:

Condition	Action
<p>The pump has a CEE plug with internal phase shifter.</p>	<ol style="list-style-type: none"> <li>1. Pull out the plug.</li> <li>2. Shift two phases.</li> <li>3. Wait until the motor has stopped.</li> <li>4. Connect the plug.</li> </ol>  <p style="text-align: right;">WS006206A</p>
<p>The pump has a phase shifter with an on/off switch.</p>	<ol style="list-style-type: none"> <li>1. Turn the knob on the phase shifter to neutral position.</li> <li>2. Wait until the motor has stopped.</li> <li>3. Turn the knob to the opposite position from before.</li> </ol>  <p style="text-align: right;">WS006206A</p>
<p>The pump has neither a CEE plug with internal phase shifter, nor a phase shifter with an on/off switch.</p>	<p>Transpose two phase leads on the output terminal of the starter.</p>

**NOTICE:**

Do not reverse the phase sequence while the pump is running. Temporarily incorrect rotation can occur, resulting in damage to motor electronics and rotating parts.

The pump should start. If it does not, then contact a certified electrician to check the mains and the junctions.

# Operation

## Precautions



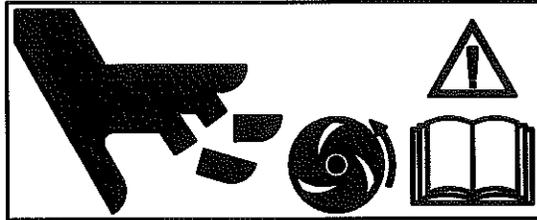
**WARNING:**

- Never operate the pump without safety devices installed.
- Never operate the pump with the discharge line blocked, or the discharge valve closed.
- Make sure you have a clear path of retreat.
- Never work alone.



**CAUTION:**

If the pump is equipped with automatic level control and/or internal contactor, there is a risk of sudden restart.



W5006209A

## Distance to wet areas



**Electrical Hazard:**

- Risk of electrical shock. Make sure no one gets closer than 20 m (65 ft.) to the unit when being in contact with the pumped or mixed liquid.
- Risk of electrical shock. This unit has not been investigated for use in swimming pools. If used in connection with swimming pools special safety regulations apply.

## Noise level

**NOTICE:**

The noise level of the product is lower than 70 dB. However, the noise level of 70 dB may be exceeded in some installations and at certain operating points on the performance curve. Make sure that you understand the noise level requirements in the environment where the pump is installed. Failure to do so may result in hearing loss or violation of local laws.

## Start the pump



**DANGER:**

If you need to work on the pump, make sure that it is isolated from the power supply and cannot be energized.

**WARNING:**

- Make sure that the unit cannot roll or fall over and injure people or damage property.
- In some installations, the pump and the surrounding liquid may be hot. Bear in mind the risk of burn injuries.
- Make sure nobody is close to the unit when it is started. The unit will jerk in the opposite direction of the impeller rotation.

**NOTICE:**

Make sure that the rotation of the impeller is correct. For more information, see Check the impeller rotation.

1. Inspect the pump. Check that there is no physical damage to the pump or cables.
2. Check the oil level in the oil housing.
3. Remove the fuses or open the circuit breaker, and check that the impeller can be rotated freely.
4. Check that the monitoring equipment (if any) works.
5. Check that the impeller rotation is correct.
6. Start the pump.

## Clean the pump

The pump must be cleaned if it has been running in very dirty water. If clay, cement or other similar dirt is left in the pump it may clog the impeller and seal, preventing the pump from working.

Let the pump run for a while in clean water, or flush it through the discharge connection.

# Maintenance

## Precautions



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**DANGER:**

Disconnect and lock out electrical power before installing or servicing the unit.

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**WARNING:**

- Always follow safety guidelines when working on the product. See *Introduction and Safety* (page 3).
  - Make sure that the unit cannot roll or fall over and injure people or damage property.
  - Rinse the unit thoroughly with clean water before working on the unit.
  - Rinse the components in water after dismantling.
- 

Make sure that you follow these requirements:

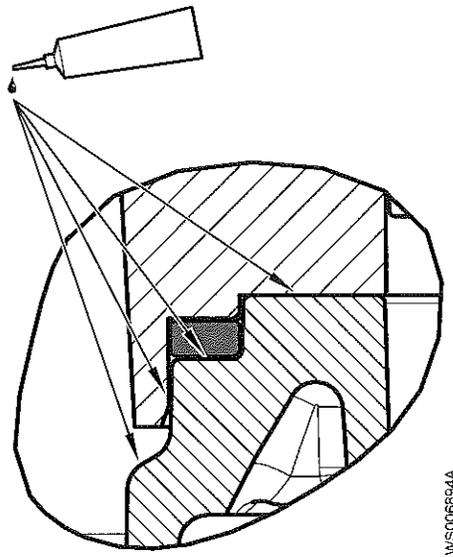
- Check the explosion risk before you weld or use electrical hand tools.
- Allow all system and pump components to cool before you handle them.
- Make sure that the product and its components have been thoroughly cleaned.
- Do not open any vent or drain valves or remove any plugs while the system is pressurized. Make sure that the pump is isolated from the system and that pressure is relieved before you disassemble the pump, remove plugs, or disconnect piping.

## Maintenance guidelines

During the maintenance and before reassembly, always remember to perform these tasks:

- Clean all parts thoroughly, particularly O-ring grooves.
- Change all O-rings, gaskets, and seal washers.
- Lubricate all springs, screws, O-rings with grease.

For an optimal corrosion protection, all O-rings and adjacent surfaces must be coated with Exxon Mobil Unirex N3 or equivalent.



**Figure 4: Example of O-ring adjacent surfaces**

During the reassembly, always make sure that existing index markings are in line.

The reassembled drive unit must always be insulation-tested and the reassembled pump must always be test-run before normal operation.

## Torque values

All screws and nuts must be lubricated to achieve correct tightening torque. Screws that are screwed into stainless steel must have the threads coated with suitable lubricants to prevent seizing.

If there is a question regarding the tightening torques, please contact the local sales and service representative.

### Screws and nuts

**Table 1: Stainless steel, A2 and A4, torque Nm (ft-lbs)**

Property class	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
50	1.0 (0.74)	2.0 (1.5)	3.0 (2.2)	8.0 (5.9)	15 (11)	27 (20)	65 (48)	127 (93.7)	220 (162)	434 (320)
70, 80	2.7 (2)	5.4 (4)	9.0 (6.6)	22 (16)	44 (32)	76 (56)	187 (138)	364 (268)	629 (464)	1240 (915)
100	4.1 (3)	8.1 (6)	14 (10)	34 (25)	66 (49)	115 (84.8)	248 (183)	481 (355)	—	—

**Table 2: Steel, torque Nm (ft-lbs)**

Property class	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
8.8	2.9 (2.1)	5.7 (4.2)	9.8 (7.2)	24 (18)	47 (35)	81(60)	194 (143)	385 (285)	665 (490)	1310 (966.2)
10.9	4.0 (2.9)	8.1 (6)	14 (10)	33 (24)	65 (48)	114 (84)	277 (204)	541 (399)	935 (689)	1840 (1357)

Maintenance

Property class	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
12.9	4.9 (3.6)	9.7 (7.2)	17 (13)	40 (30)	79 (58)	136 (100)	333 (245)	649 (480)	1120 (825.1)	2210 (1630)

**Hexagon screws with countersunk heads**

For hexagon socket head screws with countersunk head, maximum torque for all property classes must be 80% of the values for property class 8.8 above.

**Service**

Regular inspection and service of the pump ensures more reliable operation.

Type of service	Purpose	Inspection interval
Inspection	To prevent operational interruptions and machine breakdown. Measures to secure performance and pump efficiency are defined and decided for each individual application. It can include such things as impeller trimming, wear part control and replacement, control of zinc-anodes and control of the stator.	Twice a year
Major overhaul	To secure a long operating lifetime for the product. It includes replacement of key components and the measures taken during an inspection.	Every year, under normal operating conditions

**NOTICE:**

Shorter intervals may be required when the operating conditions are extreme, for example with very abrasive or corrosive applications or when the liquid temperatures exceed 40°C (104°F).

**Inspection**

Regular inspection and service of the pump ensures more reliable operation.

Service item	Action
Visible parts on the pump and installation	<ol style="list-style-type: none"> <li>1. Check that all screws, bolts, and nuts are properly tightened.</li> <li>2. Check the condition of the pump casing, strainer, cover, lifting handles, eye bolts, ropes, chains, and wires.</li> <li>3. Check for worn or damaged parts.</li> <li>4. Adjust and/or replace if necessary.</li> </ol>
Pipes, valves, and other peripheral equipment	<ol style="list-style-type: none"> <li>1. Check for worn or damaged parts.</li> <li>2. Adjust and/or replace if necessary.</li> </ol>
Impeller	<ol style="list-style-type: none"> <li>1. Check for worn or damaged parts.</li> <li>2. Adjust and/or replace if necessary.</li> </ol> <p>Wear on the impeller or surrounding parts necessitates fine adjustments of the impeller or replacement of worn parts.</p>

Service item	Action
Oil	Check the oil: <ol style="list-style-type: none"> <li>1. Take an oil sample.</li> <li>2. If the oil contains particles, then replace the mechanical seal. Contact an authorized service shop.</li> </ol> Make sure that the volume is filled to the correct level. See <i>Fill with oil</i> (page 31). A smaller amount of water is not harmful for the mechanical seal.
Cable entry	<ol style="list-style-type: none"> <li>1. Check that the following requirements are met:               <ul style="list-style-type: none"> <li>• The cable entry must be firmly tightened into its bottom-most position.</li> <li>• MSHA pump version: The cable entry must be tightened so that the clearance between the gland screw and the MSHA cover is &gt;3.175 mm (1/8 in). Use a feeler gauge to check the clearance.</li> <li>• MSHA pump version: The gland screw is secured from rotating with a screw and washer.</li> <li>• The seal sleeve and the washers must conform to the outside diameter of the cables.</li> </ul> </li> <li>2. Cut off a piece of the cable so that the seal sleeve closes around a new position on the cable.</li> <li>3. Replace the seal sleeve, if necessary.</li> </ol>
Inspection volume <sup>1</sup>	<ol style="list-style-type: none"> <li>1. Check that the inspection screw is properly tightened.</li> <li>2. Remove the inspection screw.</li> <li>3. Drain all liquid, if any.</li> <li>4. If there is oil in the inspection volume, then empty the oil and check again after one week. If there is oil in the inspection volume again, then replace the mechanical seal. Contact an authorized service shop.</li> <li>5. If there is water in the inspection volume, then check that the inspection screw O-ring is not damaged.</li> </ol>
Cable	<ol style="list-style-type: none"> <li>1. If the outer jacket is damaged, replace the cable.</li> <li>2. Check that the cables do not have any sharp bends and are not pinched.</li> </ol>
Cooling system	If the flow through the system has been partly restricted, then rinse and clean.
Level sensors or other sensor equipment	<ol style="list-style-type: none"> <li>1. Check the functionality.</li> <li>2. Repair or replace any damaged equipment.</li> <li>3. Clean and adjust the equipment.</li> </ol>
Starter equipment	<ol style="list-style-type: none"> <li>1. Check the condition and functionality.</li> <li>2. Contact an electrician, if necessary.</li> </ol>
Insulation resistance in the stator	<ol style="list-style-type: none"> <li>1. Check the insulation between:               <ul style="list-style-type: none"> <li>• Phase–phase on the stator</li> <li>• Phase–earth (ground)</li> </ul>               The insulation should be &gt; 1 megohm. Use a 1000-VDC megger to test the insulation.             </li> <li>2. If the resulting value is &lt; 1 megohm, then contact an authorized service shop.</li> </ol>

<sup>1</sup> Regardless of individual applications, the inspection volume should not be inspected less frequently than the intervals for normal applications and operating conditions at media (liquid) temperatures <40°C (104°F).

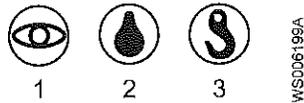
## Major overhaul

For a major overhaul, take this action in addition to the tasks listed under Inspection.

Service item	Action
Support and main bearing	Replace the bearings with new bearings.
Mechanical seal	Replace with new seal units.

## Change the oil

A paraffin oil with viscosity close to ISO VG32 is recommended. The pump is delivered from the factory with this type of oil. In applications where poisonous properties are of less concern, a mineral oil with viscosity up to ISO VG32 can be used.



1. Inspection plug
2. Oil screw
3. Eyebolt plug

**Figure 5: Symbols**

## Empty the oil

1. Lay the pump on its side.  
Lock the pump with supports to prevent it from rolling over.
2. Remove the oil screw.

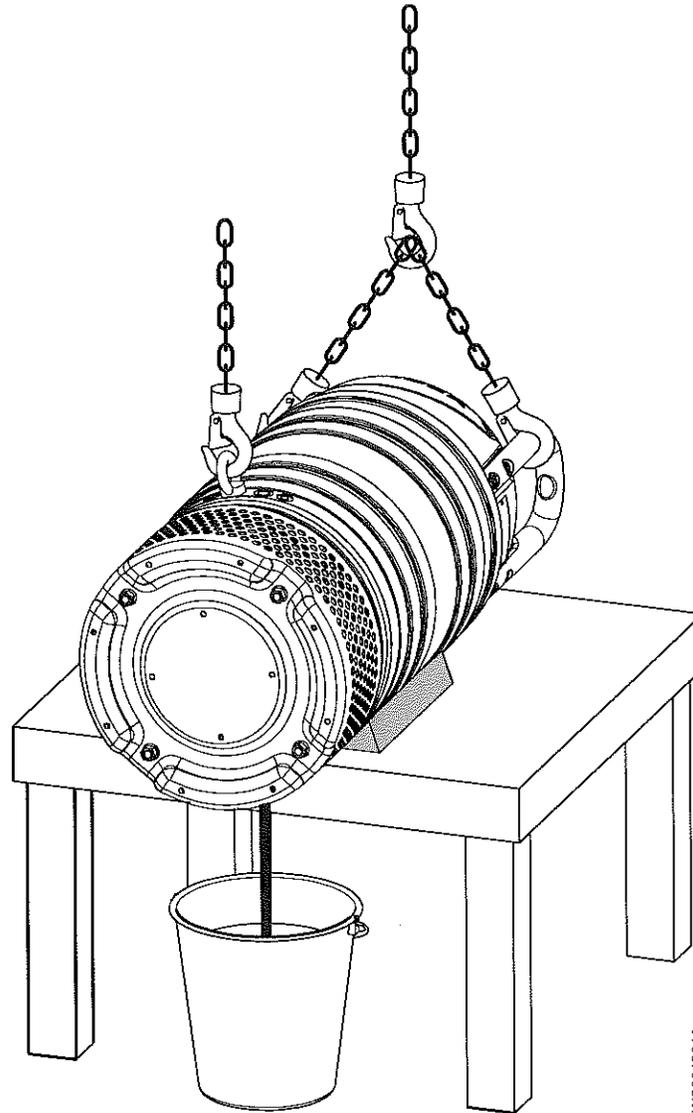
There are two oil screws. Either screw can be used for drainage, but it is easier to drain the oil if both oil screws are removed.



### **WARNING:**

The oil housing may be pressurized. Hold a rag over the oil plug to prevent oil from spraying out.

3. Turn the pump so that the oil hole faces downwards and let the oil run out.



WIS001351A

### Fill with oil

1. Replace the oil screw O-ring.
2. Put one of the oil screws back and tighten it.
3. Turn the pump so that the oil hole faces upwards and fill with new oil.  
Fill until the oil level reaches the inlet hole.  
Quantity: 1.8 L (1.9 qt)
4. Put the oil screw back and tighten it.

### Replace the impeller

#### Remove the impeller N, H



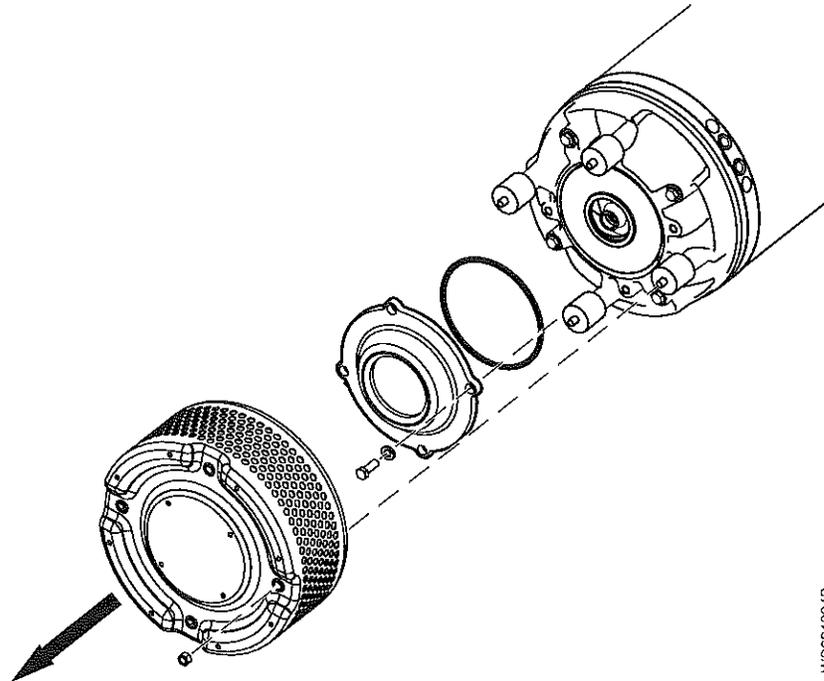
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**WARNING:**

A worn impeller and/or pump housing can have very sharp edges. Wear protective gloves.

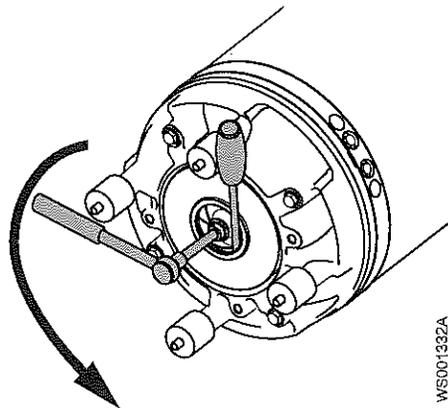
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1. Remove the strainer.



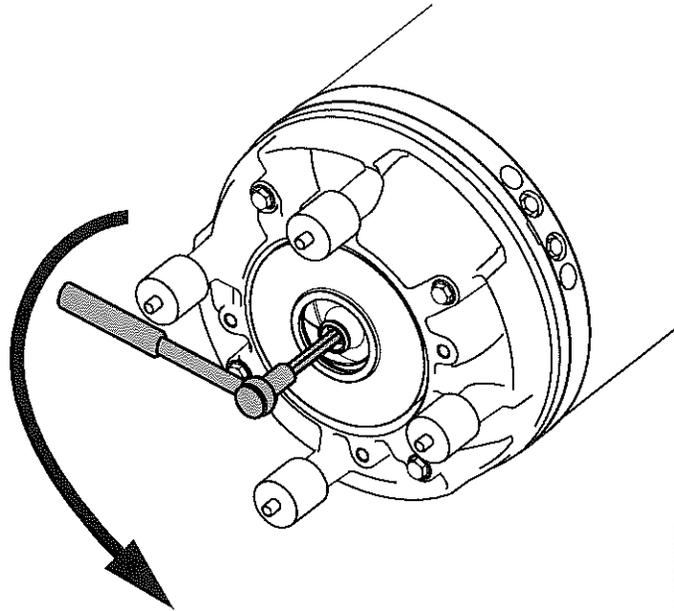
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2. Remove the suction cover.
3. Remove the O-ring.
4. Loosen the impeller:
  - a) Lock the impeller to prevent rotation.  
Use pliers, a screwdriver, or similar.
  - b) Remove the impeller screw and washer.



WS001332A

5. Remove the impeller:
  - a) Lock the impeller to prevent rotation.  
Use pliers, a screwdriver, or similar.
  - b) Turn the adjustment screw counterclockwise until the impeller breaks free from the shaft.  
Use a 12 mm hexagon bit adapter (Allen socket) with a 100 mm (4 in.) extension.



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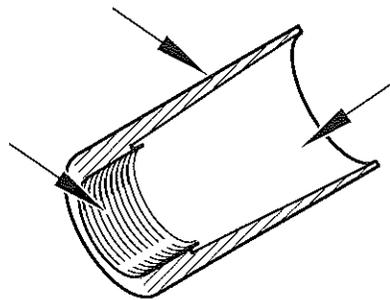
- c) Pull off the impeller.

## Install the impeller N, H

1. Prepare the shaft:
  - a) Polish off any flaws with a fine emery cloth.  
The end of the shaft must be clean and free from burrs.
  - b) Coat the inner conic, the outer cylindrical surfaces, and the thread of the conical sleeve with a thin layer of grease.  
The proper lubrication is grease for bearings, for example Exxon Mobil Unirex N3, Mobil Mobilith SHC 220 or equivalent.

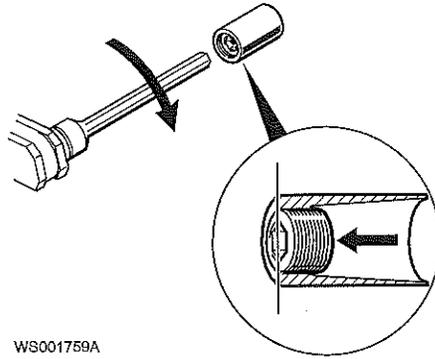
### **NOTICE:**

Surplus grease can cause the impeller to become loose. Remove surplus grease from conical and/or cylindrical surfaces of shafts and/or sleeves.



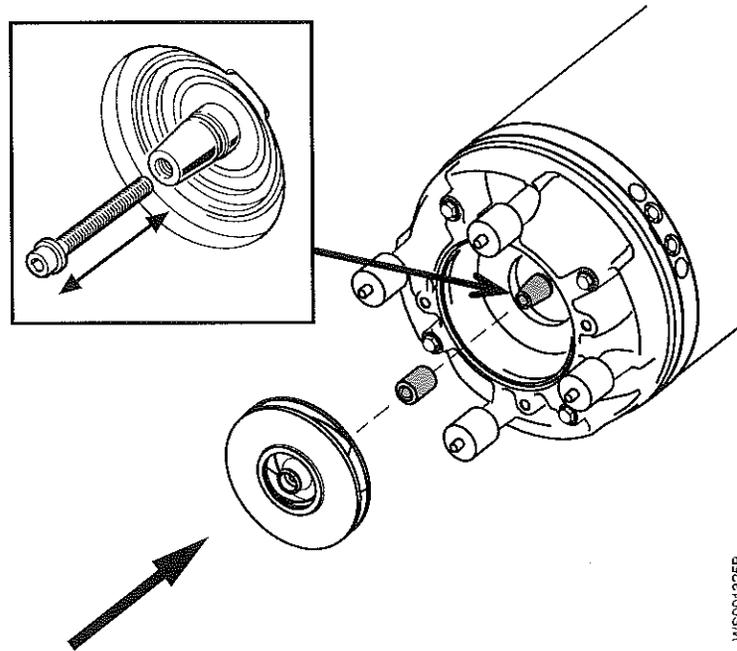
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2. Align the edge of the adjustment screw with the edge of the conical sleeve so that they are flush.

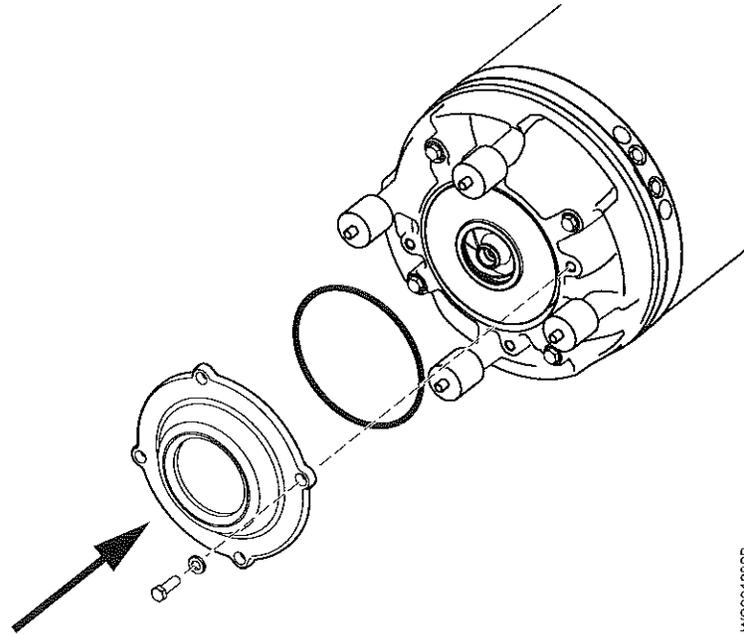


WS001759A

3. Grease the threads of the impeller screw and the washer.  
The proper lubrication of the screw and washer is lubricating grease for assembly of bolts etc., for example, Kluber ALTEMP Q NB 50 or equivalent.
4. Check that the impeller screw is clean and easy to screw into the shaft end.  
This is to prevent the shaft from rotating with the impeller screw.
5. Assemble the conical sleeve in the impeller.  
Make sure that the conical sleeve bottoms in the impeller.

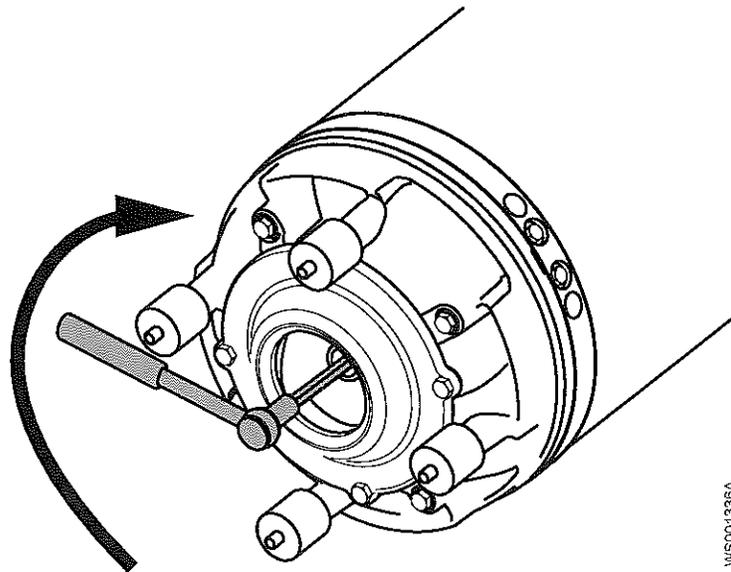


6. Assemble the impeller with the conical sleeve onto the shaft.  
Make sure that the conical sleeve bottoms in the impeller.
7. Mount the suction cover with its O-ring and tighten.  
Tightening torque: 76 Nm (57 ft-lbs)



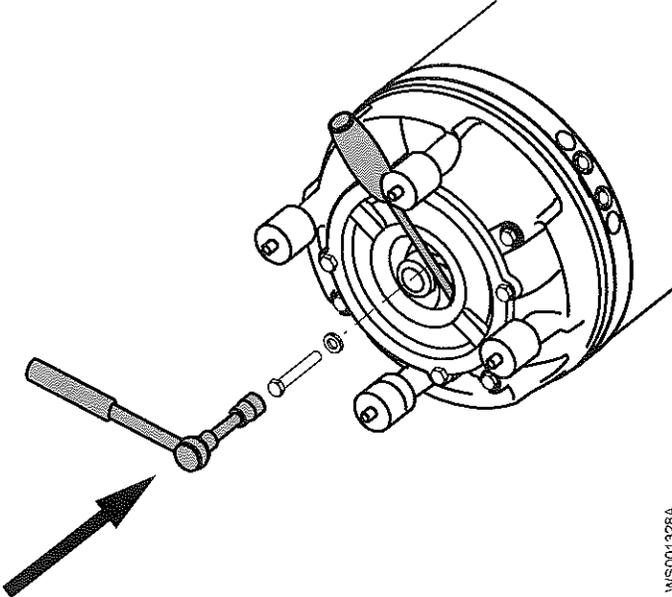
W5001330B

8. Turn the adjustment screw clockwise until the impeller makes contact with the suction cover. Tighten a further 1/8 turn, 45°. This will ensure the correct clearance between the impeller and the suction cover in the next step.  
Use a 12 mm hexagon bit adapter (Allen socket).



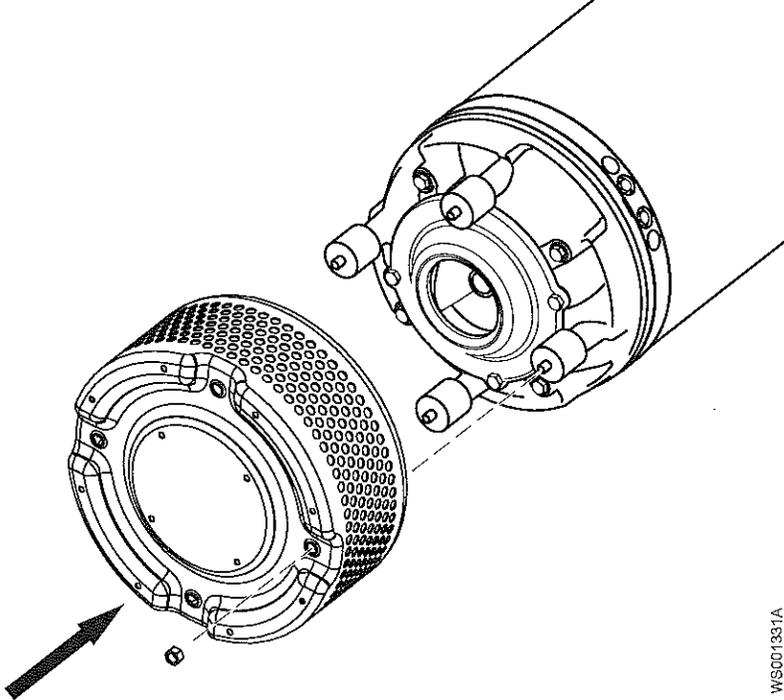
W5001336A

9. Fasten the impeller:
- Place the washer on the impeller screw.
  - Lock the impeller to prevent rotation.  
Use pliers, a screwdriver, or similar.
  - Tighten the impeller screw.  
Tightening torque: 76 Nm (57 ft-lbs)
  - Tighten a further 1/8 turn, 45°. The screw will be loaded to its yield point and the load capacity of the joint will be higher.
  - Check that the impeller can rotate easily.



WS001328A

10. Mount the strainer and the nuts.  
Tightening torque: 44 Nm (32.5 ft-lbs)



WS001331A

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# Troubleshooting

## Introduction



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**DANGER:**

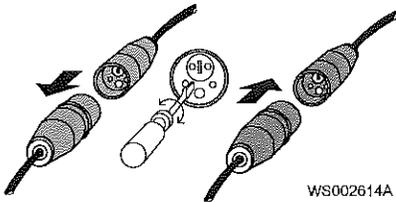
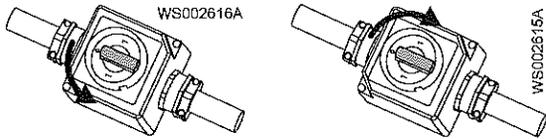
Personal injury hazard. Troubleshooting a live control panel exposes personnel to hazardous voltages. Electrical troubleshooting must be done by a qualified electrician. Failure to follow these instructions will result in serious personal injury, death, and/or property damage.

---

Follow these guidelines when troubleshooting the pump:

- Disconnect and lock out the power supply except when conducting checks that require voltage.
- Make sure that no one is near the pump when the power supply is reconnected.
- When troubleshooting electrical equipment, use the following:
  - Universal instrument multimeter
  - Test lamp (continuity tester)
  - Wiring diagram

## The pump does not start, for pumps with SMART™ or softstarter

Cause	Remedy
<p>The phase sequence may be incorrect.</p>	<ol style="list-style-type: none"> <li>1. Pull out the plug.</li> <li>2. Do one of the following:                             <ul style="list-style-type: none"> <li>• Shift two phases by turning two contact pins with a screwdriver.</li> </ul> </li> </ol> <hr/> <p><b>NOTICE:</b> Do not take the plug apart.</p> <hr/>  <p style="text-align: right;">WS002614A</p> <p><b>Figure 6: CEE plug</b></p> <ul style="list-style-type: none"> <li>• Turn the knob to the opposite position 1, with 8 seconds delay.</li> </ul> <hr/> <p><b>NOTICE:</b> Do not reverse the phase sequence while the motor is running. Doing so may cause incorrect rotation resulting in damages to the motor electronics and the rotating parts. Respect the 8 seconds delay.</p> <hr/>  <p style="text-align: center;">WS002616A                      WS002615A</p> <p><b>Figure 7: Phase shifter On/Off switch</b></p> <ul style="list-style-type: none"> <li>• If no glove or phase shifter is used, then shift two phase conductors in the cabinet.</li> </ul>

If the problem persists, contact the local Grindex service shop. Always state the product number and the serial number of your pump when you contact Grindex, see *Product Description* (page 10).

## The pump does not start



**WARNING:**

Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

**NOTICE:**

Do NOT override the motor protection repeatedly if it has tripped. Doing so may result in equipment damage.

Cause	Remedy
An alarm signal has been triggered on the control panel.	Check that: <ul style="list-style-type: none"> <li>• The impeller rotates freely.</li> <li>• The sensor indicators do not indicate an alarm.</li> <li>• The overload protection is not tripped.</li> </ul> If the problem still persists: Contact the local Grindex service shop.
The pump does not start automatically, but can be started manually.	Check that: <ul style="list-style-type: none"> <li>• The start level regulator is functioning. Clean or replace if necessary.</li> <li>• All connections are intact.</li> <li>• The relay and contactor coils are intact.</li> <li>• The control switch (Man/Auto) makes contact in both positions.</li> </ul> Check the control circuit and functions.
The installation is not receiving voltage.	Check that: <ul style="list-style-type: none"> <li>• The main power switch is on.</li> <li>• There is control voltage to the start equipment.</li> <li>• The fuses are intact.</li> <li>• There is voltage in all phases of the supply line.</li> <li>• All fuses have power and that they are securely fastened to the fuse holders.</li> <li>• The overload protection is not tripped.</li> <li>• The motor cable is not damaged.</li> </ul>
The impeller is stuck.	Clean: <ul style="list-style-type: none"> <li>• The impeller</li> <li>• The sump in order to prevent the impeller from clogging again.</li> </ul>

If the problem persists, contact the local Grindex service shop. Always state the product number and the serial number of your pump when you contact Grindex, see *Product Description* (page 10).

## The pump does not stop when a level sensor is used



### WARNING:

Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

Cause	Remedy
The pump is unable to empty the sump to the stop level.	Check that: <ul style="list-style-type: none"> <li>• There are no leaks from the piping and/or discharge connection.</li> <li>• The impeller is not clogged.</li> <li>• The non-return valve(s) are functioning properly.</li> <li>• The pump has adequate capacity. For information: Contact the local Grindex service shop.</li> </ul>

Cause	Remedy
There is a malfunction in the level-sensing equipment.	<ul style="list-style-type: none"> <li>• Clean the level regulators.</li> <li>• Check the functioning of the level regulators.</li> <li>• Check the contactor and the control circuit.</li> <li>• Replace all defective items.</li> </ul>
The stop level is set too low.	Raise the stop level.

If the problem persists, contact the local Grindex service shop. Always state the product number and the serial number of your pump when you contact Grindex, see *Product Description* (page 10).

## The pump starts-stops-starts in rapid sequence

Cause	Remedy
The pump starts due to back-flow which fills the sump to the start level again.	Check that: <ul style="list-style-type: none"> <li>• The distance between the start and stop levels is sufficient.</li> <li>• The non-return valve(s) work(s) properly.</li> <li>• The length of the discharge pipe between the pump and the first non-return valve is sufficiently short.</li> </ul>
The self-holding function of the contactor malfunctions.	Check: <ul style="list-style-type: none"> <li>• The contactor connections.</li> <li>• The voltage in the control circuit in relation to the rated voltages on the coil.</li> <li>• The functioning of the stop-level regulator.</li> <li>• Whether the voltage drop in the line at the starting surge causes the contactor's self-holding malfunction.</li> </ul>

If the problem persists, contact the local Grindex service shop. Always state the product number and the serial number of your pump when you contact Grindex, see *Product Description* (page 10).

## The pump runs but the motor protection trips



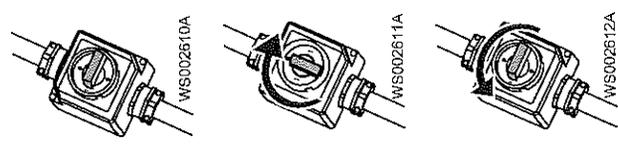
### WARNING:

Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

### NOTICE:

Do NOT override the motor protection repeatedly if it has tripped. Doing so may result in equipment damage.

Cause	Remedy
The motor protection is set too low.	Set the motor protection according to the data plate and if applicable the cable chart.
The impeller is difficult to rotate by hand.	<ul style="list-style-type: none"> <li>• Clean the impeller.</li> <li>• Clean out the sump.</li> <li>• Check that the impeller is properly trimmed.</li> </ul>

Cause	Remedy
The drive unit is not receiving full voltage on all three phases.	<ul style="list-style-type: none"> <li>• Check the fuses. Replace fuses that have tripped.</li> <li>• If the fuses are intact, notify a certified electrician.</li> </ul>
The phase currents vary, or they are too high.	Contact the local Grindex service shop.
The insulation between the phases and ground in the stator is defective.	<ol style="list-style-type: none"> <li>1. Use an insulation tester. With a 1000 V DC megger, check that the insulation between the phases and between any phase and ground is &gt; 5 megohms.</li> <li>2. If the insulation is less: Contact the local Grindex service shop.</li> </ol>
The density of the pumped fluid is too high.	<p>Make sure that the maximum density is 1100 kg/m<sup>3</sup> (9.2 lb/US gal)</p> <ul style="list-style-type: none"> <li>• Change to a more suitable pump.</li> <li>• Contact the local Grindex service shop.</li> </ul>
The ambient temperature exceeds the maximum ambient temperature.	The pump must not be used for such an application.
There is a malfunction in the overload protection.	Replace the overload protection.
The SMART™ motor protection may need to be reset.	<p>Try one of the following:</p> <ul style="list-style-type: none"> <li>• Reset the SMART™ motor protection by pulling and reinserting the power plug.</li> <li>• Or, disconnect and reconnect the power.</li> </ul> <div style="display: flex; align-items: center; justify-content: center;">  </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;">  <div> <p><b>WARNING:</b></p> <p>The pump will restart automatically after a corrected phase fault or power cut.</p> </div> </div>

If the problem persists, contact the local Grindex service shop. Always state the product number and the serial number of your pump when you contact Grindex, see *Product Description* (page 10).

## The pump delivers too little or no water



**WARNING:**

Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

**NOTICE:**

Do NOT override the motor protection repeatedly if it has tripped. Doing so may result in equipment damage.

Cause	Remedy
The impeller rotates in the wrong direction.	<ul style="list-style-type: none"> <li>• If it is a 3-phase pump without SMART™, transpose two phase leads. For pumps with softstarter, transpose the leads at T1, T2, T3 on the softstarter.</li> <li>• If it is a 3-phase pump with SMART™, correct the internal wiring.</li> <li>• If it is a 1-phase pump: Contact the local Grindex service shop.</li> </ul>
One or more of the valves are set in the wrong positions.	<ul style="list-style-type: none"> <li>• Reset the valves that are set in the wrong position.</li> <li>• Replace the valves, if necessary.</li> <li>• Check that all valves are correctly installed according to media flow.</li> <li>• Check that all valves open correctly.</li> </ul>
The impeller is difficult to rotate by hand.	<ul style="list-style-type: none"> <li>• Clean the impeller.</li> <li>• Clean out the sump.</li> <li>• Check that the impeller is properly trimmed.</li> </ul>
The pipes are obstructed.	Clean out the pipes to ensure a free flow.
The pipes and joints leak.	Find the leaks and seal them.
There are signs of wear on the impeller, pump, and casing.	Replace the worn parts.
The liquid level is too low.	<ul style="list-style-type: none"> <li>• Check that the level sensor is set correctly.</li> <li>• Depending on the installation type, add a means for priming the pump, such as a foot valve.</li> </ul>

If the problem persists, contact the local Grindex service shop. Always state the product number and the serial number of your pump when you contact Grindex, see *Product Description* (page 10).

### The pump does not start when a softstarter is used

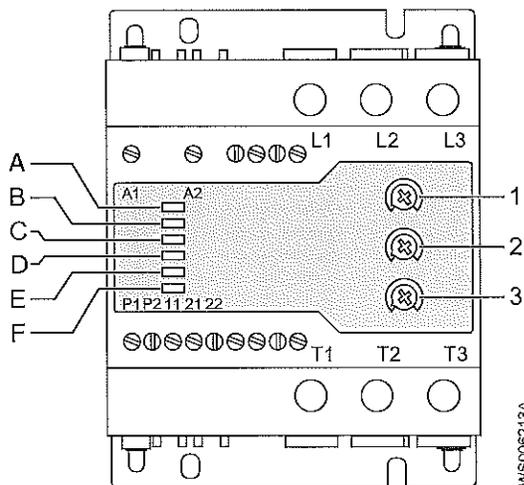


Figure 8: Softstarter terminal layout

For typical use of the pump in any application, use default settings. If a more powerful or smoother start is required, the potentiometers can be set as described in the table.

Potentiometer	Function	More powerful start	Smoother start
1	Ramp up time [Ramp U]	Lower than default	Higher than default
2	Ramp down time [Ramp D]	N/A	N/A
3	Initial torque [Torque]	Higher than default	Lower than default

LED	Status	Alarm signal
A	Power supply on	Green, continuous
B	Ramping	Yellow, intermittent
C	Bypass relay ON	Yellow, continuous
D	Softstarter over-temperature protection stops pump	Red, intermittent
	Motor protection stops pump	Red, continuous
E	L3 phase loss before pump starts (detection is made during power up of the device and thereafter it is deactivated)	Red, fast intermittent
E	Phase loss and/or low voltage alarm	Red, slow intermittent
F	Incorrect phase sequence (detection is made during power up of the device and thereafter it is deactivated)	Red, intermittent

**WARNING:**

Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

**NOTICE:**

Do NOT override the motor protection repeatedly if it has tripped. Doing so may result in equipment damage.

Always reset the softstarter by switching the power of and on again and make sure other possible problems described in *Troubleshooting* (page 37) have been ruled out before performing the steps below:

1. Disconnect and lock out power.
  2. Make sure there is a safety distance of at least 20 m (65 ft.) between the product and the pumped or mixed liquid.
  3. Remove the top cover.
  4. Reconnect power and note the type of alarm signal.
  5. Disconnect and lock out power.
  6. Perform the remedy for the noted type of alarm signal.
  7. Reconnect power to verify that the problem has been resolved.
- Repeat steps 5-7 until the problem has been resolved.

Cause	Remedy
LED A is OFF.	Check: <ul style="list-style-type: none"> <li>• The power cable and its connections to L1, L2, L3 (internal power supply is connected to L1, L2).</li> <li>• Fuses, contactors, switches and motor protection devices.</li> <li>• That line voltage is not too low.</li> </ul>
LED A is ON.	Check: <ul style="list-style-type: none"> <li>• The connection of the stator leads to T1, T2, T3.</li> <li>• The control input connections to A1, A2.</li> </ul>
LED D is ON intermittently.	<ol style="list-style-type: none"> <li>1. Allow the pump to cool down.</li> <li>2. Check that the number of starts per hour does not exceed the specified level. Refer to <i>Motor data</i> (page 45).</li> </ol>
LED D is ON continuously.	<ol style="list-style-type: none"> <li>1. Allow the pump to cool down.</li> <li>2. Check:               <ol style="list-style-type: none"> <li>a. The main fuses.</li> <li>b. That the rated current has been set on the motor protection device.</li> <li>c. That line voltage is not too low.</li> <li>d. That the power cable is not too long so that it causes low voltage.</li> <li>e. If the impeller is clogged.</li> </ol> </li> </ol>
LED E is ON.	Check the power cable connections to L3. If either L1 or L2 is missing, then LED A and LED E will be OFF.
LED F is ON.	Transpose two phase leads for L1, L2, L3 outside the pump.

If the problem persists, contact the local Grindex service shop. Always state the product number and the serial number of your pump when you contact Grindex, see *Product Description* (page 10).

# Technical Reference

## Application limits

Data	Description
Media (liquid) temperature	Maximum temperature 40°C (104°F)
pH of the pumped media (liquid)	5–8
Media (liquid) density	Maximum density: 1100 kg/m <sup>3</sup> (9.2 lb. per US gal.)
Depth of immersion	20 m (65 ft.)
Other	For specific weight, current, voltage, power rating, and speed of the pump, see the data plate on the pump. For starting current, see <i>Motor data</i> (page 45). For other applications, contact the nearest Grindex representative for information.

## Motor data

Feature	Description
Motor type	Squirrel-cage induction motor
Frequency	Standard version: 50 or 60 Hz MSHA version: 60 Hz
Supply	3-phase
Starting method	<ul style="list-style-type: none"> <li>• Direct on-line</li> <li>• Internal star-delta</li> <li>• Internal soft starter</li> </ul>
Maximum starts per hour	30 evenly spaced starts per hour
Code compliance	IEC 60034-1
Rated output variation	±10%
Voltage variation without overheating	±10%, provided that it does not run continuously at full load
Voltage imbalance tolerance	2%
Maximum frequency variation (for pumps with SMART™)	±3 Hz
Stator insulation class	H (180°C [360°F])

## Specific motor data, standard version

### 3-phase, 50 Hz

Motor type:

- 2,905 rpm
- Rated output 18 kW (24.5 hp)
- Maximum power consumption 20 kW (26.8 hp)

Voltage, V	Rated Current, A	Starting current, A	Power factor, cos $\phi$
220 D	58	355	0.92
230 D	56	370	0.9
240 D	55	390	0.88
380 D	34	239	0.89
400 D	33	238	0.89
415 D	32	222	0.88
440 D	32	238	0.83
500 D	26	187	0.88
525 D	24	153	0.93
550 D	24	162	0.89
660 Y	20	138	0.89
690 Y	19	137	0.89
1000 Y	14	99	0.86

### 3-phase, 60 Hz

Motor type:

- 3,495 rpm
- Rated output 20 kW (27 hp)
- Maximum power consumption 22 kW (29.5 hp)

Voltage, V	Rated Current, A	Starting current, A	Power factor, cos $\phi$
200 D	70	460	0.93
208 D	68	480	0.91
220 Y parallel	63	395	0.93
220 D parallel	63	410	0.94
220 D	63	410	0.93
230 Y parallel	61	415	0.92
230 D parallel	60	430	0.93
230 D	61	430	0.92
240 Y parallel	59	435	0.9
240 D	60	450	0.9
380 D	37	231	0.93
380 Y parallel	36	236	0.94

Voltage, V	Rated Current, A	Starting current, A	Power factor, cos $\phi$
400 D	35	245	0.92
400 Y parallel	35	250	0.93
440 D	32	243	0.9
440 D serial	31	205	0.94
440 Y serial	32	197	0.93
460 D	31	240	0.91
460 D serial	30	215	0.93
460 Y serial	31	207	0.92
480 D	30	252	0.88
480 Y serial	30	217	0.9
575 D	25	189	0.9
600 D	25	198	0.87

## Specific motor data, MSHA version

### 3-phase, 60 Hz

Motor type:

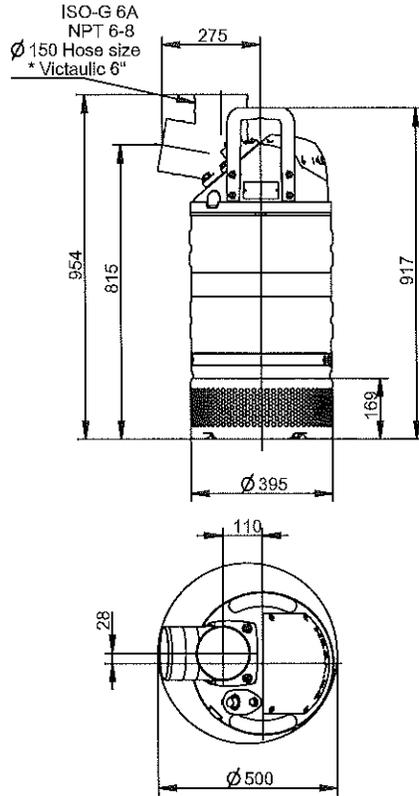
- 3,495 rpm
- Rated output 20 kW (27 hp)
- Maximum power consumption 22 kW

Voltage (V)	Rated current (A)	Starting current (A)
460 Y	30	217
575 Y	24	184
600 Y	24	193

## Dimensions and weights

All measurements in the illustrations are in millimeters, if not otherwise specified.

Standard version

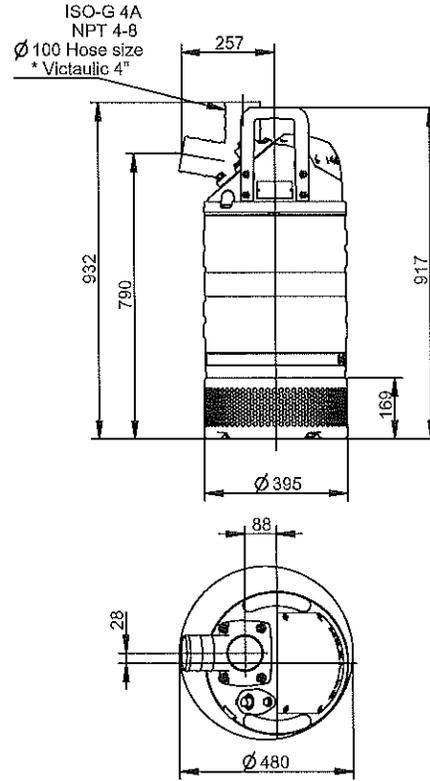


\* Designed for "Victaulic Coupling",  
according to ANSI/AWWA C606-97  
Screen opening  $\varnothing 12$

Weight (kg)
Total
131

WS006748A

Figure 9: N, DN 150



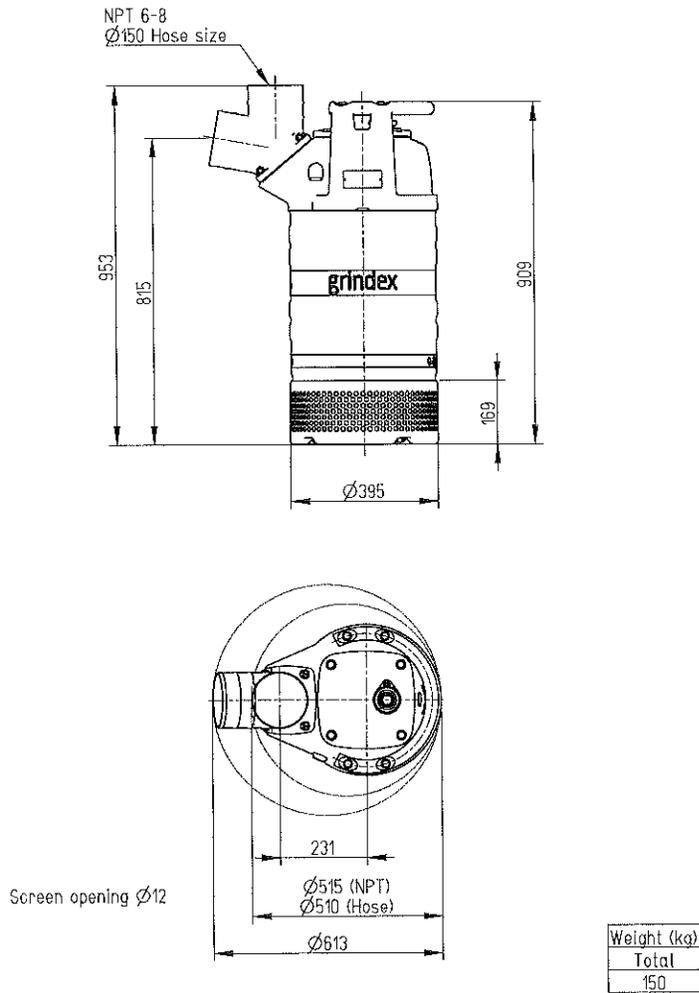
\* Designed for "Victaulic Coupling",  
according to ANSI/AWWA C606-97  
Screen opening  $\varnothing 12$

Weight (kg)
Total
131

WS0067847A

Figure 10: H, DN 100

**MSHA version**



**Figure 11: MSHA version, N**

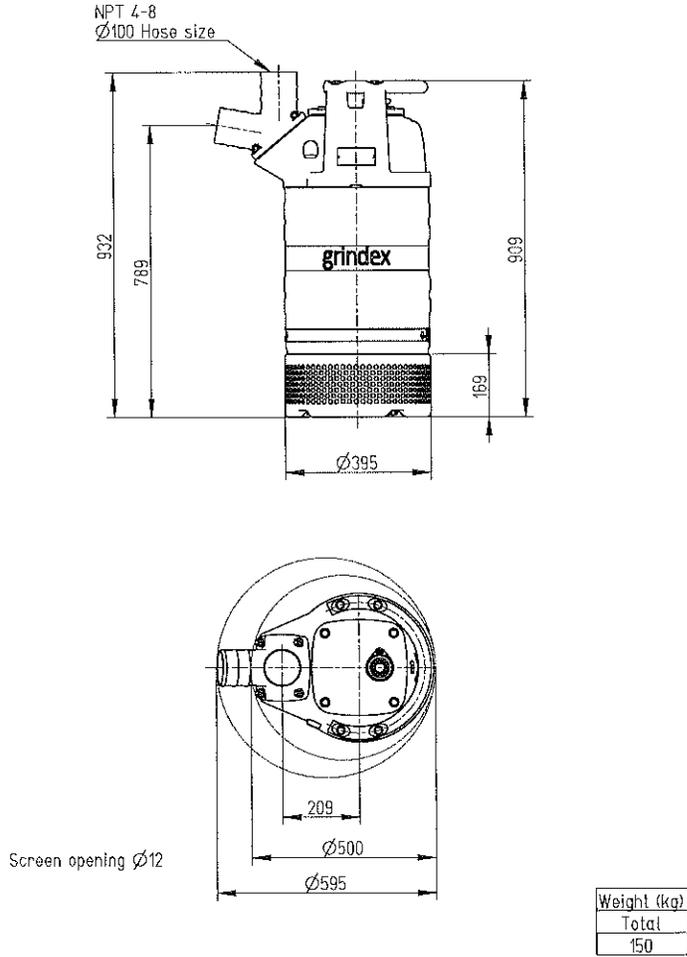


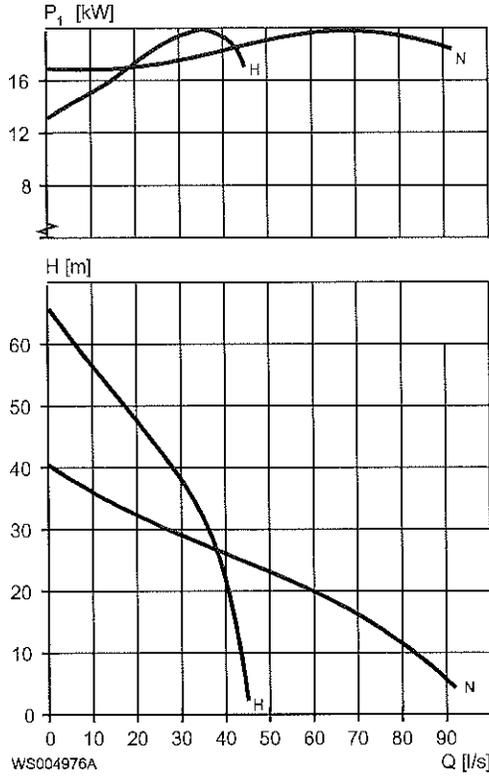
Figure 12: MSHA version, H

## Performance curves

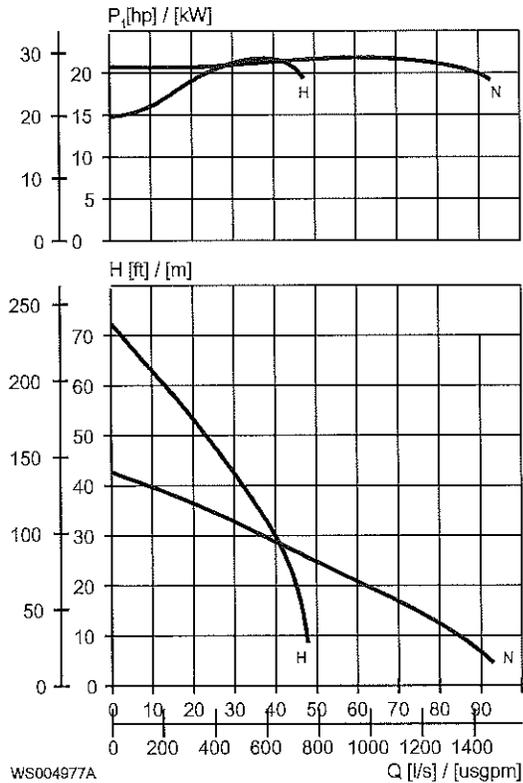
### Test standard

Pumps are tested in accordance with ISO 9906:2012, HI 11.6:2012.

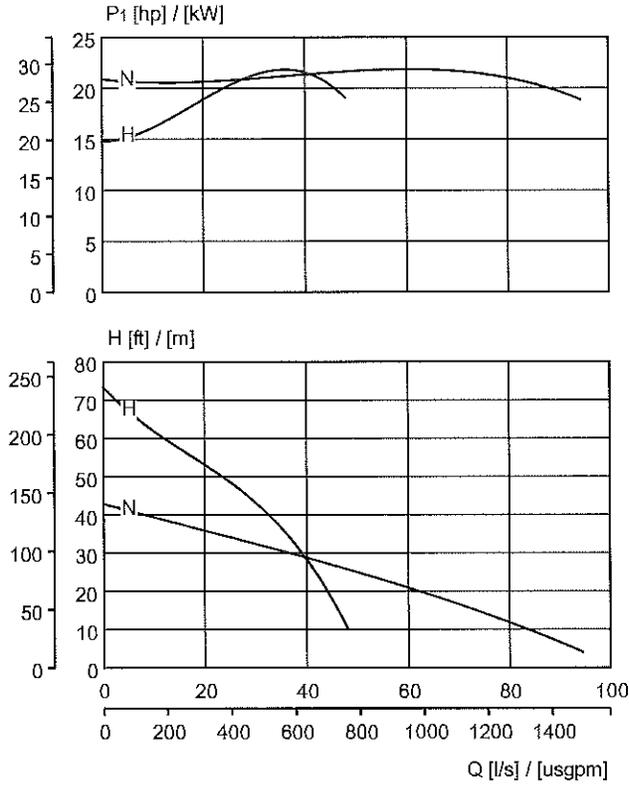
**Standard pump version, 50 Hz**



**Standard pump version, 60 Hz**



**MSHA pump version, 60 Hz**



WS006385A

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Grindex  
Gesällvägen 33  
174 87 Sundbyberg  
Sweden  
Tel: +46-8-606 66 00  
Fax: +46-8-745 53 28  
www.grindex.com

Visit our Web site for the latest version of this document  
and more information

The original instruction is in English. All non-English  
instructions are translations of the original instruction.

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Specifications

Bulletin 840 Automatic Float Switches

Technical Data

Technical Terms

**Tank Operation** — When the liquid in a tank reaches a preset low level, the float switch will start a pump to begin filling the tank. When the liquid level reaches a preset high level, the float switch will stop the pump.

**Sump Operation** — Liquid is being collected in a sump. When the liquid reaches a preset high level, the float switch will start a pump to empty the sump. When the liquid reaches a preset low level, the float switch will stop the pump.

**Operating Force** — Contact force required to trip the float switch. Operation depends on the type of switch, liquid, float, and float operator assembly.

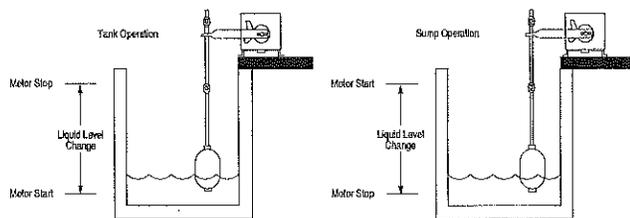
**Turbulence** — Waves or agitation in the liquid. Excessive turbulence may cause improper switch operation — for example, early switching or switching between operating points.

**Buoyancy** — Force supporting the float equal in magnitude to the weight of the displaced liquid.

Theory of Operation

Bulletin 840 Float Switches provide automatic control for motors that pump liquids from a sump or into a tank. The switch must be installed above the tank or sump, and the float must be in the liquid for the float switch to operate. **Tank Operation:** A float operator assembly is attached to the float switch by a rod, chain or cable. The float switch is actuated based on the location of the float in the liquid. The float switch contacts are open when the float forces the operating lever to the UP position. As the liquid level falls, the float and operating lever move downward. When the float reaches a preset low level, the float switch contacts close, activating the circuit and starting the motor. The contacts can directly activate a motor or provide input for a logic system to fill the tank. As the liquid level rises, the float and operating lever move upward. When the float reaches a preset high level, the float switch contacts open, deactivating the circuit and stopping the motor. **Sump Operation:** Sump operation is opposite tank operation.

Figure 1  
Tank and Sump Operation



Temperature Range (Switch)

The temperature range for the switch mechanism at +32 °F (0 °C) or below is based on the absence of freezing moisture, water, or other fluids that may solidify and impede the operation of the control. Temperature ratings are as follows:

- Operating: -22...+150 °F (-30...+66 °C)
- Storage: -22...+200 °F (-30...+93 °C)

Temperature Range (Float)

The temperature range for the float mechanism at +32 °F (0 °C) or below is based on the absence of freezing moisture, water, or other fluids that may solidify and impede the operation of the control. Temperature ratings are as follows:

- Operating and Storage: -22...+200 °F (-30...+93 °C)

Conversions

Bulletin 840 **Styles A and B** Float Switches are assembled for tank operation but can be easily converted to sump operation. **Style A** switches can be changed from tank to sump operation by moving the float rod to the opposite end of the double arm lever.

**Styles B** switches can be converted in either of the following ways:

- Remove the lever, turn the shaft 90° counterclockwise and replace the lever in its original position.
- Remove the lever and replace 180° from the original position.

**Style D** is for tank operation only. **Style DS** is for sump operation only. These switches cannot be converted.

Contacts

Bulletin 840 Float Switches have a snap action mechanism for quick-make and quick-break contact operation. This feature provides high snap-through forces once the mechanism has traveled the required distance. See table below.

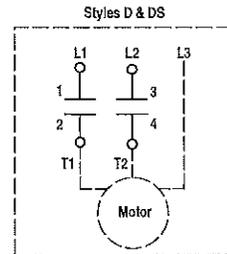
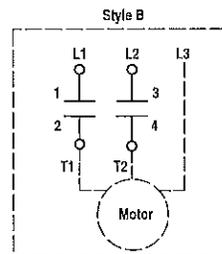
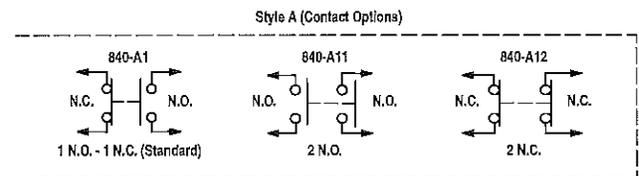
Maximum Contact Rating per Pole

Max. V AC	AC — NEMA A600				DC — NEMA N300		
	Make	Break	Make	Break	Max. V DC	Make	Break
120	60 A	6.0 A	7200V A	720V A	—	—	—
240	30 A	3.0 A	7200V A	720V A	125	2.2 A	2.2 A
480	15 A	1.5 A	7200V A	720V A	250	1.1 A	1.1 A
600	12 A	1.2 A	7200V A	720V A	—	—	—

Maximum Horsepower Ratings

Style	Single-Phase AC		2- or 3-Phase AC		DC		
	115V	230V	115V	230-460-575V	32V	115V	230V
<b>A</b> — Tank or Sump	1	1	—	—	.025	0.25	0.125
<b>B</b> — Tank or Sump	1.5	3	—	2	—	1	1
<b>D</b> — Tank	1.5	2	2	3	0.25	0.5	0.5
<b>DS</b> — Sump	1.5	2	2	3	0.25	0.5	0.5

Contact Wiring Configurations



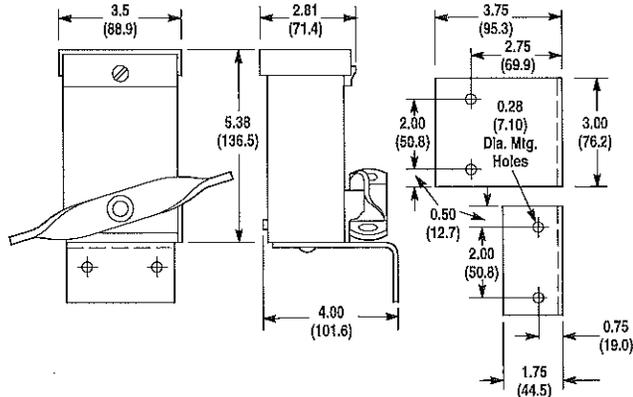
Approximate Dimensions

Approximate Dimensions and Shipping Weights

Dimensions in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

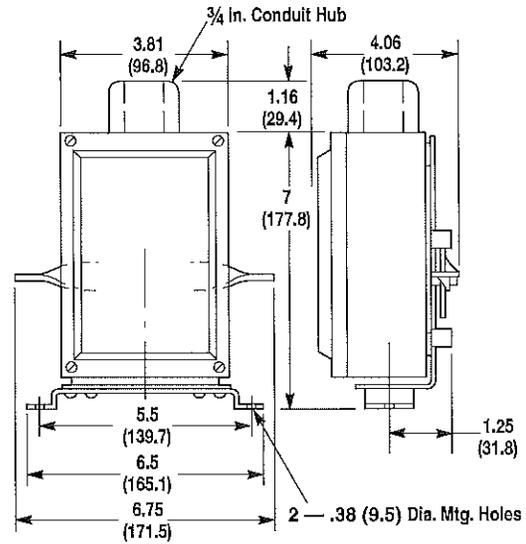
Type 1

Mounting Bracket

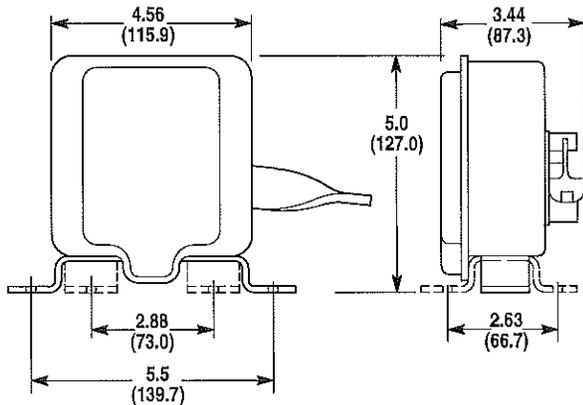


Style A —  
Approximate Shipping Weight 4 lbs (1.8 kg)

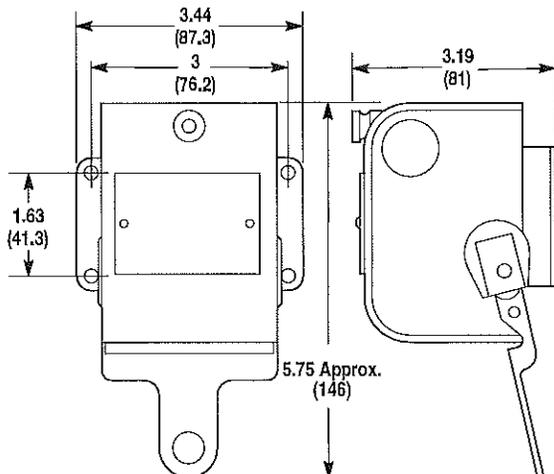
Type 4



Styles A and B —  
Approximate Shipping Weight 4 lbs (1.8 kg)



Style B —  
Approximate Shipping Weight 3 lbs (1.4 kg)



Styles D and DS —  
Approximate Shipping Weight 2 lbs (0.9 kg)



# Bulletin 840 Float Switch and Operator Assembly Instructions



**ATTENTION:** Disconnect all power before wiring float switch and motor. Secure cover before reconnecting power. Test float switch operator assembly manually before leaving the equipment unattended.

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- <b>Single Arm Lever - Separate Pulley</b> .....	<b>3, 4</b>
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**Description** - Bulletin 840 Float Switches provide automatic control for motors that pump liquids from a sump or tank. The contacts are rated for both motor and pilot duty. See Page 2 for contact ratings and wiring diagrams for each style of switch.

**Tank Operation** -When the liquid in a tank reaches a preset low level the float switch will start a pump to begin filling the tank. When the liquid level reaches a preset high level the float switch will stop the pump. The contacts will be open when the operating lever is in the up position. As the liquid level decreases, the operating lever will move downward causing the contacts to close. As the liquid level rises, the operating lever moves upward causing the contacts to open.

**Sump Operation** - Liquid is being collected in a sump. When full, the float switch starts a pump to empty the sump. When the liquid in the sump reaches a predetermined low level the float switch will turn the pump off.

**Float Switches** - Bulletin 840 Style A, B and C switches are supplied for tank operation, but can be easily converted to sump operation (see illustrations on this page). Style D switches are for tank operation only and Style DS switches are for sump operation only.

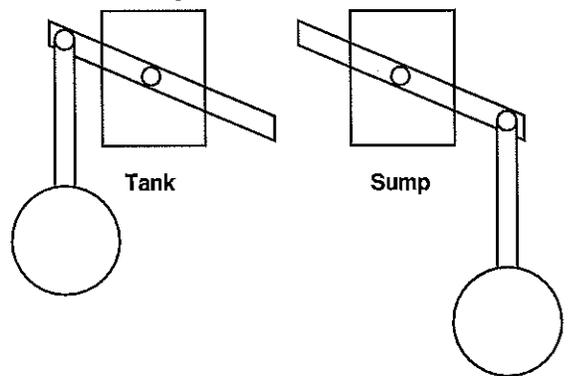
**Installing the Switch for "Tank" Operation** - When facing the lever, install the switch so that the float is positioned on the left side of the switch.

**Tank to Sump Conversion** - Style A switches can be changed from tank to sump operation by moving the float rod to the opposite end of the double arm lever.

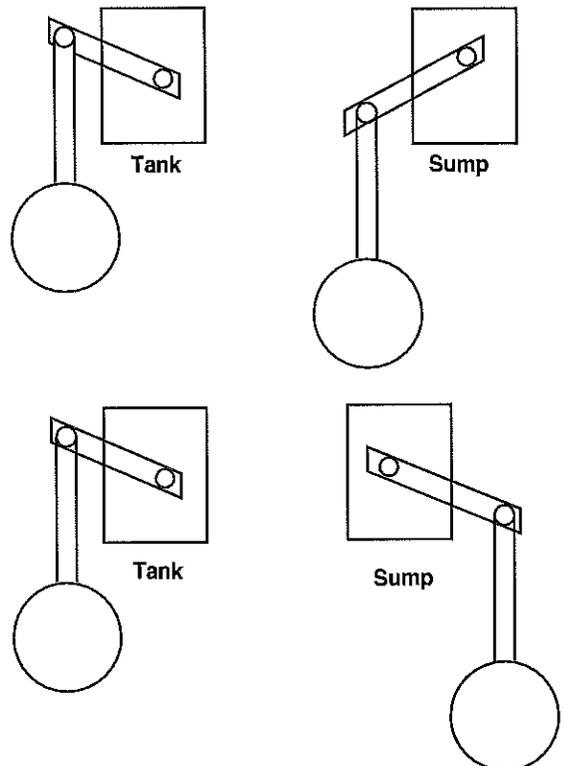
Style B and C switches can be converted in either of two ways:

- Remove the lever, turn the shaft 90 degrees counterclockwise and replace the lever in its original position;
- or
- Remove the lever and replace 180 degrees from the original position.

**Style A Conversion**



**Style B and C Conversion**





**ATTENTION:** Suitable for use on a circuit capable of delivering not more than 5,000 rms symmetrical amperes, 600 VAC maximum. Use fuses only!

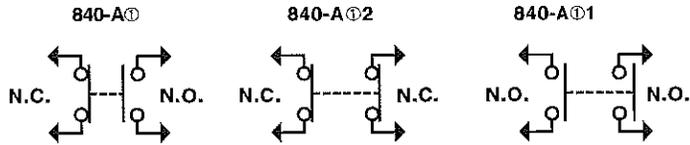
**Style A**

**USE COPPER WIRE ONLY** - Select a wire size that corresponds to the ampacity rating for either 60°C or 75°C wire.

Max. Pilot Ratings	
NEMA A600	600VAC
NEMA N300	250VDC

Max. HP Ratings		
Phase	Volts	HP
Single Phase	115	1
	230	1
DC	32	1/4
	115	1/4
	230	1/8

**CONTACT ARRANGEMENTS FOR TWO WIRE DEVICE**



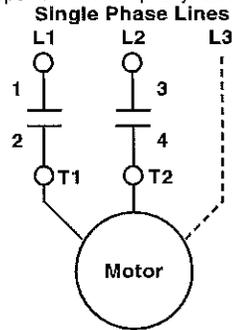
⓪ Catalog Number as listed does not include enclosure. To order switch with enclosure, add one of the following numbers "1" for NEMA Type 1, "4" for NEMA Type 4, "7" for NEMA Type 7 & 9.

**Style B**

**USE COPPER WIRE ONLY** - Select a wire size that corresponds to the ampacity rating for either 60°C or 75°C wire.

Max. Pilot Ratings	
NEMA A600	600VAC
NEMA N300	250VDC

Max. HP Ratings		
Phase	Volts	HP
Single Phase	115	1 - 1/2
	230	3
2 or 3 Phase	230	2
	460 - 575	2
DC	115	1
	230	1

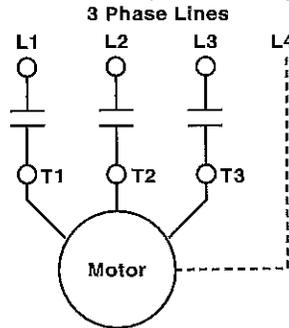


For 2 or 3 phase connect L3 direct.

**Style C**

**USE COPPER WIRE ONLY** - Select a wire size that corresponds to the ampacity rating for either 60°C or 75°C wire.

Max. HP Ratings		
Phase	Volts	HP
Single Phase	115	1 - 1/2
	230	3
2 or 3 Phase	115	3
	230 - 575	5
DC	115	2
	230	2

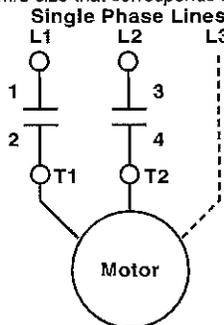


For single phase, L3 and T3 are not used.  
For 2 phase 4 wire connect line 4 directly to motor.

**Style D & DS**

**USE COPPER WIRE ONLY** - Select a wire size that corresponds to the ampacity rating for either 60°C or 75°C wire.

Max. HP Ratings		
Phase	Volts	HP
Single Phase	115	1 - 1/2
	230	2
2 or 3 Phase	115	2
	230 - 575	3
DC	32	1/4
	115	1/2
	230	1/2



For 2 or 3 phase connect L3 direct.



**ATTENTION:** For recommended torque values, refer to the table below.

Fastener Thread Size	Torque (lb-in ±25%)
#6-32	11
#8-32	20
#10-32	32
1/4-20	70

## Automatic Float Switch Assemblies

### Single Arm Lever Operator Assemblies

**Table 1. Materials**

Quantity	Material
2	3 foot Section of Rod
1	Roll Pin
1	Float
2	Adjustable Stop Collars
2	1/4-20 x 1/2 inch Set Screws
1	Pedestal (Floor Mounted Units Only)
1	Fixed Stop Collar (For Assembly Drawing "B" Only)
1	6-32 x 1 inch Screw (For Assembly Drawing "B" Only)
2	6-32 Brass Nut (For Assembly Drawing "B" Only)

Refer to Table 2 for the appropriate drawing of the operator assembly to be installed.

**Table 2. Single Arm Lever Operator Assemblies**

Mounting Style	Operator Assembly Catalog Number	For Use with Switch Style(s) Catalog Number(s)	Assembly Drawing (Page 7)
Base Mount	840-1AD	840-A1, 840-A4, 840-A7, 840-D1, 840-DS1	A
	840-1BCE	840-B1, 840-B4, 840-B7, 840-C1, 840-C4, 840-C7	B
Floor Mount	840-2A1	840-A1	A
	840-2A47	840-A4, 840-A7	A
	840-2BC1	840-B1, 840-C1	B
	840-2B47	840-B4, 840-B7	B
	840-2C47	840-C4, 840-C7	B

#### Mounting the Switch

1. Mount the switch in the desired area. Hardware for mounting the switch is not provided. For floor mount devices see instructions on this page.

#### Assembling the Rod (If more than 3 feet of rod is required.)

1. Mate the (2) 3-foot sections of rod together.
2. Align the holes in each end, insert roll pin using a pliers.

#### Attaching the Float to the Rod

##### (For operator assemblies similar to Drawing A.)

1. Turn the threaded end of the operating rod into the float until secure.

##### (For operator assemblies similar to Drawing B.)

1. Slide one adjustable stop collar onto the rod.
2. Attach the stop collars to the rod using the set screws.

**Note:** The positioning of the adjustable stop collars is dependent upon the level of the liquid to be monitored. The rod may need additional guides to stabilize vertical float movement. These guides are to be supplied by the user.

### Floor Mount Operator Assemblies -

#### Mounting the Floor Pedestal

1. Mount the pedestal in the desired area. Hardware for mounting the pedestal is not provided.

**Note:** Recommended mounting hardware diameter is 3/8 inch. The length of the hardware depends upon the thickness of the mounting surface.

#### Mounting the Switch to the Pedestal -

**Note:** If using switch (Catalog Number 840-A1), remove the bracket from the switch enclosure before mounting the switch to the pedestal.

1. Remove the hardware from the top flange/bracket of the mounting pedestal.
2. Align the mounting holes of the switch enclosure with the holed slots in the top flange bracket of the pedestal.
3. Secure in place using the hardware provided.

### Single Arm Lever , Separate Pulleys Operator Assemblies

**Table 3. Materials**

Quantity	Material
1	Float
2	Pulley Bracket Assemblies
1	Chain / Cable Assembly

Refer to Table 4 for the appropriate drawing of the operator assembly to be installed.

**Table 4. Single Arm Lever, Separate Pulley Operator Assemblies**

Mounting Style	Operator Assembly Catalog Number	For Use with Switch Style(s) Catalog Number(s)	Assembly Drawing (Page 7)
Base Mount	840-3AD	840-A1, 840-A4, 840-A7, 840-D1, 840-DS1	D
	840-3BCE	840-B1, 840-B4, 840-B7, 840-C1, 840-C4, 840-C7	D

#### Mounting the Switch

1. Mount the switch in the desired area. Mounting hardware is not provided.

#### Mounting the Pulley Brackets

1. Mount the bracket on the float side of the chain directly above the operating lever of the switch.
2. Mount the second pulley bracket away from the switch so the counterweight does not interfere with the operating lever on the switch.

#### Installing the Chain/Cable

Chain operated assemblies are provided with an eyebolt at one end of the chain which must be threaded into the float after final assembly. On cable operated assemblies, the eyebolt is welded to the float.

1. Remove the hardware and two stop collars from the float/eyebolt end of the chain/cable.

**For Recommended Torque Values, Refer to Page 2.**

## Automatic Float Switch Assemblies

### Single Arm Lever Operator Assemblies

2. Thread the chain/cable through the pulley brackets. Make sure the chain/cable rides smoothly over the pulleys.
3. Slide one stop collar onto the chain/cable through the operating lever.
4. Slide the second adjustable stop collar onto the chain/cable and secure in place. Note: The positioning of the adjustable stop collar is dependent upon the level of the liquid to be monitored.

#### Installing the Float

1. Thread the chain/cable through the eyebolt on the float.
2. Install hardware to attach the eyebolt to the chain/cable.

### Double Arm Lever, Single Pulley Operator Assemblies

**Table 5. Materials**

Quantity	Material
1	Float
1	Pulley Assembly
1	Chain/Cable Assembly
1	Pedestal (Floor Mounted Units Only)

Refer to Table 6 for the appropriate drawing of the operator assembly to be installed.

**Table 6. Double Arm Lever, Single Pulley Operator Assemblies**

Mounting Style	Operator Assembly Catalog Number	For Use with Switch Style(s) Catalog Number(s)	Assembly Drawing (Page 7)
Base Mount	840-4A1	840-A1	E
	840-4A4	840-A4	G
Floor Mount	840-5A1	840-A1	E
	840-5A4	840-A4	G

#### Mounting the Pulley

##### For operator assemblies used with switch (Catalog Number 840-A1).

1. Remove and discard the filler screws, nut and lockwasher located on the back of the enclosure.
2. Remove the nut and lockwasher from the pulley pivot pin and insert the pivot pin through the enclosure.
3. Attach the pivot pin to the enclosure using the nut and lockwasher. When the pivot pin is in place spread the cotter pin to hold the pulley in position (see Drawing E).

##### For operator assemblies used with switch (Catalog Number 840-A4).

1. Remove the nut and lockwasher that holds the pulley to the mounting bracket.
2. Mount the bracket to the back of the enclosure using the hardware provided.
3. Reattach the pulley to the mounting bracket using the nut and lockwasher. When the pulley is in place spread the cotter pin to hold it in position (see Drawing G).

#### Mounting the Switch

1. Mount the switch in the desired area. Hardware for mounting the switch is not provided.

#### Installing the Chain/Cable Assembly

Chain operated assemblies are provided with an eyebolt at one end which must be threaded into the float after final assembly. On cable operated assemblies, the eyebolt is welded to the float.

1. Remove the hardware and one stop collar from the float/eyebolt end of the chain/cable.
2. Thread the chain/cable over the pulley. Make sure the chain/cable rides smoothly over the pulley.
3. Thread the chain/cable through "both" ends of the operating lever.
4. Slide the adjustable stop collar onto the chain/cable and secure in place.

**Note:** The positioning of the stop collar is dependent upon the level of the liquid to be monitored.

#### Installing the Float

1. Thread the chain/cable through the eyebolt on the float.
2. Install hardware to attach the eyebolt to the chain/cable.

#### Floor Mount Operator Assemblies

Refer to "Floor Mount Operator Assemblies" information on Page 3.

### Double Arm Lever, Double Pulley Operator Assemblies

**Table 7. Materials**

Quantity	Material
1	Float
1	Double Pulley Assembly
1	Chain/Cable Assembly
1	Pedestal (Floor Mounted Units Only)

Refer to Table 8 for the appropriate drawing of the operator assembly to be installed.

**Table 8. Double Arm Lever, Double Pulley Operator Assemblies**

Mounting Style	Operator Assembly Catalog Number	For Use with Switch Style(s) Catalog Number(s)	Assembly Drawing (Page 8)
Base Mount	840-4A47	840-A7	I
	840-4BC1	840-B1, 840-C1	J
	840-4B4	840-B4	K
	840-4C4	840-C4	I
Floor Mount	840-4BC47	840-B7, 840-C7	I
	840-5A47	840-A7	I
	840-5BC1	840-B1, 840-C1	J
	840-5B4	840-B4	K
Floor Mount	840-5B47	840-B7	I
	840-5C47	840-C4, 840-C7	I

**For Recommended Torque Values, Refer to Page 2.**

## Automatic Float Switch Assemblies

### Mounting the Double Pulley Assembly

1. Remove the filler screws or plugs from the back or top of the enclosure.
2. Mount the double pulley assembly bracket to the enclosure using the hardware provided

### Mounting the Half-Lever Extension

(Operator assemblies used with switches that have Catalog Numbers **840-B1**, **840-B4** and **840-C1** are provided with a half-lever extension.)

- 1 Remove the screws that hold the operator lever to the switch enclosure.
- 2 Align the holes of the extension lever with the holes of the switch enclosure.
3. Fasten the levers to the enclosure using the hardware provided.

### Mounting the Switch

1. Mount the switch in the desired area. Hardware for mounting the switch is not provided.

### Installing the Chain/Cable

Chain operated assemblies have an eyebolt on one end of the chain which must be threaded into the float after final assembly. On cable operated assemblies the eyebolt is welded to the float.

1. Remove the hardware and one stop collar from the float/eyebolt end of the chain/cable.
2. Thread the chain/cable through "both" ends of the operating lever. Make sure the cable rides smoothly over the two pulleys.

**Note:** For operator assemblies with the half-lever extension the chain cable is threaded through one side of the operating lever.

### Installing the Float

1. Slide the adjustable stop collar onto the chain/cable.
- Note:** The positioning of the adjustable stop collar is dependent upon the level of the liquid to be monitored.
2. Thread the chain/cable through the eyebolt on the float.
  - 3 Install the hardware to secure the float to the chain/cable.

### Floor Mount Operator Assemblies

Refer to "Floor Mount Operator Assemblies" information on Page 3.

For Recommended Torque Values, Refer to Page 2.

## Double Arm Lever Operator Assemblies -

Table 9. Materials

Quantity	Material
2	3 foot Section of Rod
1	Roll Pin
1	Float
3	Adjustable Stop Collars
3	1/4-20 x 1/2 inch Set Screw
1	Fixed Stop Collar
1	6-32 x 1 inch Screw
2	6-32 Brass Nut
1	Counterweight ①
1	Counterweight Rod Assembly
1	Pedestal (Floor Mounted Units Only)

① Operator assemblies with rod lengths of greater than 6 feet may require additional counterweights

Refer to Table 10 for the appropriate drawing of the operator assembly to be installed

Table 10. Double Arm Lever Operator Assemblies

Mounting Style	Operator Assembly Catalog Number	For Use with Switch Style(s) Catalog Number(s)	Assembly Drawing (Page 8)
Base Mount	840-6A1	840-A1, 840-A4	M
	840-6A4	840-A7	N
	840-6BCE	840-B1, 840-B4, 840-C1	O
	840-6BCE47	840-B1, 840-B4, 840-C7	N
Floor Mount	840-7A1	840-A1, 840-A4	M
	840-7A47	840-A7	N
	840-7BC1	840-B1, 840-B4, 840-C1	O
	840-7B47	840-B7	N
	840-7C47	840-C4, 840-C7	N

### Mounting the Operator Assembly to the Switch

Operator assemblies (Catalog Numbers **840-6BCE** and **840-7BC1**) are provided with an operating extension attached to the counterweight assembly (see Drawing O).

1. Remove and discard the screws that hold the operating lever to the back of the switch.
2. Align the holes of the operating lever extension with the holes of the switch lever.
3. Secure to the switch enclosure using the hardware provided.

### For all other operator assemblies.

1. Remove the mounting hardware from the end of the counterweight assembly.
2. Insert the counterweight rod through the operating lever of the switch.
3. Secure in place using the hardware provided.

### Mounting the Switch

1. Mount the switch in the desired area. Hardware for mounting the switch is not provided.

## Automatic Float Switch Assemblies

### Assembling the Rod and Float

1. If more than 3-feet of rod is required, mate two sections of rod together.
2. Align the holes in each end of the rod and insert the roll pin using a pliers.
3. Slide the adjustable stop collar onto the rod.  
**Note:** Positioning of the adjustable stop collar is dependent upon the level of liquid to be monitored
4. Slide the rod through the float and install the fixed stop collar to the end of the rod using hardware provided

### Installing the Rod and Float Assembly

1. Attach the rod to the operating lever using two adjustable stop collars - one for each side of the lever.  
**Note:** The positioning of the adjustable stop collars is dependent upon the level of the liquid to be monitored. The rod may need additional guides to stabilize vertical float movement. These guides are to be supplied by the user.
2. Use the set screws to attach the stop collars to the rod.

**Floor Mount Operator Assemblies** Refer to "Floor Mount Operator Assemblies" information on Page 3.

### Double Parallel Arm Operator Assemblies -

**Table 11. Materials**

Quantity	Material
2	3 foot Section of Rod
1	Roll Pin
1	Float
1	Adjustable Stop Collars
1	1/4-20 x 1/2 inch Set Screw
1	Fixed Stop Collar
1	6-32 x 1 inch Screw
2	6-32 Brass Nut
1	Counterweight ①
1	Double Arm Lever / Counterweight Assembly
1	Pedestal (Floor Mounted Units Only)

① Operator assemblies with rod lengths of greater than 6-feet may require additional counterweights.

Refer to Table 12 for the appropriate drawing of the operator assembly to be installed.

**Table 12. Double Parallel Arm Operator Assemblies**

Mounting Style	Operator Assembly Catalog Number	For Use with Switch Style(s) Catalog Number(s)	Assembly Drawing (Page 8)
Base Mount	840-8A1	840-A1	P
	840-8A4	840-A4	Q
	840-8A47	840-A7	R
	840-8B1	840-B1	S
	840-8B4	840-B4	S
	840-8B47	840-B7	R
	840-8C1	840-C1	T
Floor Mount	840-8C47	840-C4, 840-C7	R
	840-9A1	840-A1	P
	840-9A4	840-A4	Q
	840-9A47	840-A7	R
	840-9B1	840-B1	S
	840-9B4	840-B4	S
	840-9B47	840-B7	R
	840-9C1	840-C1	T
	840-9C47	840-C4, 840-C7	R

For operator assemblies supplied with TWO parallel arm levers.

1. Remove the switch lever from the switch enclosure.
2. Mount the upper arm lever of the operator assembly to the enclosure.

**Note:** The upper arm lever will either mount directly to the back of the enclosure or a bracket will be provided. Filler screws or plugs may have to be removed from the back or top of the enclosure before the top lever bracket can be mounted into position. Mounting hardware is supplied with the assembly.

3. Mount the lower arm lever to the enclosure in the same position the original switch lever was mounted.

For operator assemblies supplied with ONE arm lever, use the operating lever on the switch enclosure as the lower arm lever.

1. Remove the filler screws from the top of the enclosure.
2. Mount the upper lever bracket to the switch enclosure using the hardware provided.
3. Secure the guide rod to the lower lever using the hardware provided on the guide rod.

### Mounting the Switch

1. Mount the switch in the desired area. Mounting hardware is not provided. Instructions for "Floor Mount Operator Assemblies" are listed on Page 3.

## Automatic Float Switch Assemblies

### Assembling the Rod and Float

1. If more than 3-feet of rod is required mate the two 3-foot sections of operating rod together.
2. Align the holes in each end of the rod and insert the roll pin using a pliers.
3. Slide the adjustable stop collar onto the rod.

**Note.** Positioning of the adjustable stop collar is dependent upon the level of liquid to be monitored.

4. Slide the rod through the float and install the fixed stop collar to the end of the rod using the hardware provided.

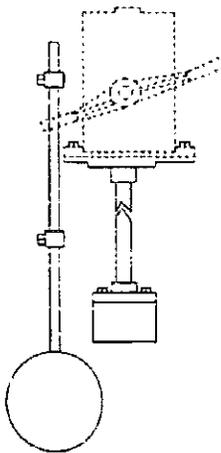
### Installing the Rod and Float Assembly

1. Insert the operating rod through the ring clamps on the guide rod.
2. Secure the rod in place using the ring clamp set screws.

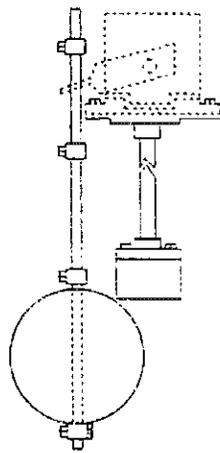
### Floor Mount Operator Assemblies

Refer to "Floor Mount Operator Assemblies" information on Page 3.

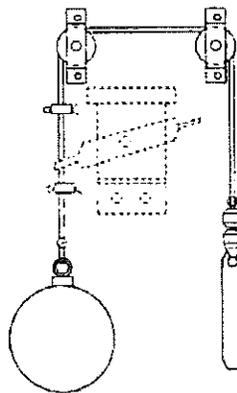
## Assembly Drawings



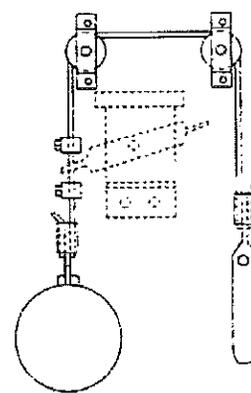
Drawing A



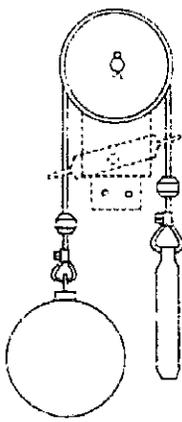
Drawing B



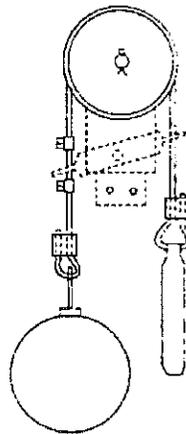
Drawing C



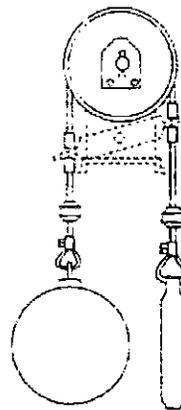
Drawing D



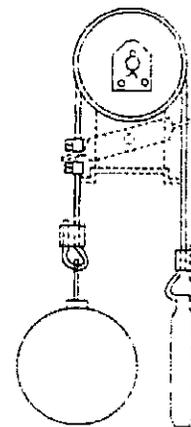
Drawing E



Drawing F



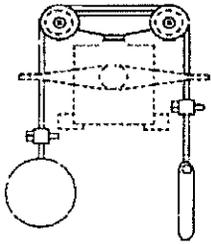
Drawing G



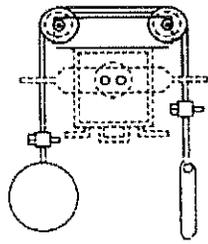
Drawing H

For Recommended Torque Values, Refer to Page 2.

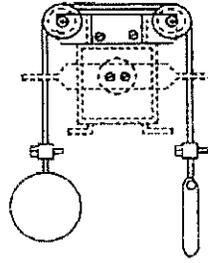
Assembly Drawings



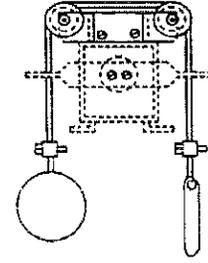
Drawing I



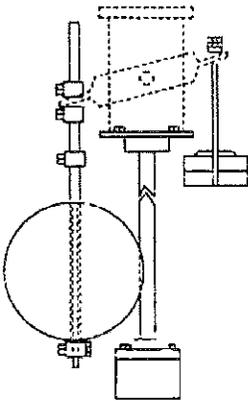
Drawing J



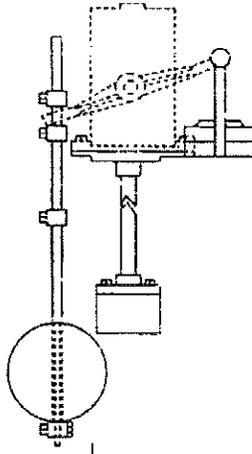
Drawing K



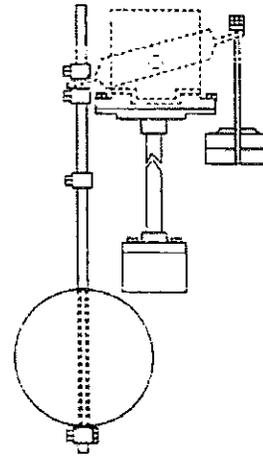
Drawing L



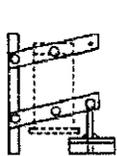
Drawing M



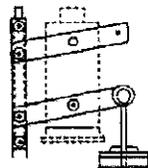
Drawing N



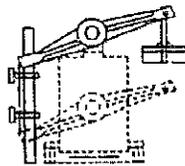
Drawing O



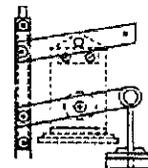
Drawing P



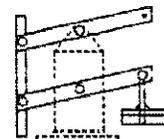
Drawing Q



Drawing R



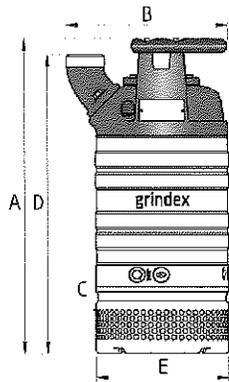
Drawing S



Drawing T

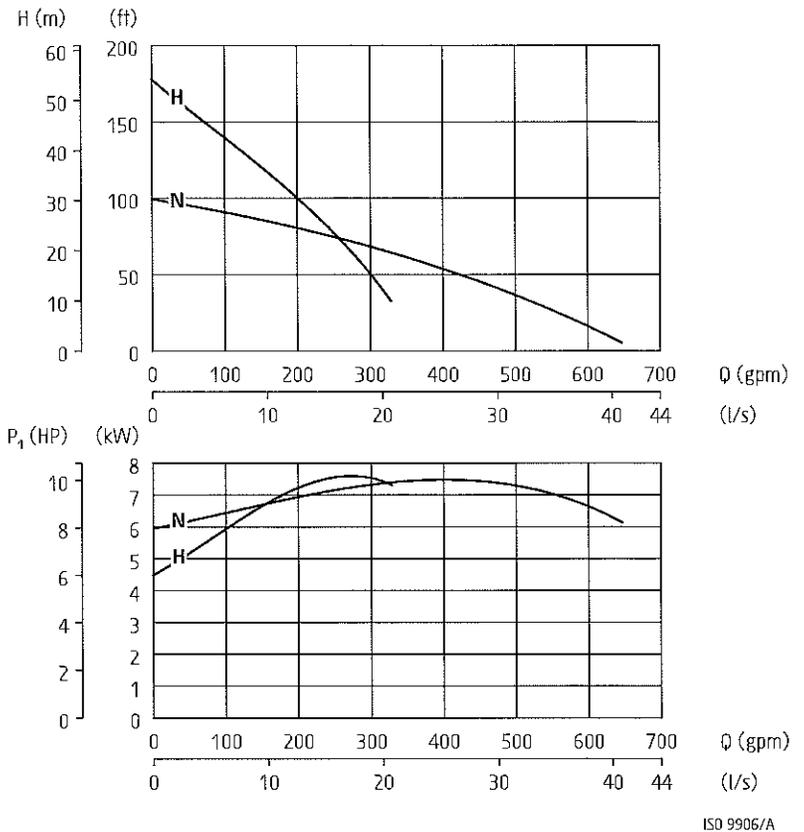
**Major MSHA**

*Electrical submersible drainage pump*



60 Hz	N	H
Discharge connection C	4"	3"
Rated power P <sub>2</sub> [kW/HP]	8.9 / 6.6	8.9 / 6.6
Max. power consumption P <sub>1</sub> [kW]	7.7	7.7
Shaft speed [rpm]	3480	3480
Rated current at 460V	11 A	11 A
Rated current at 575V	8.4 A	8.4 A
Solids passage [inch]	0.4	0.4
Height [inch]	26.7	26.7
Diameter [inch]	13.7	13.2
Weight [lbs/kg]	119 / 54	119 / 54

*Other voltages on request*



**Pump types**

N: normal pressure, H: high pressure

**Classification**

Electrical submersible drainage pump  
Protection class: IP 68

**Approvals**

MSHA Certification No. (XP) 07-JA080003-0  
MSHA 2G system approval No. 18-A080007-0

**Electrical motor**

Squirrel cage induction motor, insulation class: H (IEC 85)

**Motor protection**

Thermal contacts in the stator, opening temperature 284°F (140°C), air valve

**Cable - SubCab**

10AWG/3-2-1-Gc, length 53 ft

**Limitations**

Max. submersion depth: 66 ft (20 m)  
Max. liquid temperature: 104 °F (40 °C)  
Allowed pH range: 5 - 8  
Maximum liquid density: 68 lbs/ft<sup>3</sup> (1100 kg/m<sup>3</sup>)

**Shaft seals**

Cartridge seal: pre-assembled double mechanical seal running in an oil compartment  
Material lower seal: *silicon carbide - silicon carbide*  
Material upper seal: *tungsten carbide - ceramic*

**Bearings**

Ball bearings with C3 clearance

**Discharge connection**

3-4" NPT

**Materials**

Casted parts: *Aluminium*  
Outer casing: *Stainless steel*  
Motor shaft: *Stainless steel*  
Impeller: *Hard-Iron™*  
Suction cover: *Hard-Iron™*  
Diffusers: *Nitrile rubber*  
Screws and nuts: *Stainless steel*  
O-rings: *Nitrile rubber*

**Accessories**

Zinc anodes

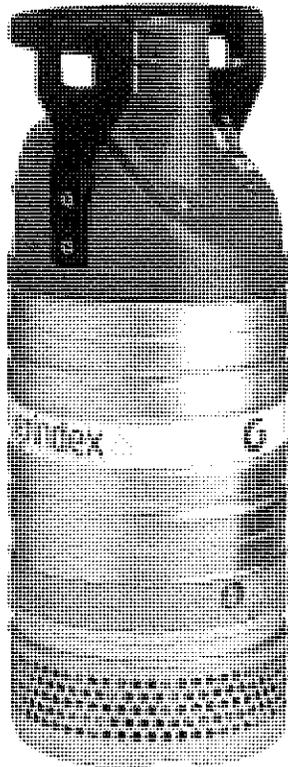


Revision 2.0

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# Installation, Operation, and Maintenance Manual

8104.082/.181 Major



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# Introduction and Safety

## Introduction

### Purpose of this manual

The purpose of this manual is to provide necessary information for:

- Installation
- Operation
- Maintenance



### CAUTION:

Read this manual carefully before installing and using the product. Improper use of the product can cause personal injury and damage to property, and may void the warranty.

### NOTICE:

Save this manual for future reference, and keep it readily available at the location of the unit.

## Safety terminology and symbols

### About safety messages

It is extremely important that you read, understand, and follow the safety messages and regulations carefully before handling the product. They are published to help prevent these hazards:

- Personal accidents and health problems
- Damage to the product
- Product malfunction

### Hazard levels

Hazard level	Indication
<b>DANGER:</b>	A hazardous situation which, if not avoided, will result in death or serious injury
<b>WARNING:</b>	A hazardous situation which, if not avoided, could result in death or serious injury
<b>CAUTION:</b>	A hazardous situation which, if not avoided, could result in minor or moderate injury
<b>NOTICE:</b>	<ul style="list-style-type: none"> <li>• A potential situation which, if not avoided, could result in undesirable conditions</li> <li>• A practice not related to personal injury</li> </ul>

## Hazard categories

Hazard categories can either fall under hazard levels or let specific symbols replace the ordinary hazard level symbols.

Electrical hazards are indicated by the following specific symbol:



---

### Electrical Hazard:

---

These are examples of other categories that can occur. They fall under the ordinary hazard levels and may use complementing symbols:

- Crush hazard
- Cutting hazard
- Arc flash hazard

## Product warranty

### Coverage

Grindex undertakes to remedy the following faults in products sold by Grindex under the following conditions:

- The faults are due to defects in design, materials or workmanship.
- The faults are reported to an Grindex representative within the warranty period.
- The product is used only under the conditions described in this manual.
- The monitoring equipment incorporated in the product is correctly connected and in use.
- All service and repair work is done by personnel authorized by Grindex.
- Genuine Grindex parts are used.

### Limitations

The warranty does not cover faults caused by the following:

- Deficient maintenance
- Improper installation
- Modifications or changes to the product and installation carried out without consulting Grindex
- Incorrectly executed repair work
- Normal wear and tear

Grindex assumes no liability for the following:

- Bodily injuries
- Material damages
- Economic losses

### Warranty claim

Grindex products are high-quality products with expected reliable operation and long life. However, should the need arise for a warranty claim, please contact your Grindex representative.

### Spare parts

Grindex guarantees that spare parts will be available for 10 years after the manufacture of this product has been discontinued.

## Safety



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**WARNING:**

- The operator must be aware of safety precautions to prevent physical injury.
  - Any pressure-containing device can explode, rupture, or discharge its contents if it is over-pressurized. Take all necessary measures to avoid over-pressurization.
  - Operating, installing, or maintaining the unit in any way that is not covered in this manual could cause death, serious personal injury, or damage to the equipment. This includes any modification to the equipment or use of parts not provided by Grindex. If there is a question regarding the intended use of the equipment, please contact an Grindex representative before proceeding.
  - This manual clearly identifies accepted methods for disassembling units. These methods must be adhered to. Trapped liquid can rapidly expand and result in a violent explosion and injury. Never apply heat to impellers, propellers, or their retaining devices to aid in their removal.
  - Do not change the service application without the approval of an authorized Grindex representative.
- 



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**CAUTION:**

You must observe the instructions contained in this manual. Failure to do so could result in physical injury, damage, or delays.

---

## User safety

### General safety rules

These safety rules apply:

- Always keep the work area clean.
- Pay attention to the risks presented by gas and vapors in the work area.
- Avoid all electrical dangers. Pay attention to the risks of electric shock or arc flash hazards.
- Always bear in mind the risk of drowning, electrical accidents, and burn injuries.

### Safety equipment

Use safety equipment according to the company regulations. Use this safety equipment within the work area:

- Hard hat
  - Safety goggles, preferably with side shields
  - Protective shoes
  - Protective gloves
  - Gas mask
  - Hearing protection
  - First-aid kit
  - Safety devices
- 

**NOTICE:**

Never operate a unit unless safety devices are installed. Also see specific information about safety devices in other chapters of this manual.

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## Electrical connections

Electrical connections must be made by certified electricians in compliance with all international, national, state, and local regulations. For more information about requirements, see sections dealing specifically with electrical connections.

## Hazardous liquids

The product is designed for use in liquids that can be hazardous to your health. Observe these rules when you work with the product:

- Make sure that all personnel who work with biologically hazardous liquids are vaccinated against diseases to which they may be exposed.
- Observe strict personal cleanliness.

## Wash the skin and eyes

Follow these procedures for chemicals or hazardous fluids that have come into contact with your eyes or your skin:

Condition	Action
Chemicals or hazardous fluids in eyes	<ol style="list-style-type: none"> <li>1. Hold your eyelids apart forcibly with your fingers.</li> <li>2. Rinse the eyes with eyewash or running water for at least 15 minutes.</li> <li>3. Seek medical attention.</li> </ol>
Chemicals or hazardous fluids on skin	<ol style="list-style-type: none"> <li>1. Remove contaminated clothing.</li> <li>2. Wash the skin with soap and water for at least 1 minute.</li> <li>3. Seek medical attention, if necessary.</li> </ol>

## MSHA requirements

According to the United States of America's Code of Federal Regulations, the following requirements must be fulfilled to maintain Mine Safety and Health Administration (MSHA) permissibility of this equipment:

Subject area	Requirements
General safety	<ul style="list-style-type: none"> <li>• Frequent inspections must be made.</li> <li>• All electrical parts, portable cable, and wiring must be kept in a safe condition.</li> <li>• There must not be any openings into the casings of the electrical parts.</li> <li>• The machine frame must be effectively earthed (grounded).</li> <li>• Power wires must not be used for earthing (grounding).</li> <li>• The operating voltage must match the voltage rating of the motor.</li> </ul>

Subject area	Requirements
Service and repair	<ul style="list-style-type: none"> <li>• Inspections, service, and repairs are only allowed when the portable cable is disconnected from the power supply.</li> <li>• Work must be performed by trained personnel (preferably the manufacturer or agent) to ensure that the pump is restored to its original state of safety in regards to all flame-arresting paths.</li> <li>• Replacement parts must be exactly equal to those provided by the manufacturer.</li> <li>• When cable entries are disturbed on pump or control, they must be reassembled in the approved manner.</li> </ul> <div style="display: flex; align-items: center; margin-top: 10px;">  <div> <p><b>DANGER:</b></p> <p>Failure to restore the permissible equipment to its original state of safety will void the MSHA approval. The creation of a safety hazard will subject the owner / operator of a mine to citations and penalties under the law.</p> </div> </div>
Fastenings	All bolts, nuts, screws, and threaded covers must be properly tightened and secured.
Cables	A flame-resistant portable cable must be used. It has to bear an MSHA-assigned identification number and be adequately protected by an automatic circuit-interrupting device. Special care must be taken in handling the cable to avoid mechanical damage and wear.
Operation	Polyurethane-equipped products must not be operated dry in hazardous areas.

## Environmental safety

### The work area

Always keep the station clean to avoid and/or discover emissions.

### Waste and emissions regulations

Observe these safety regulations regarding waste and emissions:

- Dispose appropriately of all waste.
- Handle and dispose of the processed liquid in compliance with applicable environmental regulations.
- Clean up all spills in accordance with safety and environmental procedures.
- Report all environmental emissions to the appropriate authorities.

### Electrical installation

For electrical installation recycling requirements, consult your local electric utility.

### Recycling guidelines

Always recycle according to the guidelines listed below:

1. Follow local laws and regulations regarding recycling if the unit or parts are accepted by an authorized recycling company.
2. If the first guideline is not applicable, then return the unit or parts to the nearest Grindex representative.

# Transportation and Storage

## Inspect the delivery

### Inspect the package

1. Inspect the package for damaged or missing items upon delivery.
2. Note any damaged or missing items on the receipt and freight bill.
3. File a claim with the shipping company if anything is out of order.  
If the product has been picked up at a distributor, make a claim directly to the distributor.

### Inspect the unit

1. Remove packing materials from the product.  
Dispose of all packing materials in accordance with local regulations.
2. Inspect the product to determine if any parts have been damaged or are missing.
3. If applicable, unfasten the product by removing any screws, bolts, or straps.  
For your personal safety, be careful when you handle nails and straps.
4. Contact the local sales representative if there is any issue.

## Transportation guidelines

### Precautions



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**DANGER:**

Disconnect and lock out electrical power before installing or servicing the unit.

---



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**WARNING:**

- Stay clear of suspended loads.
  - Observe accident prevention regulations in force.
- 

### Position and fastening

The unit can be transported either horizontally or vertically. Make sure that the unit is securely fastened during transportation, and cannot roll or fall over.

### Lifting



---

**WARNING:**

Crush Hazard.

- Always lift the unit by its designated lifting points.
  - Use suitable lifting equipment and ensure that the product is properly harnessed.
  - Wear personal protective equipment.
  - Stay clear of cables and suspended loads.
- 

Lifting equipment and tackle should always be inspected before starting work.

## Temperature ranges for transportation, handling and storage

### Handling at freezing temperature

At temperatures below freezing, the product and all installation equipment, including the lifting gear, must be handled with extreme care.

Make sure that the product is warmed up to a temperature above the freezing point before starting up. Avoid rotating the impeller/propeller by hand at temperatures below the freezing point. The recommended method to warm the unit up is to submerge it in the liquid which will be pumped or mixed.

---

**NOTICE:**

Never use a naked flame to thaw the unit.

---

### Unit in as-delivered condition

If the unit is still in the condition in which it left the factory - all packing materials are undisturbed - then the acceptable temperature range during transportation, handling and storage is:  $-50^{\circ}\text{C}$  ( $-58^{\circ}\text{F}$ ) to  $+60^{\circ}\text{C}$  ( $+140^{\circ}\text{F}$ ).

If the unit has been exposed to freezing temperatures, then allow it to reach the ambient temperature of the sump before operating.

### Lifting the unit out of liquid

The unit is normally protected from freezing while operating or immersed in liquid, but the impeller/propeller and the shaft seal may freeze if the unit is lifted out of the liquid into a surrounding temperature below freezing.

Units equipped with an internal cooling system are filled with a mixture of water and 30% glycol. This mixture remains a flowing liquid at temperatures down to  $-13^{\circ}\text{C}$  ( $9^{\circ}\text{F}$ ). Below  $-13^{\circ}\text{C}$  ( $9^{\circ}\text{F}$ ), the viscosity increases such that the glycol mixture will lose its flow properties. However, the glycol-water mixture will not solidify completely and thus cannot harm the product.

Follow these guidelines to avoid freezing damage:

1. Empty all pumped liquid, if applicable.
2. Check all liquids used for lubrication or cooling, both oil and water-glycol mixtures, for the presence of water. Change if needed.

## Storage guidelines

### Storage location

The product must be stored in a covered and dry location free from heat, dirt, and vibrations.

---

**NOTICE:**

- Protect the product against humidity, heat sources, and mechanical damage.
  - Do not place heavy weights on the packed product.
- 

### Long-term storage

If the unit is stored more than six months, then the following apply:

- Before operating the unit after storage, it must be inspected with special attention to the seals and the cable entry.
- The impeller/propeller must be rotated every other month to prevent the seals from sticking together.

# Product Description

## Products included

Pump model	Approvals
Major 8104.181	Standard
Major 8104.082	

## Pump design

The pump is submersible, and driven by an electric motor.

### Intended use

The product is intended for moving waste water, sludge, raw and clean water. Always follow the limits given in *Application limits* (page 44). If there is a question regarding the intended use of the equipment, please contact a Grindex representative before proceeding.



#### **WARNING:**

In explosive or flammable environments, only use Ex- or MSHA-approved products.

#### **NOTICE:**

Do NOT use the pump in highly corrosive liquids.

For information about pH, see *Application limits* (page 44).

### Particle size

The pump can handle liquid containing particles that correspond to the holes in the strainer.

Number of holes	Hole dimensions
300	Diameter 10.0 mm (0.39 in)

For more information about the strainer, see *Dimensions and weights* (page 46).

### Pressure class

N	Medium head
H	High head

### Impeller type

Wear resistant

## Monitoring equipment

The following applies to the monitoring equipment of the pump:

- The stator incorporates thermal contacts connected in series that activate the alarm at overtemperature.
- The thermal contacts open at 140°C (284°F) and close at 105°C (221°F).
- The pump can also be equipped with level regulators.

## Level regulators

### About level regulators

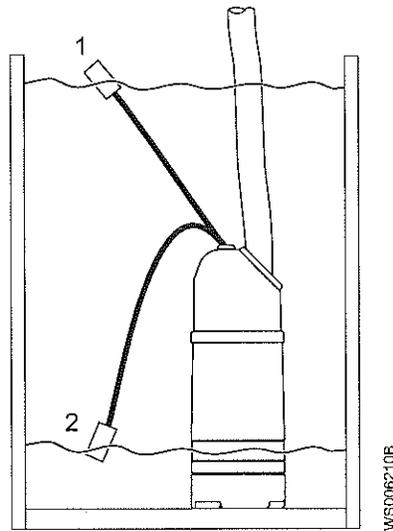
Starting and stopping the pump at different water levels can be manual or automatic. If automatic start and stop is required, a level regulator can be ordered (as an option). The option is only available for standard pumps.

### Features

Below are some of the features of the level regulators:

- The level regulator can be set at different operating levels by adjusting the length of cable.
- A clamping bracket situated at the lifting handle holds the level regulator cable in place.
- If continuous pumping is required, the level regulator can be placed in a special rubber bracket on the discharge connection to eliminate the level regulator function.

### Illustration



1. On
2. Off

Figure 1: The functionality of the level regulator

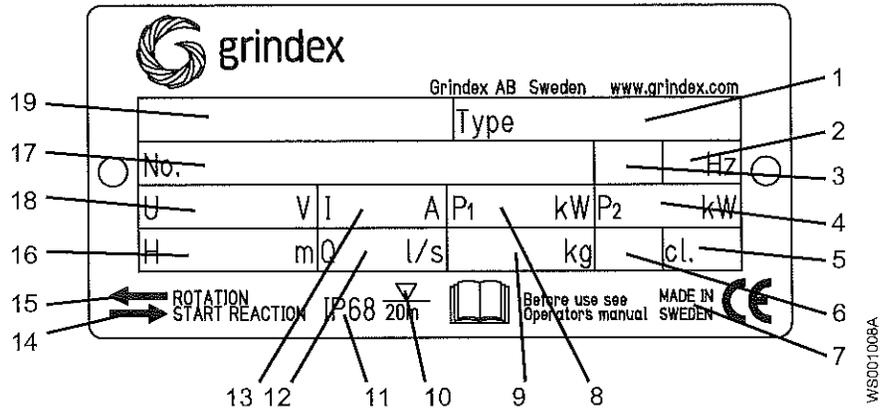
## The data plate

### Introduction

The data plate is a metal label located on the main body of the pump. The data plate lists key product specifications.

Product Description

**The data plate**



1. Pump type number
2. Frequency
3. Phases, type of current
4. Rated shaft power
5. Thermal class
6. Locked rotor code-letter
7. Country of origin
8. Maximum power consumption
9. Product weight
10. Maximum submersion depth
11. Degree of protection
12. Maximum capacity
13. Rated current
14. Direction of the start reaction
15. Direction of the impeller rotation
16. Maximum head
17. Serial number
18. Rated voltage
19. Pump model

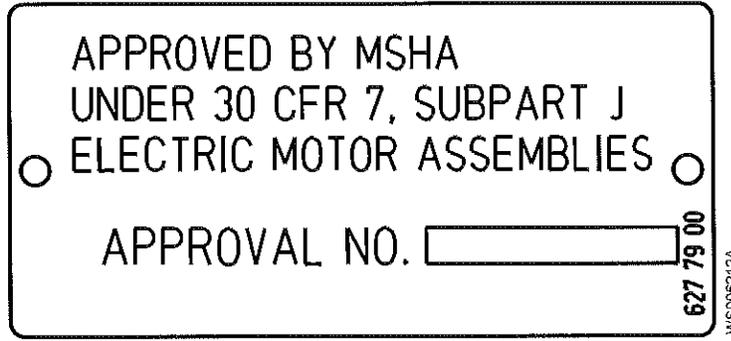
**Warning plate**

Pumps without built-in motor protection have an additional data plate. This pump must be used with separate overload protection in accordance with technical data.



W5006204A

The MSHA approval plate



# Installation

## Install the pump


**DANGER:**

Disconnect and lock out electrical power before installing or servicing the unit.


**WARNING:**

- Do not install the starter equipment in an explosive zone unless it is explosion-proof rated.
- Do not install CSA-approved products in locations that are classified as hazardous in the national electric code, ANSI/NFPA 70-2005.
- Vent the tank of a sewage station in accordance with local plumbing codes.
- Make sure that the unit cannot roll or fall over and injure people or damage property.


**WARNING:**

Electrical shock hazard. Check that the cable and cable entry have not been damaged during transport before installing the pump.

**NOTICE:**

- Never force piping to make a connection with a pump.

These requirements apply:

- Use the pump dimensional drawing in order to ensure proper installation.
- Provide a suitable barrier around the work area, for example, a guard rail.
- Check the explosion risk before you weld or use electric hand tools.
- Remove all debris from the inlet piping system before you install the pump.
- Always check the impeller rotation before lowering the pump into the pumped liquid.

### Sedimentation prevention

In order to avoid sedimentation when the pumped liquid contains solid particles, the velocity of the liquid in the discharge line must exceed a certain value. Choose applicable minimum velocity from the table, and choose proper dimension of the discharge line accordingly.

Mixture	Minimum velocity, meter per second (feet per second)
Water + coarse gravel	4 (13)
Water + gravel	3.5 (11)
Water + sand, particle size <0.6 mm (0.024 in)	2.5 (8.2)
Water + sand, particle size <0.1 mm (0.004 in)	1.5 (4.9)

For more permanent installations with a heavily contaminated pumped liquid, a settling pump-sump is recommended.

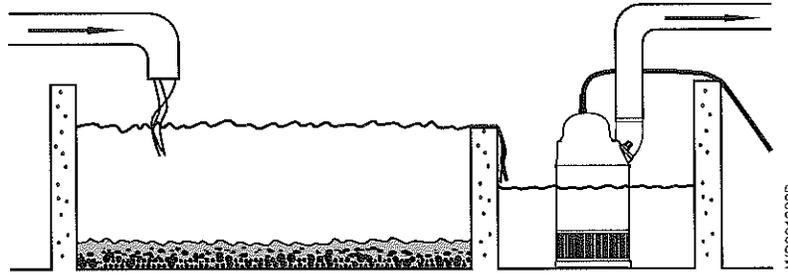
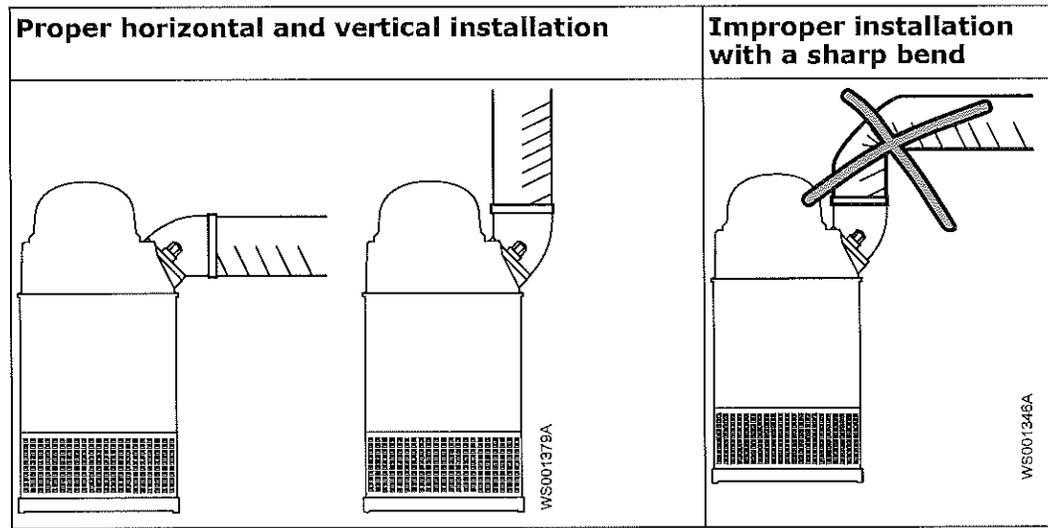


Figure 2: Settling pump-sump

**Discharge line requirements**

The discharge line can be run vertically or horizontally, but must be without sharp bends.



**Fasteners**



**WARNING:**

- Only use fasteners of the proper size and material.
- Replace all corroded fasteners.
- Make sure that all fasteners are properly tightened and that there are no missing fasteners.

**Install**

The pump is transportable and intended to operate either completely or partially submerged in the pumped liquid. The pump is equipped with a connection for hose or pipe.

These requirements and instructions only apply when the installation is made according to the dimensional drawing.

1. Run the cable so that it has no sharp bends, is not pinched, and cannot be sucked into the pump inlet.
2. Connect the discharge line.

The discharge line can be run vertically or horizontally, but must be without sharp bends.

3. Lower the pump into the sump.

The cable must not be used for this purpose. You should attach a rope or similar to the handle or the eyebolts for lowering and lifting the pump.

Heavier pumps must be lifted and lowered down by crane. Suspend the pump by the lifting handle or the eyebolts with chains or wires.

4. Place the pump on the base and make sure it cannot fall over or sink. The base should consist of a plank, a bed of coarse gravel, or a cut-down and perforated oil drum.

Alternatively, the pump can be suspended with a lifting chain just above the sump bottom. Make sure that the pump cannot rotate at startup or during operation.

5. Connect the motor cable and the starter and monitoring equipment according to the separate instructions.

Major MSHA: Make sure that the impeller rotation is correct. For more information, see *Check the impeller rotation: Pumps without built-in motor protection* (page 21).

Major: Make sure that the phase sequence is correct. For more information, see *Check the phase sequence: Pumps with built-in motor protection* (page 22).

## Make the electrical connections

### General precautions



#### Electrical Hazard:

- A certified electrician must supervise all electrical work. Comply with all local codes and regulations.
- Before starting work on the unit, make sure that the unit and the control panel are isolated from the power supply and cannot be energized. This applies to the control circuit as well.
- Leakage into the electrical parts can cause damaged equipment or a blown fuse. Keep the end of the motor cable above the liquid level.
- Make sure that all unused conductors are insulated.
- There is a risk of electrical shock or explosion if the electrical connections are not correctly carried out or if there is fault or damage on the product.



#### WARNING:

Do not install the starter equipment in an explosive zone unless it is explosion-proof rated.



#### CAUTION:

If the pump is equipped with automatic level control and/or internal contactor, there is a risk of sudden restart.



WS006209A

### Requirements

These general requirements apply for electrical installation:

- The supply authority must be notified before installing the pump if it will be connected to the public mains. When the pump is connected to the public power supply, it may cause flickering of incandescent lamps when started.
- The mains voltage and frequency must agree with the specifications on the data plate. If the pump can be connected to different voltages, then the connected voltage is specified by a yellow sticker close to the cable entry.
- The fuses and circuit breakers must have the proper rating, and the pump overload protection (motor protection breaker) must be connected and set to the rated current according to the data plate and if applicable the cable chart. The starting current in direct-on-line start can be up to six times higher than the rated current.
- The fuse rating and the cables must be in accordance with the local rules and regulations.
- If intermittent operation is prescribed, then the pump must be provided with monitoring equipment supporting such operation.
- The thermal contacts/thermistors must be in use.

## Cables

These are the requirements to follow when you install cables:

- The cables must be in good condition, not have any sharp bends, and not be pinched.
- The sheathing must not be damaged and must not have indentations or be embossed (with markings, etc.) at the cable entry.
- The cable entry seal sleeve and washers must conform to the outside diameter of the cable.
- The minimum bending radius must not be below the accepted value.
- If using a cable which has been used before, a short piece must be peeled off when refitting it so that the cable entry seal sleeve does not close around the cable at the same point again. If the outer sheath of the cable is damaged, then replace the cable. Contact a Grindex service shop.
- The voltage drop in long cables must be taken into account. The drive unit's rated voltage is the voltage measured at the cable connection point in the pump.
- The screened cable must be used according to the European CE requirements if a Variable Frequency Drive (VFD) is used. For more information, contact your Grindex representative (VFD-supplier).
- For SUBCAB cables, the twisted pair copper foil must be trimmed.

## Earthing (Grounding)



### Electrical Hazard:

- You must earth (ground) all electrical equipment. This applies to the pump equipment, the driver, and any monitoring equipment. Test the earth (ground) lead to verify that it is connected correctly.
- If the motor cable is jerked loose by mistake, the earth (ground) conductor should be the last conductor to come loose from its terminal. Make sure that the earth (ground) conductor is longer than the phase conductors. This applies to both ends of the motor cable.
- Risk of electrical shock or burn. You must connect an additional earth-(ground-) fault protection device to the earthed (grounded) connectors if persons are likely to come into physical contact with the pump or pumped liquids.

### Earth (ground) conductor length

The earth (ground) conductor must be 270mm (4.010.6 in) longer than the phase conductors in the junction box of the unit.

## Product-specific precautions



### Electrical Hazard:

This information is valid only for standard version products:

For a pump with a level regulator and a cable with earth (ground) check: Make sure that the earth (ground) check connection is done at the GC-connection point with a cable lug and one screw. Connect the ground cable from the level switch to the other screw at the GC-connection point.

## Connect the motor cable to the pump



### CAUTION:

Leakage into the electrical parts can cause damaged equipment or a blown fuse. Keep the end of the motor cable above the liquid level.

1. Check the data plate to see which connections are required for the power supply.
2. Connect the motor cable conductors, including earth (ground), to the terminal or starter unit.
3. Make sure that the pump is correctly connected to earth (ground).
4. Firmly tighten the cable entry into its bottom-most position.  
The seal sleeve and the washers must conform to the outside diameter of the cables.

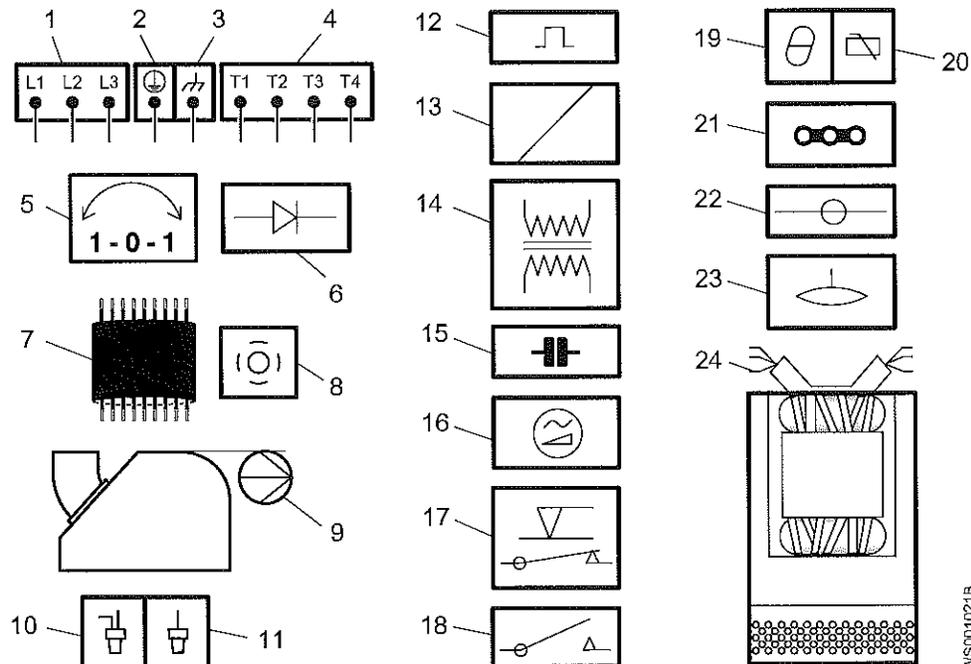


### WARNING:

Do not install the starter equipment in an explosive zone unless it is explosion-proof rated.

## Cable charts

### Connection locations



WS001021B

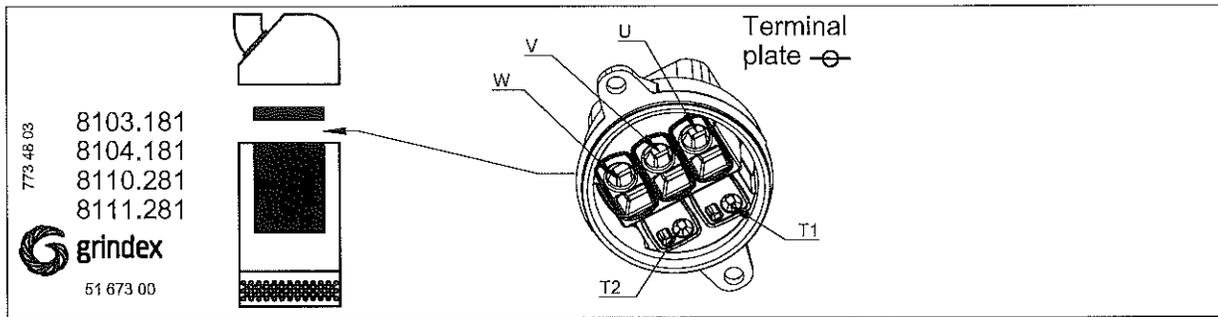
1	Starter equipment and main leads (L1, L2, L3)	13	Coil
2	Earth (ground)	14	Transformer
3	Functional ground	15	Capacitor
4	Control leads (T1, T2, T3, T4)	16	Softstarter
5	Phase shifter	17	Level regulator
6	Diode	18	Contactora, start relay or thermal relay
7	Motor cable	19	Thermal detector in stator
8	Screen	20	Thermal detector in main bearing
9	Pump	21	Jumper
10	Crimp connection	22	Terminal board, terminal plate
11	Crimp isolation	23	Leakage sensor
12	Motor protector	24	Stator leads (U1, U2, U5, U6, V1, V2, V5, V6, W1, W2, W5, W6, Z1, Z5, Z6)

**Color code standard**

<b>Code</b>	<b>Description</b>
BN	Brown
BK	Black
WH	White
OG	Orange
GN	Green
GNYE	Green-Yellow
RD	Red
GY	Grey
BU	Blue
YE	Yellow

Installation

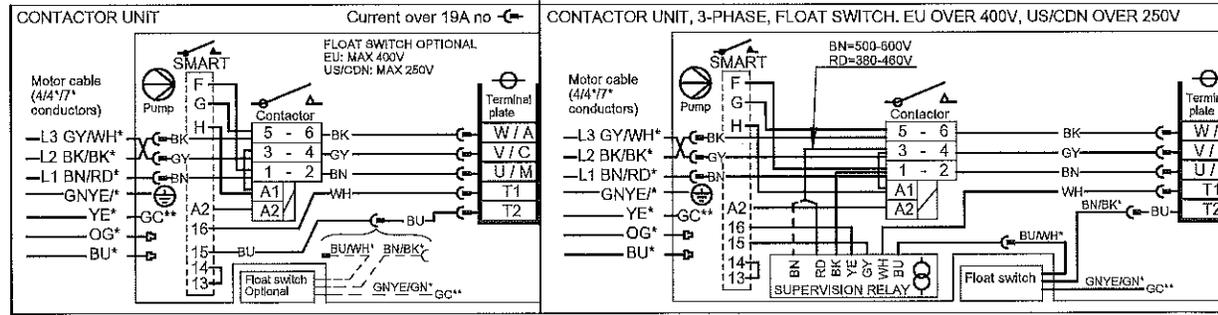
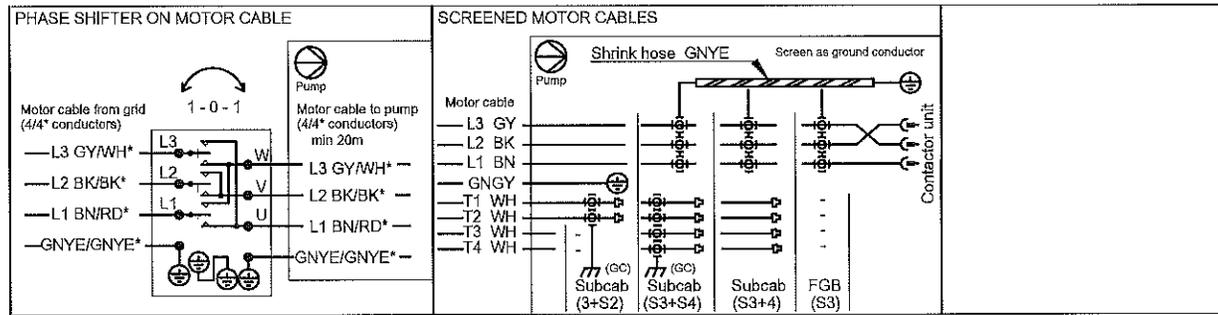
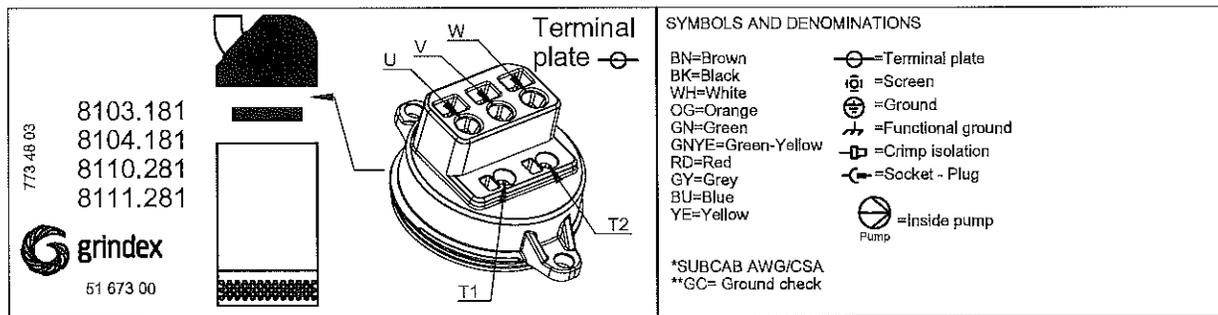
**Stator leads and thermal contacts connection to the terminal plate**



**STATOR LEADS AND THERMAL CONTACTS**

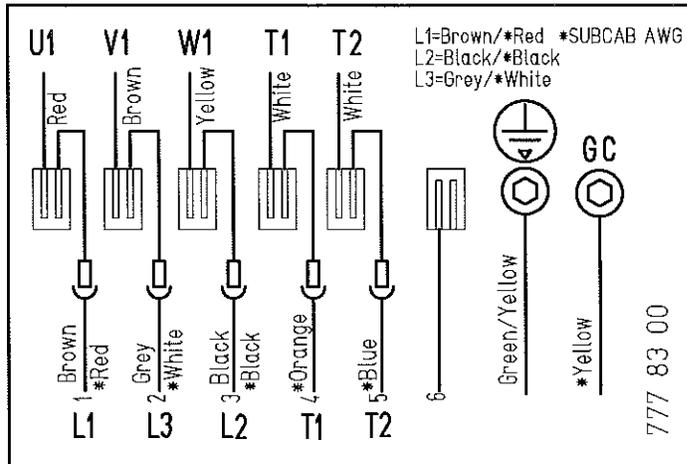
Terminal plate	3 leads Y	6 leads D	6 leads Y	9 leads Y serial	9 leads Y //	12 leads Y //	12 leads D serial	12 leads D //	STATOR LEADS
W	W	W1 V2	W1	W1	W1 W5	W1 W5	W1 V6	W1 W5 V2 V6	U1,U5 RD
V	V	V1 U2	V1	V1	V1 V5	V1 V5	V1 U6	V1 V5 U2 U6	U2,U6 GN
U	U	U1 W2	U1	U1	U1 U5	U1 U5	U1 W6	U1 U5 W2 W6	V1,V5 BN
T1	T1	T1	T1	T1	T1	T1	T1	T1	V2,V6 BU
T2	T2	T2	T2	T2	T2	T2	T2	T2	W1,W5 YE
			W2 → W5 V2 → V5 U2 → U5	W2,W6 BK	T1,T2 WH/YE				

**Motor cable and starter unit connection to the terminal plate**

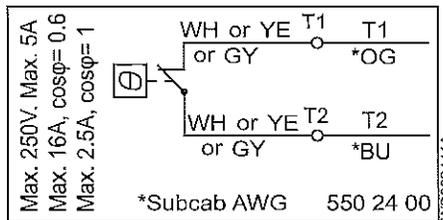


## Cable charts, MSHA version

Motor 60 Hz, 3-phase, 440-480V Y or 575-600V Y



WS004859A



## Check the impeller rotation: Pumps without built-in motor protection

Follow this procedure if your product does not have the rotation control SMART™.



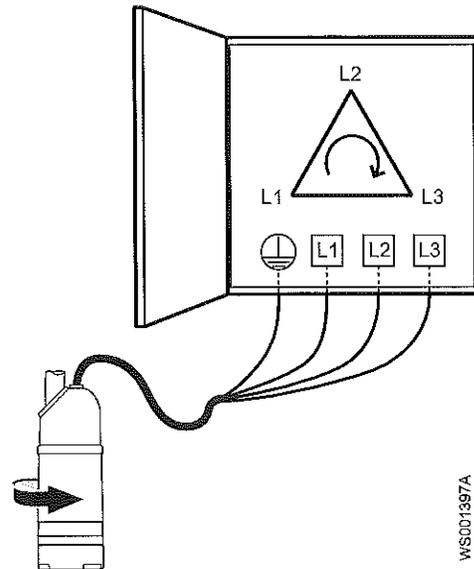
### WARNING:

The starting jerk can be powerful.

Check the direction of rotation each time the cable has been re-connected and after phase or total supply failure.

1. Start the motor.
2. Stop the motor.
3. Check that the impeller rotates in the correct direction.

The correct direction of impeller rotation is clockwise when you look at the pump from above. When started, the pump will react in the opposite direction to the impeller rotation.



**Figure 3: Start reaction**

4. If the impeller rotates in the wrong direction, then do the following:
  - If the motor has a 3-phase connection, then transpose two phase conductors and repeat this procedure from step 1.

For 3-phase pumps with external starters or without built-in motor protection, the phases must be shifted on the output terminal of the starter.

## Check the phase sequence: Pumps with built-in motor protection

Follow this procedure if your product is equipped with the rotation control SMART™.



### **WARNING:**

The starting jerk can be powerful.

The correct direction of impeller rotation is clockwise when you look at the pump from above. When started, the pump will react in the opposite direction to the impeller rotation.

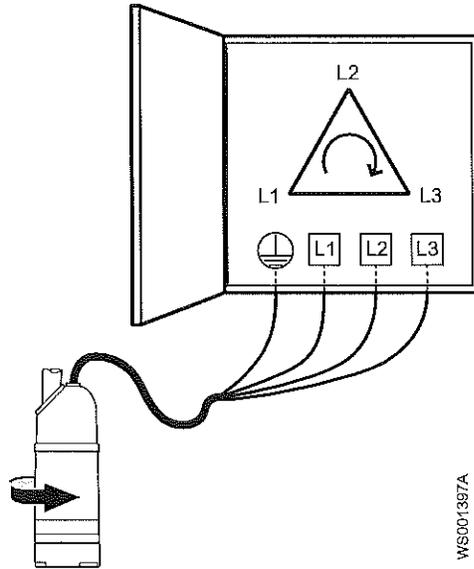
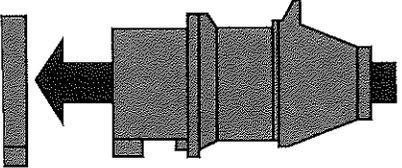
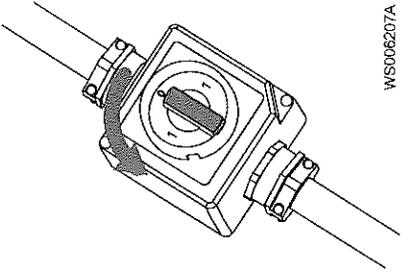


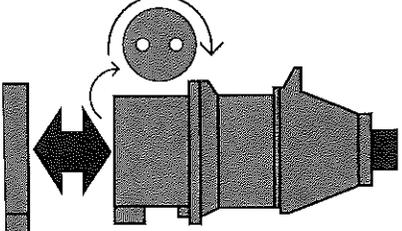
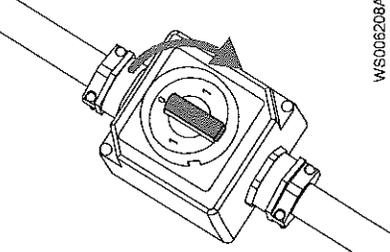
Figure 4: Start reaction

1. Connect the pump to power as follows:

Condition	Action
The pump has a CEE plug with internal phase shifter.	Connect the plug.  WS006205A
The pump has a phase shifter with an on/off switch.	Turn the knob on the phase shifter in either direction.  WS006207A
The pump has neither a CEE plug with internal phase shifter, nor a phase shifter with an on/off switch.	1. Connect the pump to power. 2. Switch on the power.

The pump should start. If it does not, then continue to the next step.

2. If the pump does not start and the fuses are correct, then shift two phases:

Condition	Action
<p>The pump has a CEE plug with internal phase shifter.</p>	<ol style="list-style-type: none"> <li>1. Pull out the plug.</li> <li>2. Shift two phases.</li> <li>3. Wait until the motor has stopped.</li> <li>4. Connect the plug.</li> </ol>  <p style="text-align: right; font-size: small;">WS006206A</p>
<p>The pump has a phase shifter with an on/off switch.</p>	<ol style="list-style-type: none"> <li>1. Turn the knob on the phase shifter to neutral position.</li> <li>2. Wait until the motor has stopped.</li> <li>3. Turn the knob to the opposite position from before.</li> </ol>  <p style="text-align: right; font-size: small;">WS006208A</p>
<p>The pump has neither a CEE plug with internal phase shifter, nor a phase shifter with an on/off switch.</p>	<p>Transpose two phase leads on the output terminal of the starter.</p>

**NOTICE:**

Do not reverse the phase sequence while the pump is running. Temporarily incorrect rotation can occur, resulting in damage to motor electronics and rotating parts.

The pump should start. If it does not, then contact a certified electrician to check the mains and the junctions.

# Operation

## Precautions



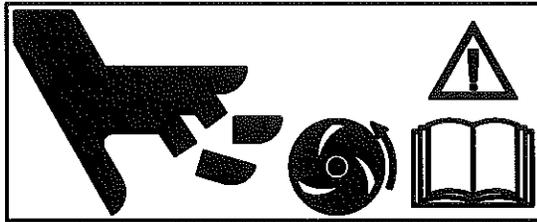
### WARNING:

- Never operate the pump without safety devices installed.
- Never operate the pump with the discharge line blocked, or the discharge valve closed.
- Make sure you have a clear path of retreat.
- Never work alone.



### CAUTION:

If the pump is equipped with automatic level control and/or internal contactor, there is a risk of sudden restart.



## Distance to wet areas



### Electrical Hazard:

- Risk of electrical shock. Make sure no one gets closer than 20 m (65 ft.) to the unit when being in contact with the pumped or mixed liquid.
- Risk of electrical shock. This unit has not been investigated for use in swimming pools. If used in connection with swimming pools special safety regulations apply.

## Noise level

### NOTICE:

The noise level of the product is lower than 70 dB. However, the noise level of 70 dB may be exceeded in some installations and at certain operating points on the performance curve. Make sure that you understand the noise level requirements in the environment where the pump is installed. Failure to do so may result in hearing loss or violation of local laws.

## Start the pump



### DANGER:

If you need to work on the pump, make sure that it is isolated from the power supply and cannot be energized.



---

**WARNING:**

- Make sure that the unit cannot roll or fall over and injure people or damage property.
  - In some installations, the pump and the surrounding liquid may be hot. Bear in mind the risk of burn injuries.
  - Make sure nobody is close to the unit when it is started. The unit will jerk in the opposite direction of the impeller rotation.
- 

**NOTICE:**

Make sure that the rotation of the impeller is correct. For more information, see Check the impeller rotation.

---

1. Inspect the pump. Check that there is no physical damage to the pump or cables.
2. Check the oil level in the oil housing.
3. Remove the fuses or open the circuit breaker, and check that the impeller can be rotated freely.
4. Check that the monitoring equipment (if any) works.
5. Check that the impeller rotation is correct.
6. Start the pump.

## Clean the pump

The pump must be cleaned if it has been running in very dirty water. If clay, cement or other similar dirt is left in the pump it may clog the impeller and seal, preventing the pump from working.

Let the pump run for a while in clean water, or flush it through the discharge connection.

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# Maintenance

## Precautions



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**DANGER:**

Disconnect and lock out electrical power before installing or servicing the unit.

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**WARNING:**

- Always follow safety guidelines when working on the product. See *Introduction and Safety* (page 3).
  - Make sure that the unit cannot roll or fall over and injure people or damage property.
  - Rinse the unit thoroughly with clean water before working on the unit.
  - Rinse the components in water after dismantling.
- 

Make sure that you follow these requirements:

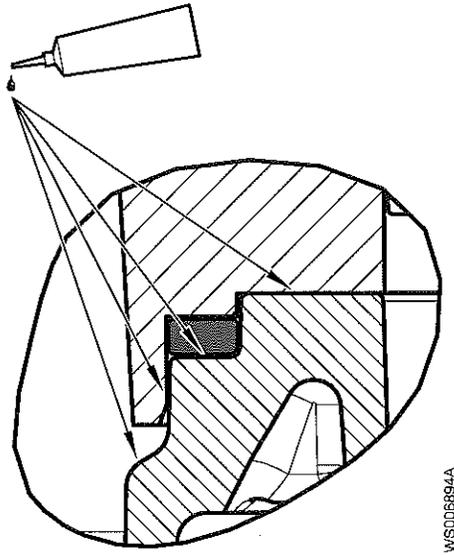
- Check the explosion risk before you weld or use electrical hand tools.
- Allow all system and pump components to cool before you handle them.
- Make sure that the product and its components have been thoroughly cleaned.
- Do not open any vent or drain valves or remove any plugs while the system is pressurized. Make sure that the pump is isolated from the system and that pressure is relieved before you disassemble the pump, remove plugs, or disconnect piping.

## Maintenance guidelines

During the maintenance and before reassembly, always remember to perform these tasks:

- Clean all parts thoroughly, particularly O-ring grooves.
- Change all O-rings, gaskets, and seal washers.
- Lubricate all springs, screws, O-rings with grease.

For an optimal corrosion protection, all O-rings and adjacent surfaces must be coated with Exxon Mobil Unirex N3 or equivalent.



**Figure 5: Example of O-ring adjacent surfaces**

During the reassembly, always make sure that existing index markings are in line.

The reassembled drive unit must always be insulation-tested and the reassembled pump must always be test-run before normal operation.

## Torque values

All screws and nuts must be lubricated to achieve correct tightening torque. Screws that are screwed into stainless steel must have the threads coated with suitable lubricants to prevent seizing.

If there is a question regarding the tightening torques, please contact the local sales and service representative.

### Screws and nuts

**Table 1: Stainless steel, A2 and A4, torque Nm (ft-lbs)**

Property class	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
50	1.0 (0.74)	2.0 (1.5)	3.0 (2.2)	8.0 (5.9)	15 (11)	27 (20)	65 (48)	127 (93.7)	220 (162)	434 (320)
70, 80	2.7 (2)	5.4 (4)	9.0 (6.6)	22 (16)	44 (32)	76 (56)	187 (138)	364 (268)	629 (464)	1240 (915)
100	4.1 (3)	8.1 (6)	14 (10)	34 (25)	66 (49)	115 (84.8)	248 (183)	481 (355)	—	—

**Table 2: Steel, torque Nm (ft-lbs)**

Property class	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
8.8	2.9 (2.1)	5.7 (4.2)	9.8 (7.2)	24 (18)	47 (35)	81(60)	194 (143)	385 (285)	665 (490)	1310 (966.2)
10.9	4.0 (2.9)	8.1 (6)	14 (10)	33 (24)	65 (48)	114 (84)	277 (204)	541 (399)	935 (689)	1840 (1357)

Property class	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30
12.9	4.9 (3.6)	9.7 (7.2)	17 (13)	40 (30)	79 (58)	136 (100)	333 (245)	649 (480)	1120 (825.1)	2210 (1630)

### Hexagon screws with countersunk heads

For hexagon socket head screws with countersunk head, maximum torque for all property classes must be 80% of the values for property class 8.8 above.

## Service

Regular inspection and service of the pump ensures more reliable operation.

Type of service	Purpose	Inspection interval
Inspection	To prevent operational interruptions and machine breakdown. Measures to secure performance and pump efficiency are defined and decided for each individual application. It can include such things as impeller trimming, wear part control and replacement, control of zinc-anodes and control of the stator.	Twice a year
Major overhaul	To secure a long operating lifetime for the product. It includes replacement of key components and the measures taken during an inspection.	Every year, under normal operating conditions

### NOTICE:

Shorter intervals may be required when the operating conditions are extreme, for example with very abrasive or corrosive applications or when the liquid temperatures exceed 40°C (104°F).

## Inspection

Regular inspection and service of the pump ensures more reliable operation.

Service item	Action
Visible parts on the pump and installation	<ol style="list-style-type: none"> <li>1. Check that all screws, bolts, and nuts are properly tightened.</li> <li>2. Check the condition of the pump casing, strainer, cover, lifting handles, eye bolts, ropes, chains, and wires.</li> <li>3. Check for worn or damaged parts.</li> <li>4. Adjust and/or replace if necessary.</li> </ol>
Pipes, valves, and other peripheral equipment	<ol style="list-style-type: none"> <li>1. Check for worn or damaged parts.</li> <li>2. Adjust and/or replace if necessary.</li> </ol>
Impeller	<ol style="list-style-type: none"> <li>1. Check for worn or damaged parts.</li> <li>2. Adjust and/or replace if necessary.</li> </ol> <p>Wear on the impeller or surrounding parts necessitates fine adjustments of the impeller or replacement of worn parts.</p>

Service item	Action
Oil	Check the oil: <ol style="list-style-type: none"> <li>1. Take an oil sample.</li> <li>2. If the oil contains particles, then replace the mechanical seal. Contact an authorized service shop.</li> </ol> Make sure that the volume is filled to the correct level. See <i>Fill with oil</i> (page 32). A smaller amount of water is not harmful for the mechanical seal.
Cable entry	<ol style="list-style-type: none"> <li>1. Check that the following requirements are met:               <ul style="list-style-type: none"> <li>• The cable entry must be firmly tightened into its bottom-most position.</li> <li>• MSHA pump version: The cable entry must be tightened so that the clearance between the gland screw and the MSHA cover is &gt;3.175 mm (1/8 in). Use a feeler gauge to check the clearance.</li> <li>• MSHA pump version: The gland screw is secured from rotating with a screw and washer.</li> <li>• The seal sleeve and the washers must conform to the outside diameter of the cables.</li> </ul> </li> <li>2. Cut off a piece of the cable so that the seal sleeve closes around a new position on the cable.</li> <li>3. Replace the seal sleeve, if necessary.</li> </ol>
Inspection volume <sup>1</sup>	<ol style="list-style-type: none"> <li>1. Check that the inspection screw is properly tightened.</li> <li>2. Remove the inspection screw.</li> <li>3. Drain all liquid, if any.</li> <li>4. If there is oil in the inspection volume, then empty the oil and check again after one week. If there is oil in the inspection volume again, then replace the mechanical seal. Contact an authorized service shop.</li> <li>5. If there is water in the inspection volume, then check that the inspection screw O-ring is not damaged.</li> </ol>
Cable	<ol style="list-style-type: none"> <li>1. If the outer jacket is damaged, replace the cable.</li> <li>2. Check that the cables do not have any sharp bends and are not pinched.</li> </ol>
Cooling system	If the flow through the system has been partly restricted, then rinse and clean.
Level sensors or other sensor equipment	<ol style="list-style-type: none"> <li>1. Check the functionality.</li> <li>2. Repair or replace any damaged equipment.</li> <li>3. Clean and adjust the equipment.</li> </ol>
Starter equipment	<ol style="list-style-type: none"> <li>1. Check the condition and functionality.</li> <li>2. Contact an electrician, if necessary.</li> </ol>
Insulation resistance in the stator	<ol style="list-style-type: none"> <li>1. Check the insulation between:               <ul style="list-style-type: none"> <li>• Phase–phase on the stator</li> <li>• Phase–earth (ground)</li> </ul>               The insulation should be &gt; 1 megohm. Use a 1000-VDC megger to test the insulation.             </li> <li>2. If the resulting value is &lt; 1 megohm, then contact an authorized service shop.</li> </ol>

<sup>1</sup> Regardless of individual applications, the inspection volume should not be inspected less frequently than the intervals for normal applications and operating conditions at media (liquid) temperatures <40°C (104°F).

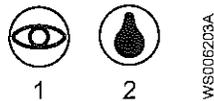
## Major overhaul

For a major overhaul, take this action in addition to the tasks listed under Inspection.

Service item	Action
Support and main bearing	Replace the bearings with new bearings.
Mechanical seal	Replace with new seal units.

## Change the oil

A paraffin oil with viscosity close to ISO VG32 is recommended. The pump is delivered from the factory with this type of oil. In applications where poisonous properties are of less concern, a mineral oil with viscosity up to ISO VG32 can be used.



1. Inspection screw
2. Oil screw

**Figure 6: Symbols**

## Empty the oil

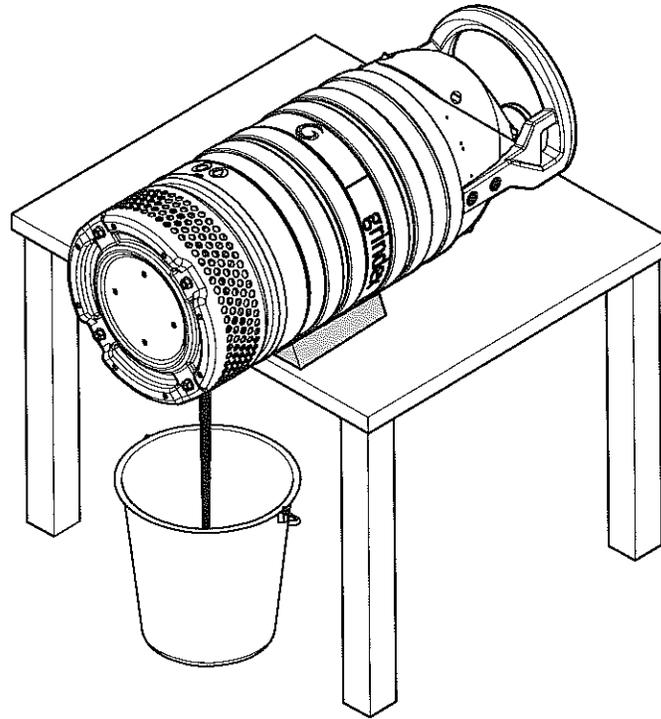
1. Lay the pump on its side.  
Lock the pump with supports to prevent it from rolling over.
2. Remove the oil screw.  
There are two oil screws. Either screw can be used for drainage, but it is easier to drain the oil if both oil screws are removed.



### **WARNING:**

The oil housing may be pressurized. Hold a rag over the oil plug to prevent oil from spraying out.

3. Turn the pump so that the oil hole faces downwards and let the oil run out.



WS006775A

### Fill with oil

1. Replace the oil screw O-ring.
2. Put one of the oil screws back and tighten it.
3. Turn the pump so that the oil hole faces upwards and fill with new oil.  
Fill until the oil level reaches the inlet hole.  
Quantity: 0.94 L (0.99 qt)
4. Put the oil screw back and tighten it.

### Replace the impeller

#### Remove the impeller N, H



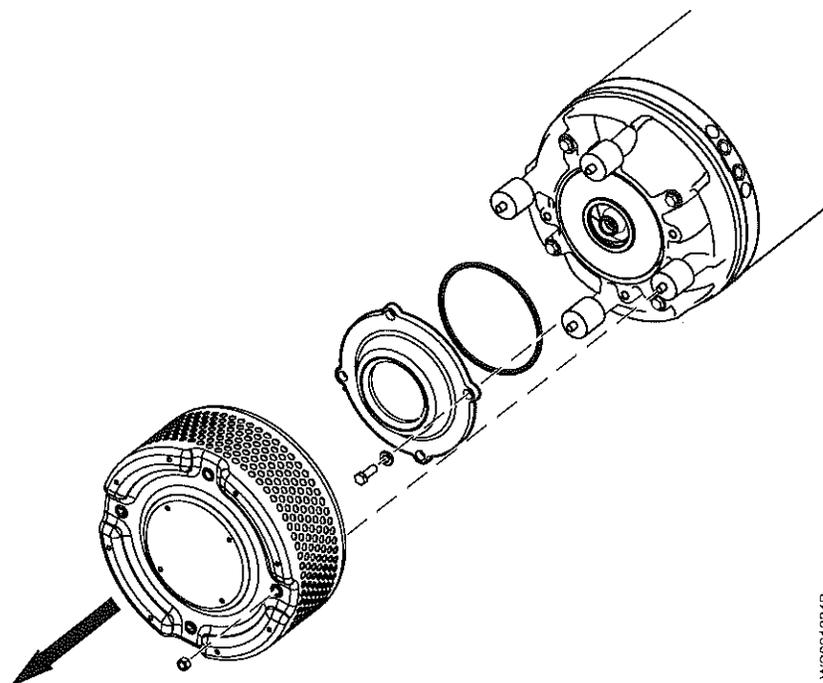
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**WARNING:**

A worn impeller and/or pump housing can have very sharp edges. Wear protective gloves.

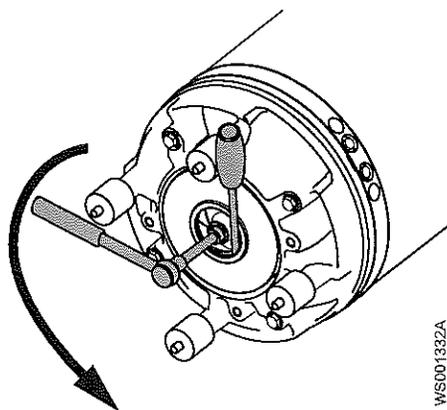
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1. Remove the strainer.



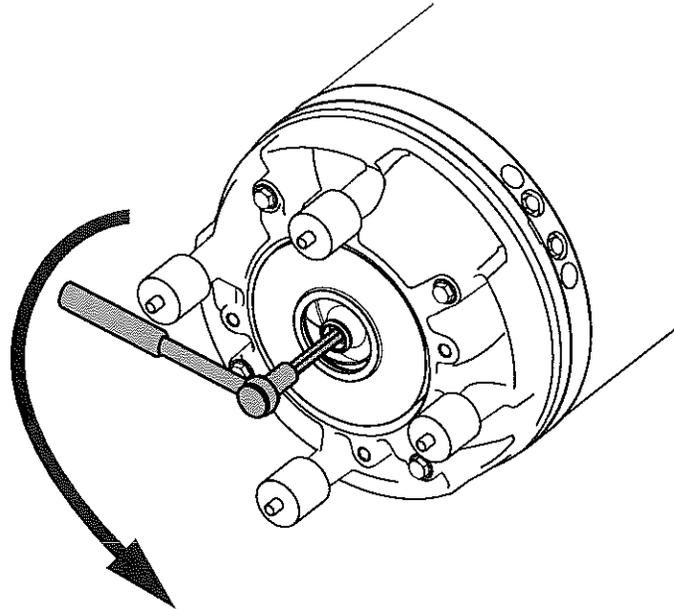
WS001334B

2. Remove the suction cover.
3. Remove the O-ring.
4. Loosen the impeller:
  - a) Lock the impeller to prevent rotation.  
Use pliers, a screwdriver, or similar.
  - b) Remove the impeller screw and washer.



WS001332A

5. Remove the impeller:
  - a) Lock the impeller to prevent rotation.  
Use pliers, a screwdriver, or similar.
  - b) Turn the adjustment screw counterclockwise until the impeller breaks free from the shaft.  
Use an 8 mm hexagon bit adapter (Allen socket).



WS001335B

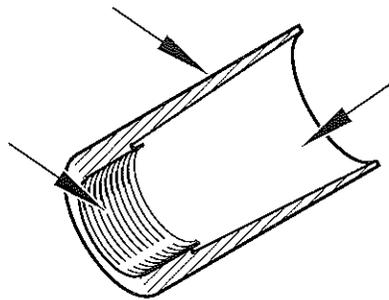
- c) Pull off the impeller.

## Install the impeller N, H

1. Prepare the shaft:
  - a) Polish off any flaws with a fine emery cloth.  
The end of the shaft must be clean and free from burrs.
  - b) Coat the inner conic, the outer cylindrical surfaces, and the thread of the conical sleeve with a thin layer of grease.  
The proper lubrication is grease for bearings, for example Exxon Mobil Unirex N3, Mobil Mobilith SHC 220 or equivalent.

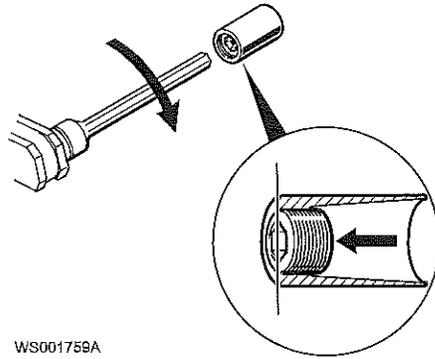
### **NOTICE:**

Surplus grease can cause the impeller to become loose. Remove surplus grease from conical and/or cylindrical surfaces of shafts and/or sleeves.



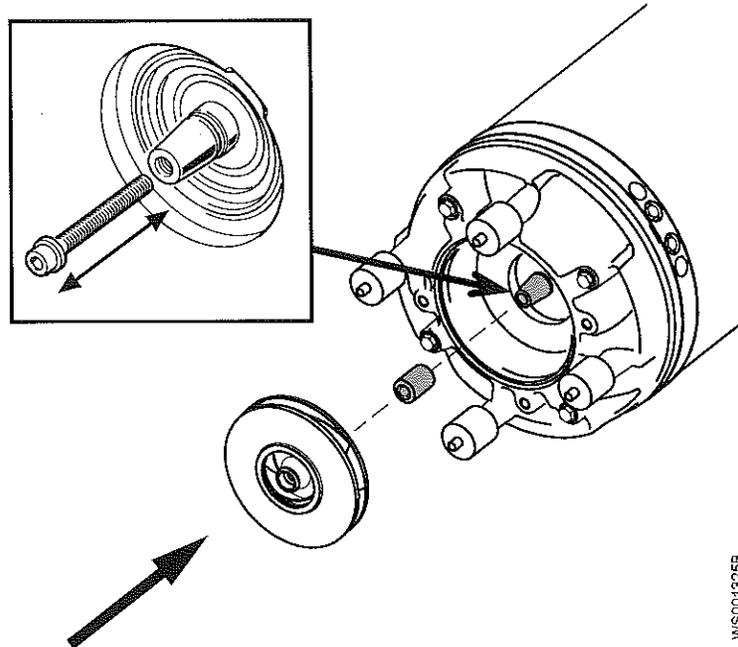
WS006895A

2. Align the edge of the adjustment screw with the edge of the conical sleeve so that they are flush.

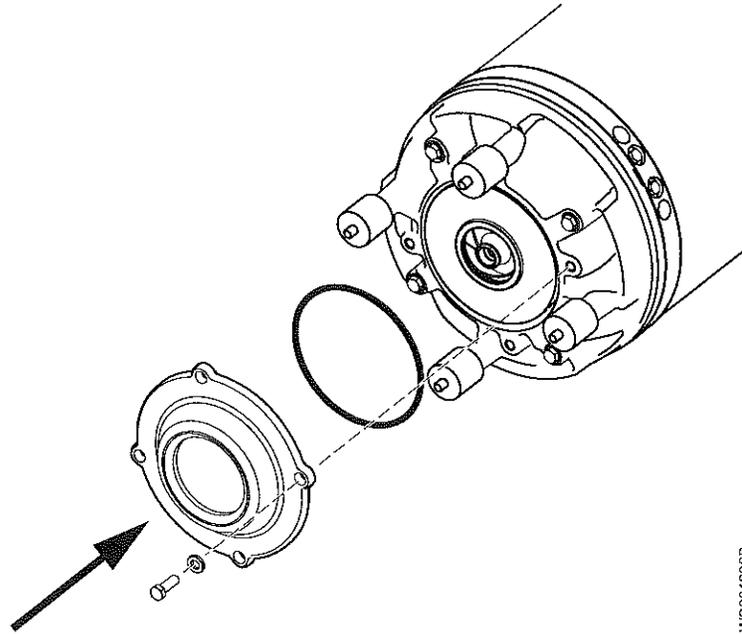


WS001759A

3. Grease the threads of the impeller screw and the washer.  
The proper lubrication of the screw and washer is lubricating grease for assembly of bolts etc., for example, Kluber ALTEMP Q NB 50 or equivalent.
4. Check that the impeller screw is clean and easy to screw into the shaft end.  
This is to prevent the shaft from rotating with the impeller screw.
5. Assemble the conical sleeve in the impeller.  
Make sure that the conical sleeve bottoms in the impeller.

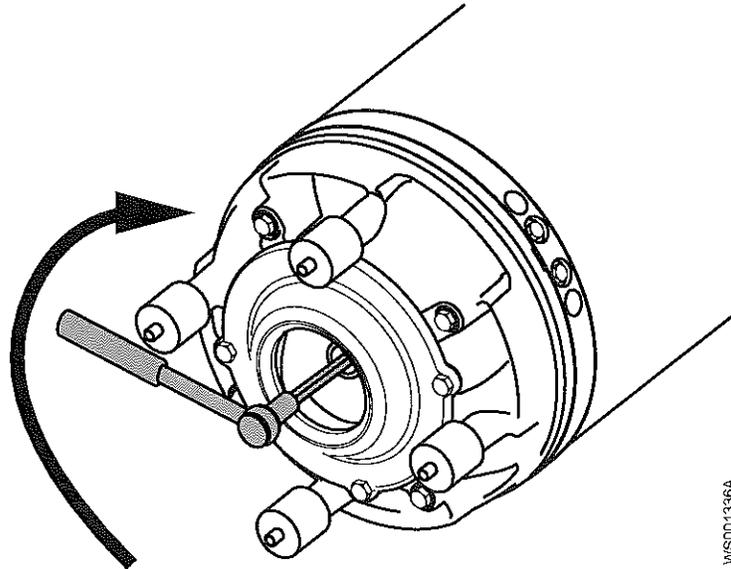


6. Assemble the impeller with the conical sleeve onto the shaft.  
Make sure that the conical sleeve bottoms in the impeller.
7. Mount the suction cover with its O-ring and tighten.  
Tightening torque: 44 Nm (32.5 ft-lbs)



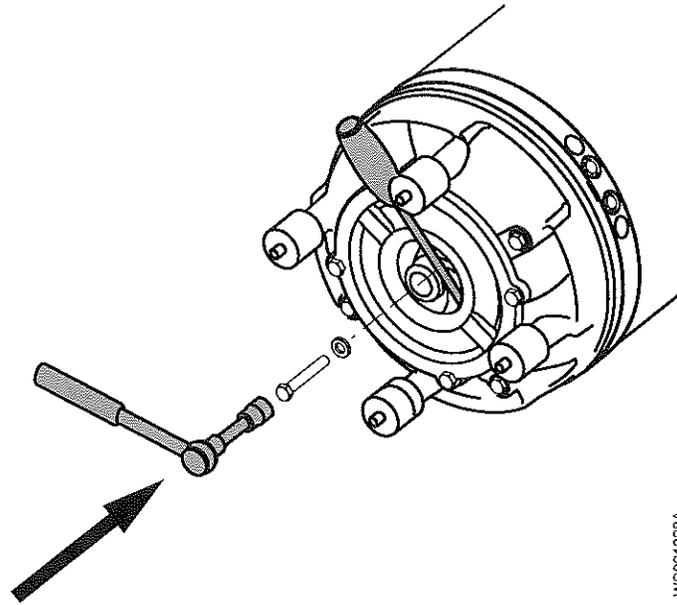
WS001330B

8. Turn the adjustment screw clockwise until the impeller makes contact with the suction cover. Tighten a further 1/8 turn, 45°. This will ensure the correct clearance between the impeller and the suction cover in the next step.  
Use an 8 mm hexagon bit adapter (Allen socket).



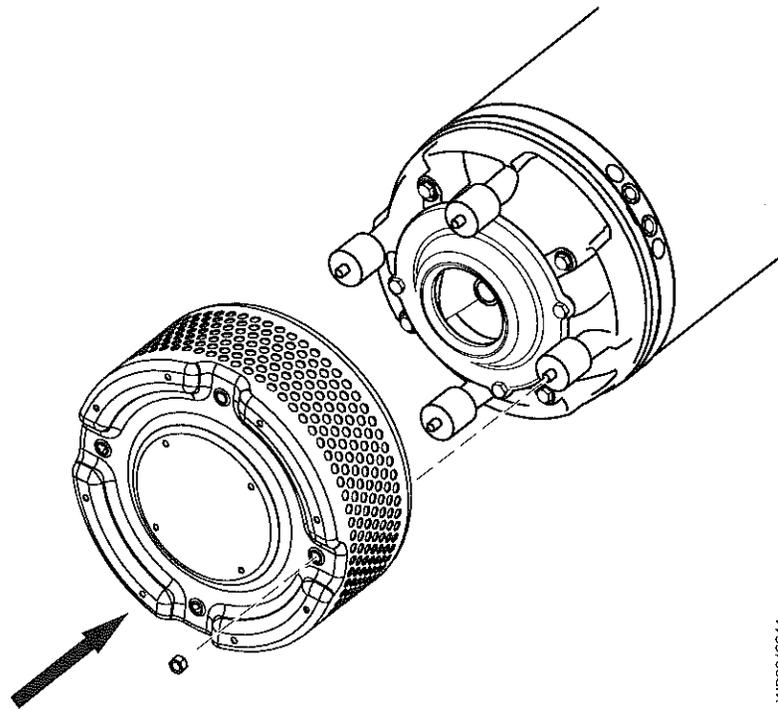
WS001336A

9. Fasten the impeller:
- Place the washer on the impeller screw.
  - Lock the impeller to prevent rotation.  
Use pliers, a screwdriver, or similar.
  - Tighten the impeller screw.  
Tightening torque: 22 Nm (16.2 ft-lbs)
  - Tighten a further 1/8 turn, 45°. The screw will be loaded to its yield point and the load capacity of the joint will be higher.
  - Check that the impeller can rotate easily.



WS001325A

10. Mount the strainer and the nuts.  
Tightening torque: 22 Nm (16.2 ft-lbs)



WS001331A

# Troubleshooting

## Introduction



---

**DANGER:**

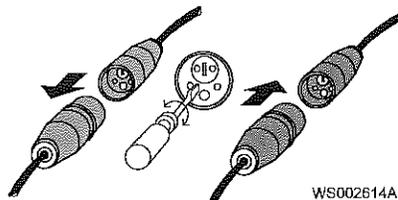
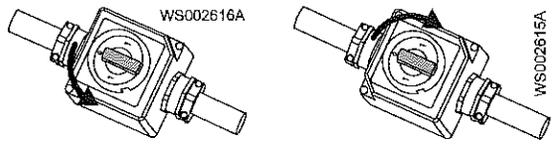
Personal injury hazard. Troubleshooting a live control panel exposes personnel to hazardous voltages. Electrical troubleshooting must be done by a qualified electrician. Failure to follow these instructions will result in serious personal injury, death, and/or property damage.

---

Follow these guidelines when troubleshooting the pump:

- Disconnect and lock out the power supply except when conducting checks that require voltage.
- Make sure that no one is near the pump when the power supply is reconnected.
- When troubleshooting electrical equipment, use the following:
  - Universal instrument multimeter
  - Test lamp (continuity tester)
  - Wiring diagram

## The pump does not start, for pumps with SMART™

Cause	Remedy
<p>The phase sequence may be incorrect.</p>	<ol style="list-style-type: none"> <li>1. Pull out the plug.</li> <li>2. Do one of the following:                             <ul style="list-style-type: none"> <li>• Shift two phases by turning two contact pins with a screwdriver.</li> </ul> </li> </ol> <p><b>NOTICE:</b> Do not take the plug apart.</p>  <p style="text-align: right;">WS002614A</p> <p><b>Figure 7: CEE plug</b></p> <ul style="list-style-type: none"> <li>• Turn the knob to the opposite position 1, with 8 seconds delay.</li> </ul> <p><b>NOTICE:</b> Do not reverse the phase sequence while the motor is running. Doing so may cause incorrect rotation resulting in damages to the motor electronics and the rotating parts. Respect the 8 seconds delay.</p>  <p style="text-align: center;">WS002616A      WS002615A</p> <p><b>Figure 8: Phase shifter On/Off switch</b></p> <ul style="list-style-type: none"> <li>• If no glove or phase shifter is used, then shift two phase conductors in the cabinet.</li> </ul>

If the problem persists, contact the local Grindex service shop. Always state the product number and the serial number of your pump when you contact Grindex, see *Product Description* (page 10).

## The pump does not start



**WARNING:**

Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

**NOTICE:**

Do NOT override the motor protection repeatedly if it has tripped. Doing so may result in equipment damage.

Cause	Remedy
An alarm signal has been triggered on the control panel.	Check that: <ul style="list-style-type: none"> <li>• The impeller rotates freely.</li> <li>• The sensor indicators do not indicate an alarm.</li> <li>• The overload protection is not tripped.</li> </ul> If the problem still persists: Contact the local Grindex service shop.
The pump does not start automatically, but can be started manually.	Check that: <ul style="list-style-type: none"> <li>• The start level regulator is functioning. Clean or replace if necessary.</li> <li>• All connections are intact.</li> <li>• The relay and contactor coils are intact.</li> <li>• The control switch (Man/Auto) makes contact in both positions.</li> </ul> Check the control circuit and functions.
The installation is not receiving voltage.	Check that: <ul style="list-style-type: none"> <li>• The main power switch is on.</li> <li>• There is control voltage to the start equipment.</li> <li>• The fuses are intact.</li> <li>• There is voltage in all phases of the supply line.</li> <li>• All fuses have power and that they are securely fastened to the fuse holders.</li> <li>• The overload protection is not tripped.</li> <li>• The motor cable is not damaged.</li> </ul>
The impeller is stuck.	Clean: <ul style="list-style-type: none"> <li>• The impeller</li> <li>• The sump in order to prevent the impeller from clogging again.</li> </ul>

If the problem persists, contact the local Grindex service shop. Always state the product number and the serial number of your pump when you contact Grindex, see *Product Description* (page 10).

## The pump does not stop when a level sensor is used



**WARNING:**

Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

Cause	Remedy
The pump is unable to empty the sump to the stop level.	Check that: <ul style="list-style-type: none"> <li>• There are no leaks from the piping and/or discharge connection.</li> <li>• The impeller is not clogged.</li> <li>• The non-return valve(s) are functioning properly.</li> <li>• The pump has adequate capacity. For information:                      Contact the local Grindex service shop.</li> </ul>

Cause	Remedy
There is a malfunction in the level-sensing equipment.	<ul style="list-style-type: none"> <li>• Clean the level regulators.</li> <li>• Check the functioning of the level regulators.</li> <li>• Check the contactor and the control circuit.</li> <li>• Replace all defective items.</li> </ul>
The stop level is set too low.	Raise the stop level.

If the problem persists, contact the local Grindex service shop. Always state the product number and the serial number of your pump when you contact Grindex, see *Product Description* (page 10).

## The pump starts-stops-starts in rapid sequence

Cause	Remedy
The pump starts due to back-flow which fills the sump to the start level again.	Check that: <ul style="list-style-type: none"> <li>• The distance between the start and stop levels is sufficient.</li> <li>• The non-return valve(s) work(s) properly.</li> <li>• The length of the discharge pipe between the pump and the first non-return valve is sufficiently short.</li> </ul>
The self-holding function of the contactor malfunctions.	Check: <ul style="list-style-type: none"> <li>• The contactor connections.</li> <li>• The voltage in the control circuit in relation to the rated voltages on the coil.</li> <li>• The functioning of the stop-level regulator.</li> <li>• Whether the voltage drop in the line at the starting surge causes the contactor's self-holding malfunction.</li> </ul>

If the problem persists, contact the local Grindex service shop. Always state the product number and the serial number of your pump when you contact Grindex, see *Product Description* (page 10).

## The pump runs but the motor protection trips



### WARNING:

Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

### NOTICE:

Do NOT override the motor protection repeatedly if it has tripped. Doing so may result in equipment damage.

Cause	Remedy
The motor protection is set too low.	Set the motor protection according to the data plate and if applicable the cable chart.
The impeller is difficult to rotate by hand.	<ul style="list-style-type: none"> <li>• Clean the impeller.</li> <li>• Clean out the sump.</li> <li>• Check that the impeller is properly trimmed.</li> </ul>

Cause	Remedy
The drive unit is not receiving full voltage on all three phases.	<ul style="list-style-type: none"> <li>• Check the fuses. Replace fuses that have tripped.</li> <li>• If the fuses are intact, notify a certified electrician.</li> </ul>
The phase currents vary, or they are too high.	Contact the local Grindex service shop.
The insulation between the phases and ground in the stator is defective.	<ol style="list-style-type: none"> <li>1. Use an insulation tester. With a 1000 V DC megger, check that the insulation between the phases and between any phase and ground is &gt; 5 megohms.</li> <li>2. If the insulation is less: Contact the local Grindex service shop.</li> </ol>
The density of the pumped fluid is too high.	<p>Make sure that the maximum density is 1100 kg/m<sup>3</sup> (9.2 lb/US gal)</p> <ul style="list-style-type: none"> <li>• Change to a more suitable pump.</li> <li>• Contact the local Grindex service shop.</li> </ul>
The ambient temperature exceeds the maximum ambient temperature.	The pump must not be used for such an application.
There is a malfunction in the overload protection.	Replace the overload protection.
The SMART™ motor protection may need to be reset.	<p>Try one of the following:</p> <ul style="list-style-type: none"> <li>• Reset the SMART™ motor protection by pulling and reinserting the power plug.</li> <li>• Or, disconnect and reconnect the power.</li> </ul> <div style="display: flex; align-items: center; justify-content: center;">  </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;">  <div style="margin-left: 20px;"> <p><b>WARNING:</b> The pump will restart automatically after a corrected phase fault or power cut.</p> </div> </div>

If the problem persists, contact the local Grindex service shop. Always state the product number and the serial number of your pump when you contact Grindex, see *Product Description* (page 10).

## The pump delivers too little or no water



**WARNING:**

Always disconnect and lock out power before servicing to prevent unexpected startup. Failure to do so could result in death or serious injury.

**NOTICE:**

Do NOT override the motor protection repeatedly if it has tripped. Doing so may result in equipment damage.

Cause	Remedy
The impeller rotates in the wrong direction.	<ul style="list-style-type: none"> <li>• If it is a 3-phase pump without SMART™, transpose two phase leads.</li> <li>• If it is a 3-phase pump with SMART™, correct the internal wiring.</li> <li>• If it is a 1-phase pump: Contact the local Grindex service shop.</li> </ul>
One or more of the valves are set in the wrong positions.	<ul style="list-style-type: none"> <li>• Reset the valves that are set in the wrong position.</li> <li>• Replace the valves, if necessary.</li> <li>• Check that all valves are correctly installed according to media flow.</li> <li>• Check that all valves open correctly.</li> </ul>
The impeller is difficult to rotate by hand.	<ul style="list-style-type: none"> <li>• Clean the impeller.</li> <li>• Clean out the sump.</li> <li>• Check that the impeller is properly trimmed.</li> </ul>
The pipes are obstructed.	Clean out the pipes to ensure a free flow.
The pipes and joints leak.	Find the leaks and seal them.
There are signs of wear on the impeller, pump, and casing.	Replace the worn parts.
The liquid level is too low.	<ul style="list-style-type: none"> <li>• Check that the level sensor is set correctly.</li> <li>• Depending on the installation type, add a means for priming the pump, such as a foot valve.</li> </ul>

If the problem persists, contact the local Grindex service shop. Always state the product number and the serial number of your pump when you contact Grindex, see *Product Description* (page 10).

# Technical Reference

## Application limits

Data	Description
Media (liquid) temperature	Maximum temperature 40°C (104°F)
pH of the pumped media (liquid)	5–8
Media (liquid) density	Maximum density: 1100 kg/m <sup>3</sup> (9.2 lb. per US gal.)
Depth of immersion	20 m (65 ft.)
Other	For specific weight, current, voltage, power rating, and speed of the pump, see the data plate on the pump. For starting current, see <i>Motor data</i> (page 44). For other applications, contact the nearest Grindex representative for information.

## Motor data

Feature	Description
Motor type	Squirrel-cage induction motor
Frequency	Standard version: 50 or 60 Hz MSHA version: 60 Hz
Supply	3-phase
Starting method	Direct on-line
Maximum starts per hour	30 evenly spaced starts per hour
Code compliance	IEC 60034-1
Rated output variation	±10%
Voltage variation without overheating	±10%, provided that it does not run continuously at full load
Voltage imbalance tolerance	2%
Maximum frequency variation (for pumps with SMART™)	±3 Hz
Stator insulation class	H (180°C [360°F])

## Specific motor data, standard version

**3-phase, 50 Hz**

Motor type:

- 2,895 rpm
- Rated output 5.6 kW (7.5 hp)
- Maximum power consumption 6.6 kW (8.9 hp)

Voltage, V	Rated current, A	Starting current, A	Power factor, cos $\phi$
220 D	19	123	0.93
230 D	19	129	0.9
240 D	19	135	0.85
380 D	11	73	0.92
380 Y	11	71	0.9
400 D	11	78	0.87
400 Y	11	75	0.89
415 D	10	67	0.92
440 D	10	71	0.86
500 D	8.7	59	0.89
500 Y	8.6	53	0.9

**3-phase, 60 Hz**

Motor type:

- 3,470 rpm
- Rated output 6.6 kW (8.9 hp)
- Maximum power consumption 7.7 kW (10.3 hp)

Voltage, V	Rated current, A	Starting current, A	Power factor, cos $\phi$
200 D	24	185	0.91
208 D	24	194	0.88
220 D	22	159	0.93
220 D parallel	22	154	0.91
220 Y parallel	22	158	0.92
230 D	21	167	0.9
230 D parallel	21	167	0.9
230 Y parallel	22	166	0.89
240 D	21	175	0.86
240 Y parallel	22	174	0.85
380 Y parallel	13	92	0.93
400 Y parallel	13	94	0.88
440 D	11	80	0.93
460 D	11	84	0.9
480 D	11	88	0.86
575 D	8.5	64	0.91

Voltage, V	Rated current, A	Starting current, A	Power factor, $\cos \phi$
575 Y	8.4	58	0.92
600 D	8.5	67	0.88
600 Y	8.4	61	0.88

## Specific motor data, MSHA version

### 3-phase, 60 Hz

Motor type:

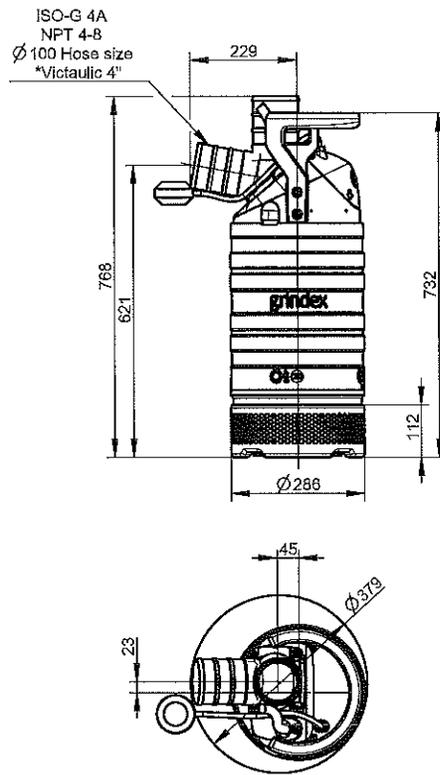
- 3,490 rpm
- Rated output 6.6 kW (8.85 hp)
- Maximum power consumption 7.7 kW

Voltage (V)	Rated current (A)	Starting current (A)
440 Y	11	75
460 Y	11	79
480 Y	11	83
575 Y	8.4	58
600 Y	8.4	61

## Dimensions and weights

All measurements in the illustrations are in millimeters, if not otherwise specified.

Standard version

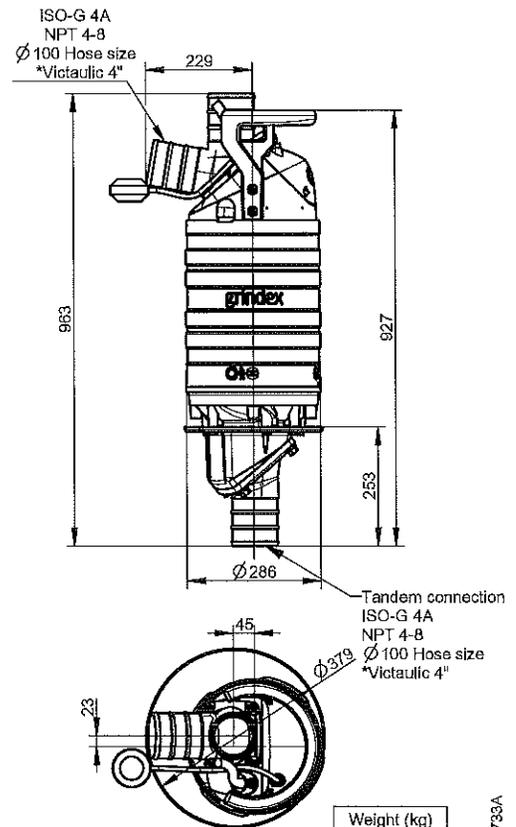


\*Designed for "Victaulic Coupling, according to ANSI/AWWA C606-97 SCREEN OPENING Ø10

Weight (kg)
Total
50

Figure 9: N

WS006731A

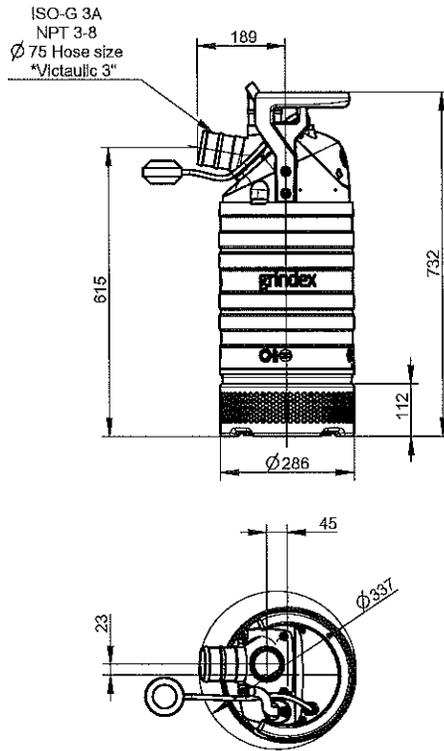


\*Designed for "Victaulic Coupling, according to ANSI/AWWA C608-97

Weight (kg)
Total
52.3

Figure 10: N, tandem

WS006733A



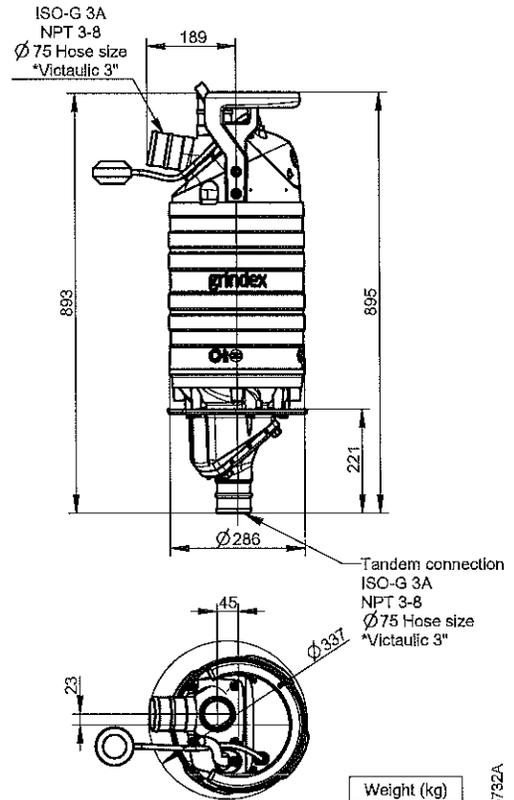
\*Designed for "Victaulic Coupling, according to ANSI/AWWA C606-97

SCREEN OPENING  $\varnothing 10$

Weight (kg)
Total
50

WSD06730A

Figure 11: H



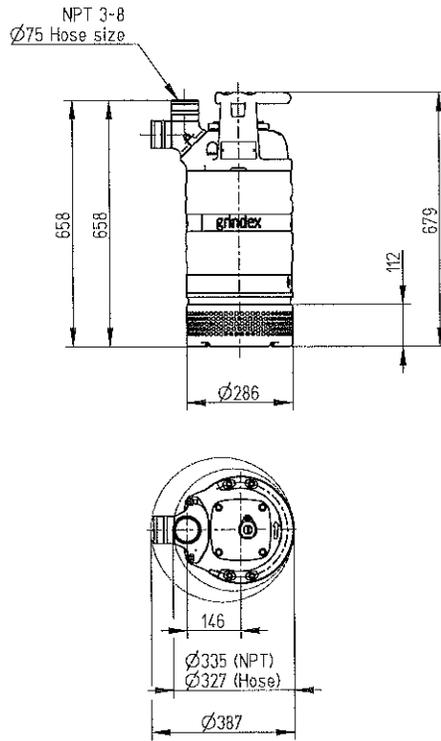
\*Designed for "Victaulic Coupling, according to ANSI/AWWA C606-97

Weight (kg)
Total
52.3

WSD06732A

Figure 12: H, tandem

**MSHA version**



\*\*Totalweight 8103: 49kg  
 Totalweight 8104: 51kg  
 Screen opening Ø10

Weight (kg)
Total
**

**Figure 13: MSHA version**

**Performance curves**

**Test standard**

Pumps are tested in accordance with ISO 9906:2012, HI 11.6:2012.

**Standard pump version**

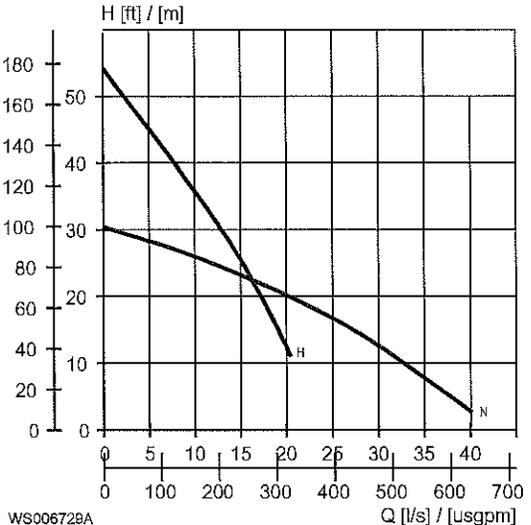
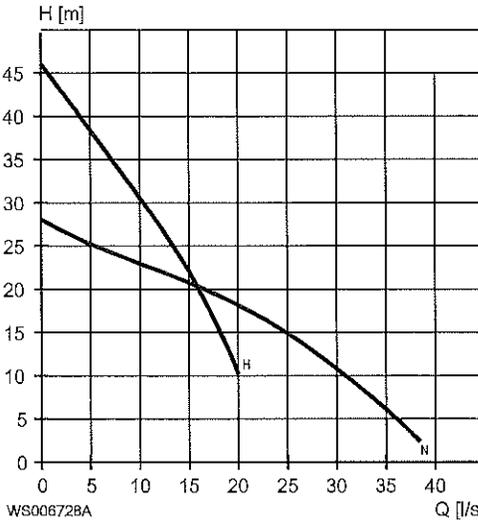
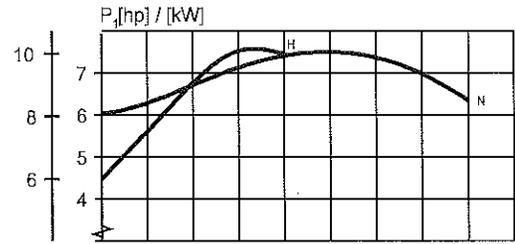
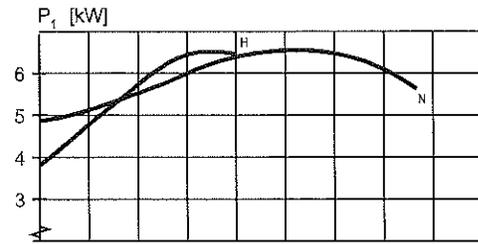
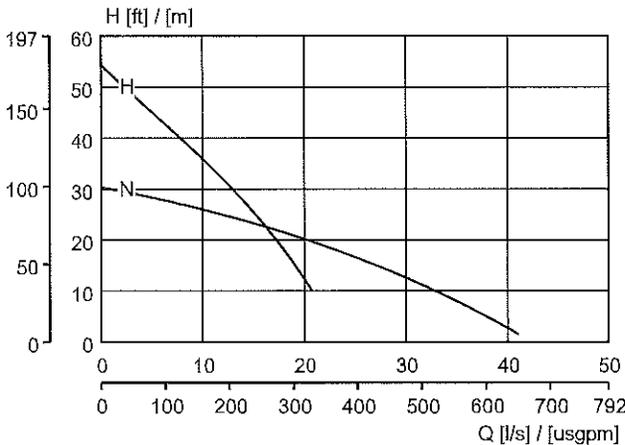
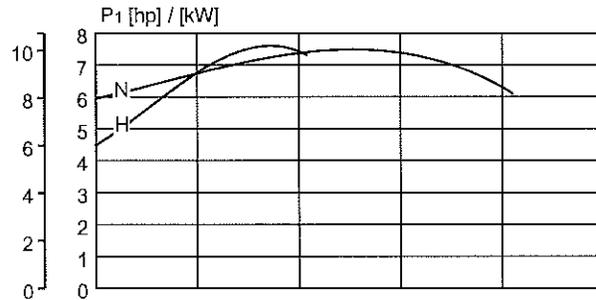


Figure 14: 50 Hz

Figure 15: 60 Hz

**MSHA pump version, 60 Hz**



WS006377A

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Grindex  
Gesällvägen 33  
174 87 Sundbyberg  
Sweden  
Tel: +46-8-606 66 00  
Fax: +46-8-745 53 28  
www.grindex.com

Visit our Web site for the latest version of this document  
and more information

The original instruction is in English. All non-English  
instructions are translations of the original instruction.

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Technical  
specification



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## ENM-10 Level regulator

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**FLYGT**  
a xylem brand

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# PRODUCT DESCRIPTION

## Product description

The simplest possible method for level control! A mechanical switch in a plastic casing, freely suspended at the desired height from its own cable. When the liquid level reaches the regulator, the casing will tilt and the mechanical switch will close or break the circuit, thereby starting or stopping a pump or actuating an alarm device. No wear, no maintenance! In sewage pumping stations, for ground water and drainage pumping – in fact, for most level control applications – the ENM-10 is the ideal solution.

The regulator casing is made of polypropylene and the cable is sheathed with a special PVC or Nitrile/PVC rubber compound. The plastic components are welded and screwed together. Adhesive is never used. Impurities and deposits will not adhere to the smooth casing.

This level regulator is available in different versions, depending upon the medium in which it is to be used. As standard, the regulator can be obtained with 6, 13, 20, 30 or 50 metres (20, 42, 65, 100 or 167 feet) of cable for liquids with specific density between 0.95 and 1.10 g/cm<sup>3</sup>; for other specific densities and for the Ex-version, the regulator is only available with 20 metres (65 ft) of cable. The regulator can withstand up to 60°C (140°F).

## Technical data

<b>Liquid temperature:</b>	min. 0°C (32°F) max. 60°C (140°F)
<b>Liquid density:</b>	min. 0.65 g/cm <sup>3</sup> max. 1.5 g/cm <sup>3</sup>
<b>Degree of protection:</b>	IP68, 20 m (65 ft)
<b>Interrupting capacity of micro switch:</b>	AC, resistive load, 250V 10A AC, inductive load, 250V 3A cos $\phi$ = 0.5 DC, 30V 5A
<b>With gold plated micro switch:</b>	same as above, except: DC, 24V 10mA

Note that local regulations may limit the voltage.

## Materials

Body:	Body:
Bending relief:	EPDM rubber
Cable:	special compound PVC or NBR/PVC nitrile/PVC rubber

## Dimensions

**Table 1**

For density g/cm <sup>3</sup>	Regulator length mm (in.)	Diameter mm (in.)
0.65–0.80	194 (7 10/16)	100 (4)
0.80–0.95	177 (7)	100 (4)
0.95–1.10	162 (6 3/8)	100 (4)
1.05–1.20	142 (5 9/16)	100 (4)
1.20–1.30	133 (5 1/4)	100 (4)

For density g/cm <sup>3</sup>	Regulator length mm (in.)	Diameter mm (in.)
1.30-1.40	130 (5 2/16)	100 (4)
1.40-1.50	126 (5)	100 (4)

**Weight:** approx. 2 kg (4.5 lb) for a standard density regulator with 20 m cable.

**Approvals:** CE, CSA, SEMKO, NEMKO, DEMKO

**LVD approval** according to EN61058

**CSA approval:** Cert no. 1330172

Cl.I Zone 0, Gr. IIC;

CL.I Div.1 Gr A, B, C&D;

Cl.II Gr. E, F&G;

Cl.III when installed to the certified Intrinsically Safe relay, Ex ia, rated for the locations per submitter controll drawing and installation manual.

Intrinsically safe circuits are required for the automatic control system. - Use a EX-safety barrier (e.g. Prod. no. 84 01 07).



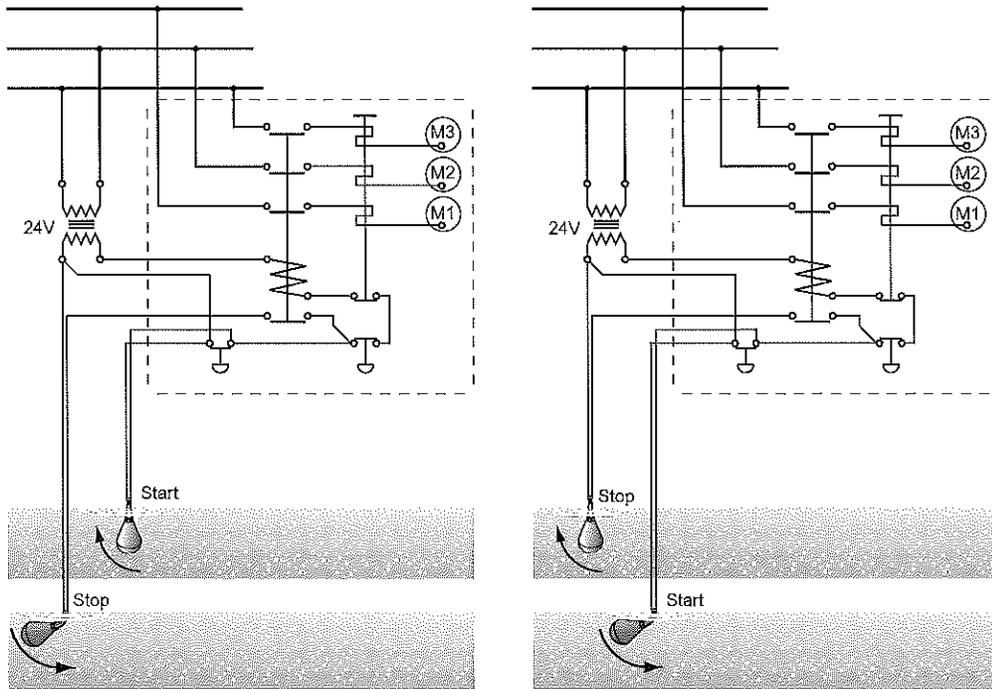
Figure 1

**Wiring alternative**

To conform to local regulations, the level regulators are normally connected through a transformer to a low-tension control circuit.

Two regulators are used; one for starting and one for stopping. A third regulator can be connected if an alarm is required at a given level.

Identical regulators can be used for all functions.



Connect the gray and black leads.

Connect the gray and brown leads.

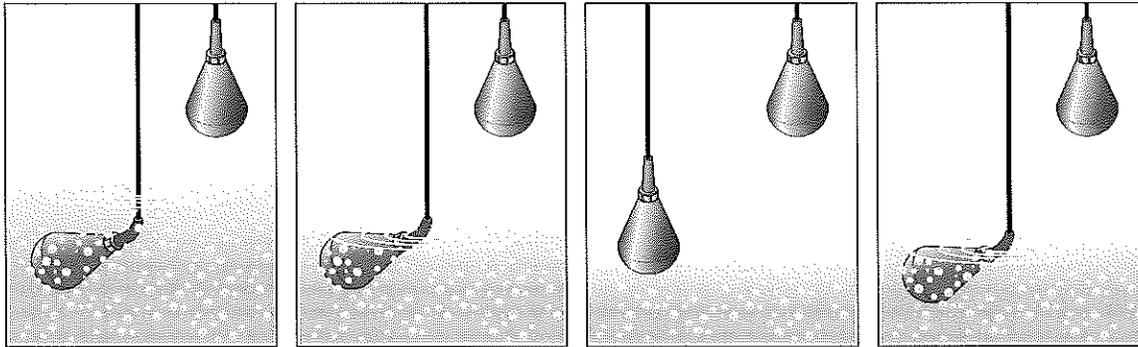
PRODUCT DESCRIPTION

Insulate the brown lead.

Figure 2: Connected for emptying

Insulate the black lead.

Figure 3: Connected for emptying

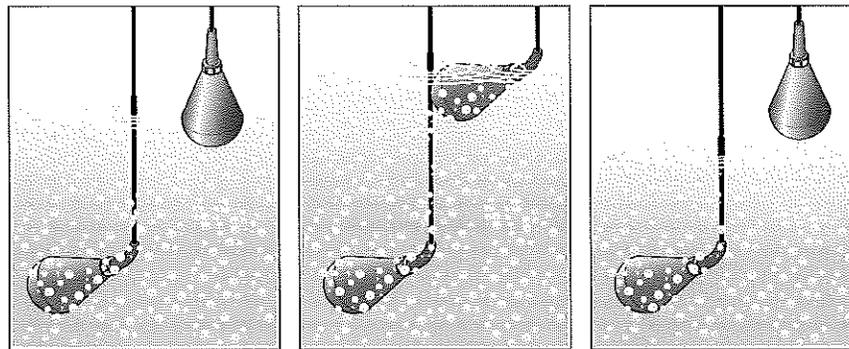


Let the level drop . . .

. . . to the lowest permissible point.

The regulator will then react . . .

. . . so the process is reversed.



At the highest permissible point . . .

. . . level regulator II reacts . . .

. . . in the opposite fashion.

Figure 4

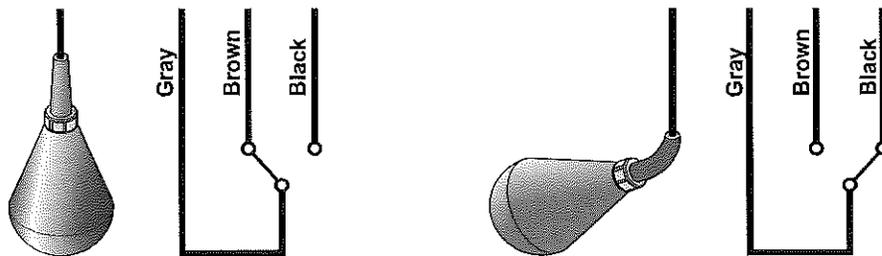


Figure 5: Colour code

Maintenance and repair

ENM-10 is very durable and practically maintenance free. You only have to check on it occasionally, to ensure its continual operation.

- It is recommended to occasionally clean ENM-10, and especially when fat/grease covers the plastic surface.
- At the same time, make an ocular inspection of the regulator to make sure neither cable, protective sleeve or plastic casing show any signs of damage.

- A damaged ENM-10 cannot be repaired in any way, due to the hermetic encapsulation. If the unit is found to be damaged, replace it with a new one.
- For Ex-installations, also make absolutely sure that the Ex-barrier (e.g. Prod. no. 84 01 07) is operating correctly - The LED changes when the switch is toggled.

The manufacturers reserve the right to alter performance specification or design without notice.

# CHEMICAL RESISTANCE LIST

## Chemical resistance list

The liquid in which level regulation is practiced most frequently is, of course, water. Of the millions of regulators in use all over the world today, it is estimated that nine out of ten work in water.

However, with a float body of polypropylene, a cable of PVC or NBR/PVC nitrile/PVC rubber and a bending relief of EPDM rubber, the ENM-10 is virtually insensitive to many aggressive liquids.

The table shows how resistant the ENM-10 equipped with either PVC or NBR/PVC nitrile/PVC rubber cable, is to different chemicals at two different temperatures.

The classification is broken down into the following categories:

0 = No effect, 1 = Minor to moderate and 2 = Severe effect. The sign – means that information is not available.

Keep in mind also that the density of the liquid determines the buoyancy of the regulator. The ENM-10 is made for seven different densities. See Product description (page 2).

Always observe local regulations:

Take particular note of:

- risk of fire/explosion
- hygiene requirements

Acids	PVC cable		NBR/PVC nitrile/PVC rubber cable		Salts	PVC cable		NBR/PVC nitrile/PVC rubber cable		Solvents and miscellaneous	PVC cable		NBR/PVC nitrile/PVC rubber cable	
	20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)		20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)		20°C (68°F)	60°C (140°F)	20°C (68°F)	60°C (140°F)
Acetic Acid 50%	1	2	0	0	Aluminium Chloride	0	0	0	0	Aceton	2	2	2	2
Acetic Acid 75%	2	2	0	0	Calcium Sulphate	0	0	0	0	Aniline	2	2	1	2
Benzoic Acid	2	2	0	0	Calcium Chloride	0	0	0	0	Benzene	2	2	2	2
Boric Acid 5%	0	—	0	0	Calcium Nitrate	0	0	0	0	Butyl Alcohol	2	2	0	1
Butyric Acid	2	2	2	2	Copper Chloride	0	0	0	0	Carbon Tetrachloride	2	2	2	2
Chromic Acid 10%	0	2	2	2	Copper Sulphate	0	0	0	0	Chlorobenzene	2	2	2	2
Citric Acid	0	1	0	0	Ferric Chloride	0	0	0	0	Chloroform	2	2	2	2
Hydrobromic Acid 5%	1	2	0	0	Ferrous Sulphate	0	0	0	0	Ethyl Alcohol	2	2	0	1
Hydrochloric Acid 10%	0	1	0	1	Magnesium Chloride	0	0	0	0	Ethyl Ether	2	2	2	2
Hydrochloric Acid 37%	1	2	0	2	Potassium Sulphate	0	0	0	0	Ethyl Acetate	2	2	2	2
Hydrocyanic Acid 10%	0	0	1	2	Potassium Nitrate	0	0	0	0	Ethylene Dichloride	2	2	2	2
Hydrofluoric Acid 5%	0	2	0	1	Potassium Carbonate	1	1	1	1	Ethylene Chloride	2	2	2	2
Hypochloric Acid	1	2	2	2	Potassium Bicarbonate	0	0	0	0	Formaldehyde 37%	1	2	0	0
Maleic Acid	2	2	2	2	Sodium Sulphate	0	0	0	0	Gasoline	2	2	2	2
Nitric Acid 5%	1	1	1	1	Sodium Chloride	0	0	0	0	Kerosene	2	2	2	2
Nitric Acid 65%	2	2	2	2	Sodium Nitrate	0	0	0	0	Methyl Alcohol	2	2	0	0
Oleic Acid	1	2	2	2	Sodium Bicarbonate	0	0	0	0	Methyl Ethyl Ketone	2	2	2	2
Oxalic Acid 50%	1	1	1	2	Sodium Carbonate	0	0	0	0	Methylene Chloride	2	2	2	2
Phosphoric Acid 25%	0	0	1	2	Tin Chloride	1	1	1	1	Nitrobenzene	2	2	2	2
Phosphoric Acid 85%	0	0	1	2	Zinc Sulphate	0	0	0	0	Phenol	2	2	2	2
Sulphuric Acid 10%	1	2	1	2	Zinc Chloride	0	0	0	0	Toluene	2	2	2	2
Sulphuric Acid 78%	2	2	2	2						Trichlorethylene	2	2	2	2
Tannic Acid	0	0	0	0	Oils					Turpentine	2	2	2	2
Tartaric Acid	1	1	1	1	Castor Oil	1	1	1	1	Xylene	2	2	2	2
					Cocoonut Oil	0	—	0	2	Gases				
					Corn Oil	2	2	2	2	Carbon Dioxide	0	0	0	0
					Diesel Oil	2	2	2	2	Carbon Monoxide	0	0	0	0
					Linseed Oil	2	2	2	2	Chlorine (wet)	2	2	2	2
					Mineral Oils	2	2	2	2	Hydrogen Sulphide	0	0	1	1
					Olive Oil	1	1	1	1	Sulphur Dioxide (wet)	1	1	2	2
					Silicone Oils	0	0	0	0					
Bases														
Ammonium Hydroxide	0	—	0	0										
Calcium Hydroxide	0	0	0	0										
Potassium Hydroxide	1	2	0	0										
Sodium Hydroxide	1	2	0	0										

0 = No effect, 1 = Minor to moderate, 2 = Severe effect. — = No information available.

Figure 6

PRODUCT RANGE

# PRODUCT RANGE

## Product range

Part no.	For density [g/cm <sup>3</sup> ]	Color of level switch	Type of cable	Cable length [m]	Approvals	For market	Notes
5828800	0,65-0,80	Blue	1	20	CE		
5828801	0,80-0,95	Blue	1	20	CE		
5828802	0,95-1,10	Blue	1	6	CE		
5828803	0,95-1,10	Blue	1	13	CE		
5828804	0,95-1,10	Blue	1	20	CE		
5828805	1,05-1,20	Blue	1	20	CE		
5828806	1,2-1,3	Blue	1	20	CE		
5828807	1,3-1,4	Blue	1	20	CE		
5828808	1,4-1,5	Blue	1	20	CE		
5828809	0,65-0,80	Grey	5	20	CSA/CE	Canada	
5828810	0,80-0,95	Grey	5	20	CSA/CE	Canada	
5828811	0,95-1,10	Grey	5	6	CSA/CE	Canada	
5828812	0,95-1,10	Grey	5	13	CSA/CE	Canada	
5828813	0,95-1,10	Grey	5	20	CSA/CE	Canada	
5828814	1,05-1,20	Grey	5	20	CSA/CE	Canada	
5828815	1,2-1,3	Grey	5	20	CSA/CE	Canada	
5828816	1,3-1,4	Grey	5	20	CSA/CE	Canada	
5828817	1,4-1,5	Grey	5	20	CSA/CE	Canada	
5828818	0,65-0,80	Grey	1	20	CSA/CE	Canada	
5828819	0,80-0,95	Grey	1	20	CSA/CE	Canada	
5828820	0,95-1,10	Grey	1	6	CSA/CE	Canada	
5828821	0,95-1,10	Grey	1	13	CSA/CE	Canada	
5828822	0,95-1,10	Grey	1	20	CSA/CE	Canada	
5828823	1,05-1,20	Grey	1	20	CSA/CE	Canada	
5828824	1,2-1,3	Grey	1	20	CSA/CE	Canada	
5828825	1,3-1,4	Grey	1	20	CSA/CE	Canada	
5828826	1,4-1,5	Grey	1	20	CSA/CE	Canada	
5828827	0,65-0,80	Blue	2	20	CE	USA	
5828828	0,80-0,95	Blue	2	20	CE	USA	
5828829	0,95-1,10	Blue	2	6	CE	USA	
5828830	0,95-1,10	Blue	2	13	CE	USA	
5828831	0,95-1,10	Blue	2	20	CE	USA	
5828832	1,05-1,20	Blue	2	20	CE	USA	
5828833	1,2-1,3	Blue	2	20	CE	USA	
5828834	1,3-1,4	Blue	2	20	CE	USA	
5828835	1,4-1,5	Blue	2	20	CE	USA	
5828836	0,95-1,10	Grey	5	30	CSA/CE	Canada	
5828837	0,95-1,10	Grey	5	50	CSA/CE	Canada	
5828838	0,95-1,10	Grey	5	100	CSA/CE	Canada	
5828839	0,95-1,10	Grey	5	150	CSA/CE	Canada	
5828851	0,95-1,10	Red	3	65	CE		
5828852	0,95-1,10	Red	3	6	CE		
5828853	0,95-1,10	Red	3	13	CE		
5828854	0,95-1,10	Red	3	20	CE		
5828855	0,95-1,10	Red	3	6	CSA/CE	Canada	
5828856	0,95-1,10	Red	3	13	CSA/CE	Canada	
5828857	0,95-1,10	Red	3	20	CSA/CE	Canada	

Cont. 

Figure 7

5828858	0,95-1,10	Red	4	6	CE	USA
5828859	0,95-1,10	Red	4	13	CE	USA
5828860	0,95-1,10	Red	4	20	CE	USA
5828870	0,65-0,80	Blue	5	20	CE	
5828871	0,80-0,95	Blue	5	20	CE	
5828872	0,95-1,10	Blue	5	6	CE	
5828873	0,95-1,10	Blue	5	13	CE	
5828874	0,95-1,10	Blue	5	20	CE	
5828875	1,05-1,20	Blue	5	20	CE	
5828876	1,2-1,3	Blue	5	20	CE	
5828877	1,3-1,4	Blue	5	20	CE	
5828878	1,4-1,5	Blue	5	20	CE	
5828879	0,95-1,10	Blue	1	65	CE	
5828880	0,95-1,10	Blue	1	30	CE	
5828881	0,95-1,10	Blue	1	50	CE	
5828882	0,95-1,10	Grey	1	30	CSA/CE	Canada
5828883	0,95-1,10	Grey	1	50	CSA/CE	Canada
5828884	0,95-1,10	Blue	2	30	CE	USA
5828885	0,95-1,10	Blue	2	50	CE	USA
5828886	0,95-1,10	Red	3	30	CE	
5828887	0,95-1,10	Red	3	50	CE	
5828890	0,95-1,10	Blue	5	30	CE	
5828891	0,95-1,10	Blue	5	50	CE	
5828892	0,95-1,10	Red	3	6	CE	Japan
5828893	0,95-1,10	Red	3	13	CE	Japan
5828894	0,95-1,10	Red	3	20	CE	Japan
5828895	0,95-1,10	Blue	1	6	CE	Japan
5828896	0,95-1,10	Blue	1	13	CE	Japan
5828897	0,95-1,10	Blue	1	20	CE	Japan
5828898	0,95-1,10	Blue	1	50	CE	Japan
5947919	0,95-1,10	Blue	5	20	CE	Designed for low current and slow movements
5947920	0,95-1,10	Grey	5	20	CSA/CE	Designed for low current and slow movements

Type of cable:

1. Blue PVC jacket with color coding of wires: Grey/Brown/Black
2. Blue PVC jacket with color coding of wires: Red/White/Black
3. Red PVC jacket with color coding of wires: Grey/Brown/Black
4. Red PVC jacket with color coding of wires: Red/White/Black
5. BLACK NBR/PVC jacket with color coding of wires: Grey/Brown/Black (NBR=Nitrile rubber)

# Xylem |'zīləm|

- 1) The tissue in plants that brings water upward from the roots
- 2) A leading global water technology company

We're 12,000 people unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to [xylem.com](http://xylem.com)



Xylem Water Solutions AB  
Gesällvägen 33  
174 87 Sundbyberg  
Sweden  
Tel. +46-8-475 60 00  
Fax +46-8-475 69 00  
<http://tpi.xylem.com>

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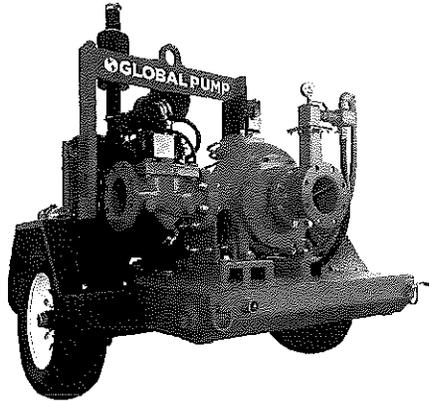
The original instruction is in English. All non-English instructions are translations of the original instruction.

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# GLOBAL PUMP®

A MERSINO COMPANY

## 6GST GLOBAL STANDARD TRASH



Global Pump® Standard Trash pumps are specifically designed to effectively handle a wide range of liquids from water to sewage and sludge that can contain solids and other material.

Global Pump Standard Trash pumps provide a dependable, highly efficient solution. The model 6GST is capable of achieving maximum flows of 3,000 gpm (681 m<sup>3</sup>/h) and maximum total head of 202' (61.6 m) while handling solids up to 3" (76.2 mm) in diameter.

The standard 6GST is powered by a water-cooled, 4-cylinder diesel engine. Alternative drives are available including natural gas as well as electric motors.

### FEATURES

Global Pump's rugged, heavy duty pumps are engineered specifically for portable application

Non-return valve uses only a single moving part to allow with minimal restriction

Standard engine control panel provides preset emergency shutdown protection and allows the addition of automatic level control

Fully guarded coupling

Pump casings are hydrostatically tested to 50 psig (345 kPa) above the peak casing design pressure

Highway trailer with integral fuel cell/chassis, lights, fenders, tie downs, lifting bail, front and rear jacks. Trailer brakes can be offered as required

### OPTIONS

Available with a variety of priming systems, including Global's Auto Prime® automatic priming system (compressor-fed venturi priming) or a diaphragm priming system

Mechanical seal with glycol (biodegradable optional) quench allows the pump to start and run dry

Global Pump's Environmental Box separates and silences air exhaust and returns liquid to the pump suction.

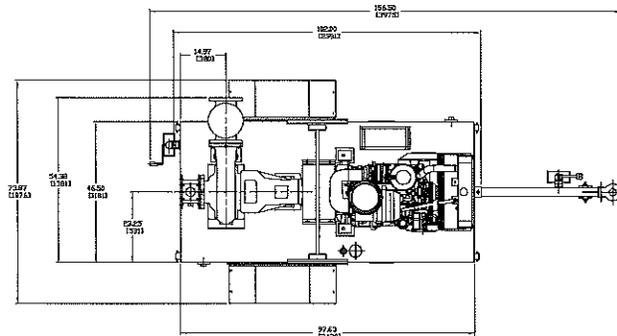
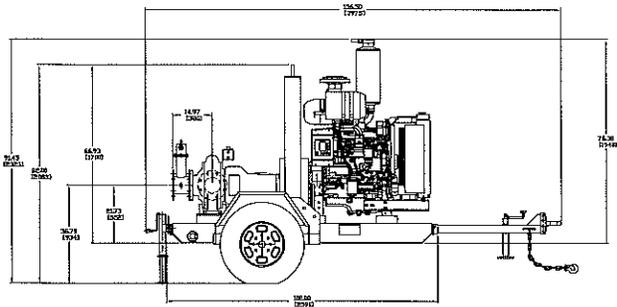
Fuel cubes for extended run times and/or remote location as required

Sound attenuated enclosure options

Skid-mounted formats with tie downs, lifting bail, and fork pockets

Hose racks, accessory containers and other custom features available as required

Wide range of suction and discharge fittings including Global Pump's own "QD" Quick Disconnect fittings and accessories

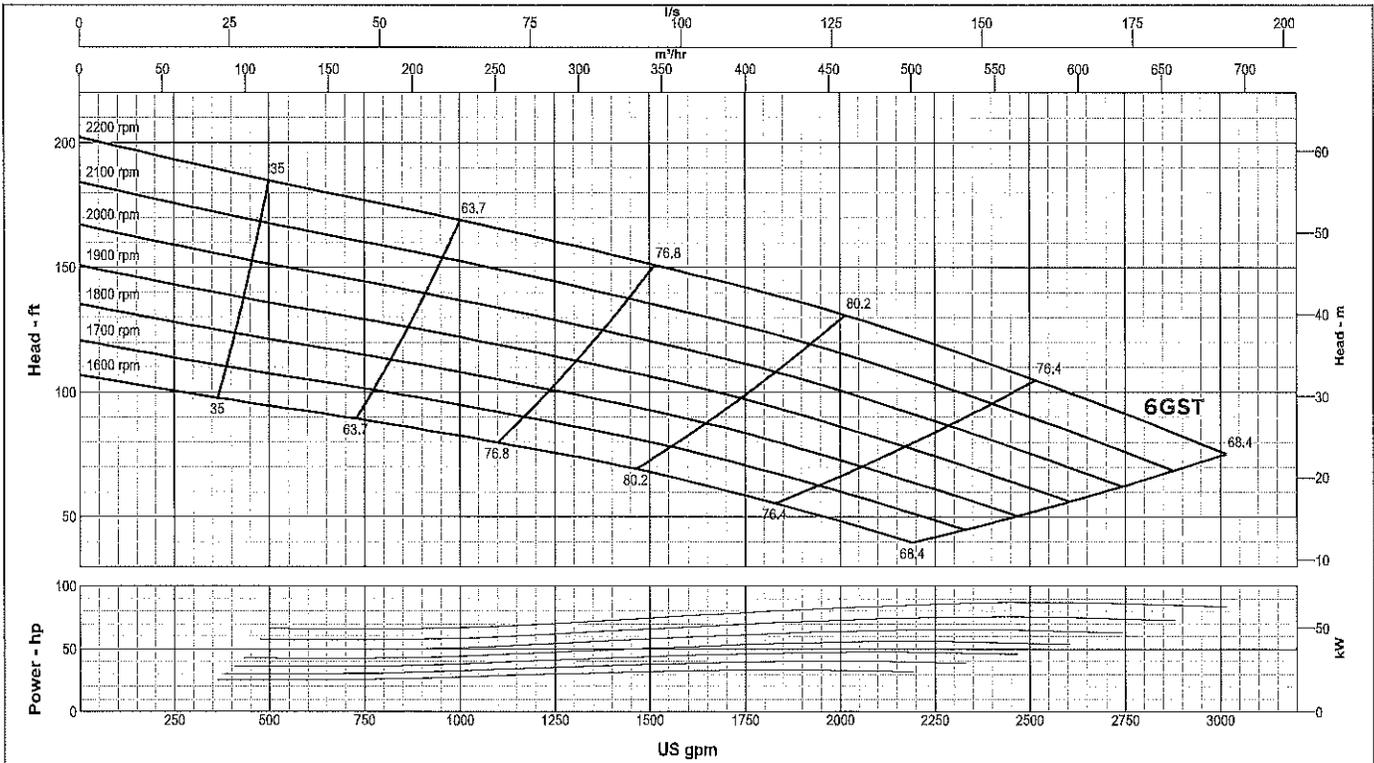


**SPECIFICATIONS**

Connections	6" (150 mm) ANSI Flanges
Max Pump Speed	2,200 rpm
Max Flow	3,000 gpm (681 m <sup>3</sup> /h)
Max Head	202' (61.6 m)
Max Static Priming Lift	28' (8.5 m)
Temperature Limit	160° F (70° C)
Solids Handling Capability	3" (76.2 mm)
Max Casing Pressure	125 psig (862 kPa)
Fuel Cell	115 gallons (435 liters)
Dry Weight	4,500 lbs

**PUMP MATERIAL**

Casing	Cast Iron (CD4MCu is an option)
Impeller	Cast Iron (CD4MCu is an option)
Bearing Housing	Cast Iron
Bearing Lubrication	Grease
Shaft/Shaft Sleeve	Steel/Stainless Steel
Seal	Silicon Carbide on Silicon Carbide
Chassis/Fuel Cell	Steel
Non-Return Valve	Nitrile Fitted Cast Iron



**GLOBAL PUMP**  
 10162 East Coldwater Road, Davison, MI 48423  
 Tel: 810.653.4828 Fax: 810.658.0632  
**1.866.360.PUMP** www.globalpump.com

Lubrication and Maintenance

**Lubrication and Maintenance Service Interval Chart—Generator (Standby) Applications**

below to titles in Lubrication and Maintenance Sections for procedures.

NOTE: Use service intervals listed below for generator (standby) applications. Match service items

Item	Lubrication and Maintenance Service Intervals			
	Every 2 Weeks	500 Hours or 12 Months	2000 Hours or 24 Months	As Required
Operate Engine at Rated Speed and 50%–70% Load a Minimum of 30 Minutes	*			
Check Engine Oil and Coolant Level	*			
Check Fuel Filter/Water Bowl	*			
Check Air Cleaner Dust Unloader Valve & Restriction Indicator Gauge <sup>a</sup>	*			
Visual Walk Around Inspection	*			
Service Fire Extinguisher		*		
Check Engine Mounts		*		
Service Battery		*		
Change Engine Oil And Replace Oil Filter <sup>b, c</sup>		*		
Check Crankcase Vent System		*		
Check Air Intake Hoses, Connections, & System		*		
Replace Fuel Filter Elements		*		
Check Automatic Belt Tensioner and Belt Wear		*		
Check Engine Electrical Ground Connection		*		
Check Cooling System		*		
Coolant Solution Analysis-Add SCAs as required		*		
Pressure Test Cooling System		*		
Check Engine Speeds		*		
Check Crankshaft Vibration Damper (6.8 L Engines) <sup>d</sup>			*	
Flush and Refill Cooling System			*	
Test Thermostats			*	
Check and Adjust Engine Valve Clearance			*	
Add Coolant				*
Replace Air Cleaner Elements				*
Replace Fan and Alternator Belts				*
Check Fuses				*
Check Air Compressor (If Equipped)				*
Bleed Fuel System				*

<sup>a</sup> Replace primary air cleaner element when restriction indicator shows a vacuum of 625 mm (25 in.) H<sub>2</sub>O.

<sup>b</sup> During engine break-in, change the oil and filter for the first time before 100 hours of operation.

<sup>c</sup> Service intervals depend on sulfur content of the diesel fuel, oil pan capacity, and the oil and filter used, which means that intervals may be REDUCED. (See DIESEL ENGINE OIL AND FILTER SERVICE INTERVALS in Fuels, Lubricants, and Coolant Section.)

<sup>d</sup> Replace crankshaft damper every 4500 hours or 60 months, whichever occurs first.

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## Maintenance

Refer to the engine operation manual for engine maintenance procedure and schedule.

### Towing maintenance

If the pump assembly is trailer mounted, then perform the following tasks before transporting the assembly.

- Check the axle bearings for wear and proper lubrication.
  - Check the wheels for loose lug nuts and tighten them as needed.
  - Check the tires for wear and tire pressure.
  - Check the hitch assembly for damage and loose hardware. If hardware is damaged, then replace and tighten all loose hardware.
  - Check the safety chains for damage and verify that the hooks work properly. If the safety chains are missing, then replace immediately.
  - Check the jack stands for operation and condition. Grease the jack stands as needed.
  - Check that all of the lights are operational and replace the bulbs as needed.
- a) If the trailer is equipped with a braking system, then perform the following steps:
  - b) Check the breakaway system is operational.
  - c) Measure the breakaway battery to ensure it is charged.
  - d) Check the brakes for wear and service as needed.

### Daily maintenance

#### Maintenance

- Check the diesel fuel for the presence of water. If water is detected, then drain and clean the fuel tank. Otherwise, check the fuel level and replenish as necessary.
- Check the radiator coolant level.

#### Pump maintenance

- Check the coolant level in the mechanical seal Reservoir. Replenish as necessary.
  - For required mechanical seal coolant, refer to Technical Data.
- Check the position of the casing and the discharge check valve drain valves. Verify that the valves are closed before operation.

#### Air compressor maintenance

- Check for any unusual noise or vibration.
- Conduct a visual inspection and ensure that all guards are in place.
- Check all pressurized components for rust, cracks, or leaks.
- Check for lubricant leaks.
- Check for the correct actuation of the pressure relief valve on the compressor. Verify that the valve easily springs back into the original position when released.
- For air compressors utilizing an integral oil sump:

- a) Maintain the oil level between the high and low marks on the dipstick.
- b) Check the oil for any contamination. If contaminated, then drain and refill the compressor with appropriate oil.
  - For recommended air compressor oil, refer to Technical Data.

If any problems are discovered, then discontinue use of the equipment and consult your local Global Pump representative.

#### **Vacuum pump maintenance**

- Check the oil level.
- Check for the feed of oil through the sight glass.
- Drain the moisture trap.

#### **Gearbox maintenance**

If the unit contains a gearbox, then perform the following on a daily basis before starting the unit.

- Check the gearbox oil level. Replenish the oil as necessary.
  - For recommended gearbox oil, refer to Technical Data.

#### **Environmental Box Maintenance**

If the unit is fitted with an Environmental Box, then perform the following task on a daily basis.

- Check the Environmental Box for the build-up of sediment and clean as necessary.
  - Refer to the attached Environmental Box drawing for part descriptions and locations.

#### **After the first 100 hours**

##### **Air compressor maintenance**

If the unit contains an air compressor with an integral oil supply, then perform the following tasks after the first 100 hours of operation.

1. If the unit has recently been in operation, then allow the compressor to cool.
2. Drain the oil sump.
3. Fill the oil sump with a replacement lubricant. For required lubricants and quantities, refer to Technical Data.

#### **250 hour maintenance**

##### **Pump maintenance**

1. Verify that the pump is powered off and all power is removed from the driver. If the driver is a diesel engine, then verify that the ground cable is removed from the negative battery terminal.
2. Drain any product from the pump by opening the casing and discharge check valve drain valves.

Drain fluids back into the source or into a spill container to be properly discarded.

1. Disconnect the pump from the suction and the discharge piping.
2. Inspect the pump and remove all dirt and debris. Visually inspect the casing from the suction flange for any obstructions and remove as needed.
3. Disconnect the venturi assembly and inspect for wear and the conditions of the O rings and the venturi. Remove the housing and check the condition of the ball valve, and screen. Clean the screen of any dirt or debris.
4. Remove the discharge check valve inspection cover. Check the condition of the ball valve, seat, and O-ring seal. Replace the damaged parts as required.
5. Charge the bearing housing with grease. Refer to bearing Re-greasing procedure.
6. Connect power to the driver. If the driver is a diesel engine, then connect the ground cable to the negative battery terminal.
7. Record the serviced items and operation hours in a service log.

When all of the maintenance is completed, start the pump and perform a vacuum test as described in Verify general operation section. Record the vacuum gauge readings in a service log as a reference.

#### Motor maintenance

1. Verify that the motor is powered off and all power sources are removed.
2. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, and other matter. Oily vapor, paper pulp, textile lint, and other debris accumulate then block the motor ventilation. If the motor is not properly ventilated, then overheating occurs and causes early failure.
3. Measure the motor winding insulation resistance of each phase with a mega-ohm meter. Record the readings on a service log. Compare the readings of each phase. If the readings are markedly different, then contact your local Global Pump representative.
4. Ensure that all electrical connectors are in place and secured.
5. Record the serviced items and operation hours in a service log.

#### Air compressor maintenance

- Inspect the compressor oil lines, air lines, and other connections.
- Examine the compressor air filter for excessive dirt. Replace the filter as required.
- If the compressor is external to the driver, then check the drive belt condition and tension. Adjust the drive belt tension or replace as necessary.
  - To replace the belt refer to the appropriate service manual, available from your local Global Pump representative.

#### Vacuum pump maintenance

- Check the tension and the condition of the drive belt. Adjust the tension or replace as necessary.
- To replace the belt refer to the appropriate service manual, available from your local Global Pump representative.

#### 500 hour maintenance

##### Air compressor

If the unit contains an air compressor with an integral oil supply, then perform the following tasks.

- Change the lubricant.

In harsh environments, change the lubricant more frequently. For required lubricants and quantities, refer to Technical Data.

- Change the air filter.
- In harsh environments, change the air filter more frequently.
- Tighten the pulley clamp screws.

#### Vacuum pump maintenance

- Check the condition of the air filter. Replace as necessary.

To replace the air filter refer to the appropriate service manual, available from your local Global Pump representative.

- Change the oil cooler filter.

To replace the oil cooler filter, refer to the appropriate service manual, available from your local Global Pump representative.

- Inspect the peeler valve assembly and associated parts for wear and damage. Replace as necessary.
- To replace components of the peeler valve assembly or associated parts, refer to the appropriate service manual, available from your local Global Pump representative.

### 1000 hour maintenance

#### Air compressor

- Change the air filter.
  - In harsh environments, change the air filter more frequently.
- Inspect the air compressor valves for any leakage or the build-up of carbon. Clean and replace as necessary.
- If the air compressor contains an integral oil supply, then clean the oil sump strainer screen. If necessary, clean the oil sump.
  - To remove and clean the oil sump strainer screen, refer to the air compressor manual.

#### Vacuum pump maintenance

- Change the vacuum pump oil.
  - For recommended vacuum pump oil, refer to Technical Data.
- Change the exhaust smoke eliminator filter.

To replace the smoke eliminator filter refer to the appropriate service manual, available from your local Global Pump representative.

#### Gearbox maintenance

If the unit contains a gearbox, then perform the following tasks every 1000 hours.

1. Drain the oil from the gearbox.
2. Refill with the correct oil.

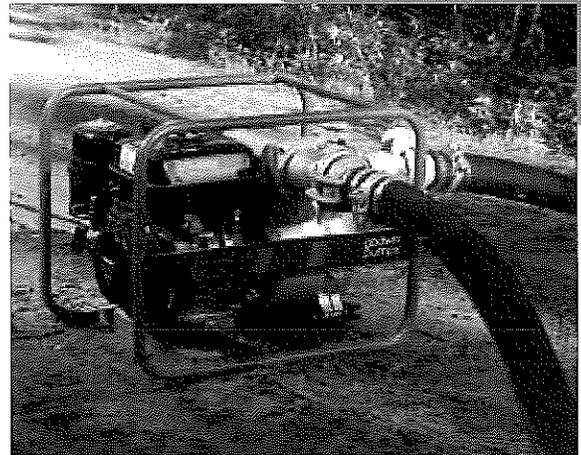
### 5000 hour maintenance

#### Pump maintenance

- Inspect the mechanical seal for excessive wear and damage. Replace as necessary.
  - To replace the mechanical seal, refer to the appropriate service manual, available from your local Global Pump representative.
- Inspect the bearings for excessive wear and damage. Replace as necessary.
  - To replace the bearings, refer to the appropriate service manual, available from your local Global Pump representative.
- Check the clearances between the impeller, and wear ring. If the correct clearances cannot be achieved, then check the parts for wear and damage. Replace as necessary.
  - For the required clearances, refer to *wear ring clearance*.
- Inspect the shaft and the related seals for wear and damage. Replace as necessary.
  - To replace the shaft and the related seals, refer to the appropriate service manual, available from your local Global Pump representative.

# Wet-Prime Pumps

The Wet-Prime line of portable, gasoline-powered pumps are available in dewatering, trash, pressure and plastic models. Wet-Prime pumps are capable of maximum heads to 187 ft (57 m) and maximum flows to 425 gpm (95 m<sup>3</sup>/h). The pumps feature durable, lightweight steel roll cage for added protection and easy maneuvering. They include high performance engine with "Oil Alert" system and electronic ignition to increase fuel efficiency. Wet-Prime Pumps are ideal for applications including construction dewatering, landscaping and irrigation, farming, remote firefighting and marine construction.



## **Dewatering**

The Wet-Prime Dewatering pumps are suitable for pumping water with light abrasives and small solids, semi-trash construction and industrial dewatering, landscaping and irrigation, utilities, manholes and vault draining.

## **Trash**

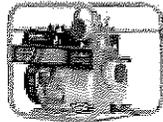
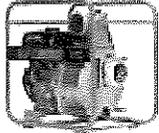
The Wet-Prime Trash pumps are suitable for construction and industrial, trash-laden water, stream/pond dewatering, septic tanks and manholes, pumping water with light abrasives and solids.

## **Pressure**

The Wet-Prime Pressure pumps are suitable for marine construction, remote firefighting, landscaping, irrigation, tank cleaning and jetting.

## **Plastic**

The Wet-Prime Plastic pumps are suitable for agricultural chemicals, general dewatering, landscaping, irrigation, saltwater dewatering, and swimming pools.

Dewatering				
	GWP-25HX	GWP-50HX	GWP-80HX	GWP-100HX
				
Suction/Discharge Dia. - in. (mm)	1 (25)	2 (50)	3 (80)	4 (100)
Solids Handling Dia. - in. (mm)	0.2 (5)	0.75 (19)	0.75 (19)	0.75 (19)
Max Head - ft (m)	106 (32)	95 (29)	85 (26)	92 (28)
Max Flow - gpm (m <sup>3</sup> /h)	30 (6.9)	158 (36)	238 (54)	383 (87)
Power - HP (kW)	1.1 (0.8)	4.0 (3)	5.5 (4.1)	8.0 (5.9)
Fuel Tank Cap. - gal (l)	0.15 (0.55)	0.66 (2.5)	0.95 (3.6)	1.58 (6)
Dimensions - in.	9x14x13	18x14x15	20x15x17	26x20x26
Weight - lbs. (kg)	12.1 (5.5)	51 (23)	64 (29)	123 (56)

**Dewatering Pumps Features and Benefits:**

**GWP-25HX**

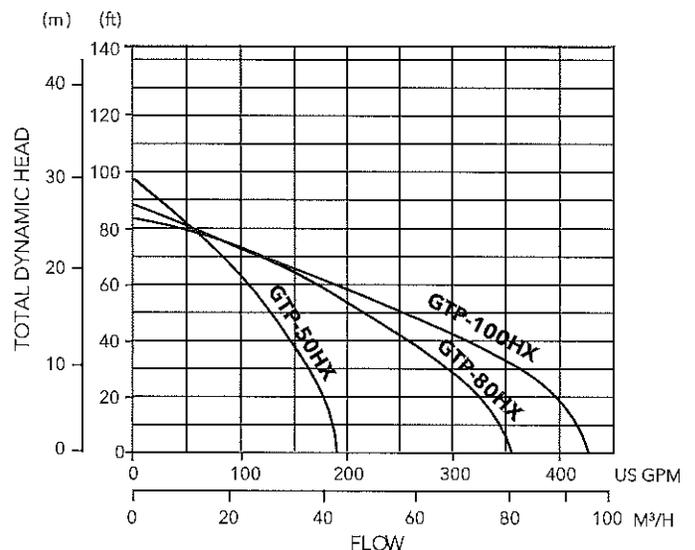
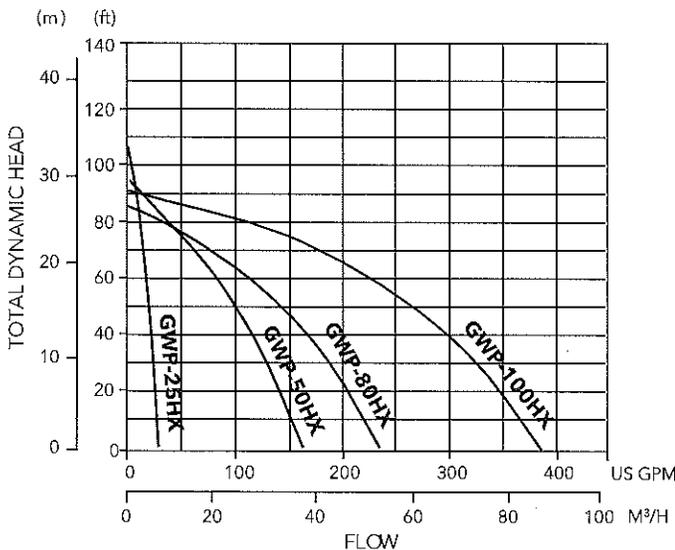
- Carbon ceramic mechanical seal for increased protection
- Die-cast aluminum volute and impeller
- Lightweight die-cast aluminum pump casing
- High efficiency, four-stroke engine

**GWP-50HX, GWP-80HX & GWP-100HX**

- Semi-trash handling capability
- Abrasion resistant solid silicon carbide mechanical seal for superior durability
- High-grade ductile iron volute and impeller for reduced wear and maintenance
- Removable, lightweight die-cast aluminum pump casing
- Rubber mounts for reduced vibration

**Trash Pumps Features and Benefits:**

- Solids handling capability
- Abrasion resistant solid silicon carbide mechanical seal for superior durability and protection
- High-grade ductile iron volute and wearplate for reduced wear and maintenance
- Hi-chrome cast iron impeller for reduced wear and maintenance
- Removable, lightweight die-cast aluminum cover and volute for fast debris removal
- Rubber engine mounts for reduced vibration



**APPENDIX D**

**OUTFALL 008**

**CHAIN OF CUSTODIES**

PEABODY COULTERVILLE MINING, LLC - CHAIN OF CUSTODY

PEABODY SITE ID		* FIELDS FOR LAB/EQUIS USE		TIME		GRAB		# CONTAINERS		Flow Condition		Flow (GPM)		pH <sup>1</sup>		Temp (C)		Settleable Solids <sup>2</sup> (MLD)		SAMPLE TYPE	
FACILITY CODE	LOCATION CODE	LOCATION CODE	SAMPLE DATE	DATE	TIME	DATE	TIME	DATE	TIME	DATE	TIME	DATE	TIME	DATE	TIME	DATE	TIME	DATE	TIME	DATE	TIME
<p><b>Gateway Mine</b></p> <p>pH meter calibrated</p>																					
008	1825	DA0008	12/15/16	12/15/16	09:35																
008DOWN	1825	27SW16	12/15/16	12/15/16	10:17				8	4	35	7.6	4.1	-							IL-SB-Metals
<p>RELINQUISHED BY: <i>JD Ant</i> DATE: 12/15/16 TIME: 13:05 RECEIVED BY: <i>R. Cant</i></p> <p>RELINQUISHED BY: DATE: TIME: RECEIVED BY:</p> <p>RELINQUISHED BY: DATE: TIME: RECEIVED BY:</p>																					
<p><b>PRECIPITATION EVENT STATISTICS</b></p> <p>Date &amp; period of ppt event:</p> <p>Rainfall Total:</p>																					
<p><b>FIELD MEASUREMENTS</b></p> <p>IL-SB-Metals (Condition 1/3/4): Flow, pH, &amp; Temp                  IL-SB-Metals (Condition 2): Flow, pH, Temp, Settleable Solids                  IL-SW-NPDES: Flow, pH, &amp; Temp</p>																					
<p><b>BOTTLES</b></p> <p>IL-SB-Metals (Condition 1/2/3/4):                  Plastic 1-L, Plastic 500 mL, Plastic 500 mL w/ HNO<sub>3</sub>, Glass Amber 1-L,                  Plastic 250 mL w/ H<sub>2</sub>SO<sub>4</sub>, Mercury Kit (2 glass bottles), Plastic 1-L                  Plastic 1-L (settleable solids if needed)</p> <p>IL-SW-NPDES: Plastic 1-L</p>																					
<p><b>LAB ANALYTES</b></p> <p>IL-SB-Metals (Condition 1/4):                  Acidity, Alkalinity, Hardness, pH, Fe, Mn, Cl, SO<sub>4</sub>, TSS, As, Ba, Cd,                  Cr, Cr6, Cu, Pb, Mn, Ni, Phenols, Se, Ag, Zn, Low Level Hg</p> <p>IL-SB-Metals (Condition 2/3):                  pH, SO<sub>4</sub>, Cl, Hardness, As, Ba, Cd, Cr, Cr6, Cu, Pb, Mn,                  Ni, Phenols, Se, Ag, Zn, Low Level Hg</p> <p>IL-SW-NPDES: pH, Hardness, SO<sub>4</sub>, Cl</p>																					
<p><sup>1</sup> pH measured using electronic meter</p> <p><sup>2</sup> Report of Settleable Solids prepared using EPA Method 161.5 and Imhoff Cone</p> <p>ND: "No Discharge" is defined as no disturbed flow, unconstructed outfall or mined through outfall</p>																					

\* LAB USE ONLY: WHEN ENTERING SYS\_SAMPLE\_CODE INTO EQUIS, USE FACILITY CODE, LOCATION CODE, AND SAMPLE DATE FROM ABOVE. THESE WILL BE SEPARATED BY UNDERSCORES. SAMPLE DATE FORMAT MMDDYYYY (NO "/"). FOR EXAMPLE, 1640, MW1, 09/01/2010 WILL HAVE A SYS\_SAMPLE\_CODE OF 1640\_MW1\_09012010

PEABODY COULTERVILLE MINING, LLC - CHAIN OF CUSTODY

Gateway Mine

PEABODY SITE ID	* FIELDS FOR LAB/EQUIS USE		TIME	GRAB	# CONTAINERS	Flow Condition	Flow (GPM)	pH	Temp (°C)	Settleable Solids (OUT)	SAMPLE TYPE	SAMPLER:
	FACILITY CODE	LOCATION CODE										
	pH meter calibrated											meter calibrated to 4, 7 and 10
008	1825	DA0008		8							IL-SB-Metals	
008DOWN	1825	27SW16		1							IL-SW-NPDES	
RELINQUISHED BY:				DATE:	TIME:	RECEIVED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:	Precipitation Event Statistics Date & period of ppt event:
RELINQUISHED BY:				DATE:	TIME:	RECEIVED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:	Rainfall Total:
RELINQUISHED BY:				DATE:	TIME:	RECEIVED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:	FIELD MEASUREMENTS IL-SB-Metals (Condition 1/3/4): Flow, pH, & Temp IL-SB-Metals (Condition 2): Flow, pH, Temp, Settleable Solids IL-SW-NPDES; Flow, pH, & Temp
<p><b>BOTTLES</b>  <b>IL-SB-Metals (Condition 1/2/3/4):</b>                  Plastic 1-L, Plastic 500 mL, Plastic 500 mL w/ HNO3, Glass Amber 1-L,                  Plastic 250 mL w/ H2SO4, Mercury Kit (2 glass bottles), Plastic 1-L                  Plastic 1-L (settleable solids if needed)</p> <p><b>IL-SW-NPDES:</b> Plastic 1-L</p> <p><b>LAB ANALYTES</b>  <b>IL-SB-Metals (Condition 1/4):</b>                  Acidity, Alkalinity, Hardness, pH, Fe, Mn, Cl, SO4, TSS, As, Ba, Cd,                  Cr, Cr6, Cu, Pb, Mn, Ni, Phenols, Se, Ag, Zn, Low Level Hg</p> <p><b>IL-SB-Metals (Condition 2/3):</b>                  pH, SO4, Cl, Hardness, As, Ba, Cd, Cr, Cr6, Cu, Pb, Mn,                  Ni, Phenols, Se, Ag, Zn, Low Level Hg</p> <p><b>IL-SW-NPDES:</b> pH, Hardness, SO4, Cl</p>												
<p><b>NOTES:</b></p> <p>1. pH measured using electronic meter                  ? Report of Settleable Solids unrounded using EPA Method 160.5 and Inhoff Conc                  ND: "No Discharge" is defined as no disturbed flow, unconstructed outfall or innaid through outfall</p>												

\* LAB USE ONLY: WHEN ENTERING SYS\_SAMPLE\_CODE INTO EQUS, USE FACILITY CODE, LOCATION CODE, AND SAMPLE DATE FROM ABOVE. THESE WILL BE SEPARATED BY UNDERSCORES. SAMPLE DATE FORMAT MMDDYYYY (NO "/>). FOR EXAMPLE, 1640, MW1, 09/01/2010 WILL HAVE A SYS\_SAMPLE\_CODE OF 1640\_MW1\_09012010

**APPENDIX E**

**NPDES PERMIT IL0062189**



Electronic Filing Received, E-File Office 6/8/2017  
**ILLINOIS ENVIRONMENTAL PROTECTION AGENCY**

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 • (217) 782-2829

BRUCE RAUNER, GOVERNOR

LISA BONNETT, DIRECTOR

May 27, 2015

618/993-7200

Peabody Coulterville Mining, LLC  
7100 Eagle Crest Boulevard, Suite 200  
Evansville, IN 47715-8152

Re: Peabody Coulterville Mining, LLC  
Gateway Mine  
NPDES Permit No. IL0062189  
Final Renewed Permit

Gentlemen:

Attached is the final renewed NPDES Permit for your discharge. The Permit as issued covers discharge limitations, monitoring, and reporting requirements. The failure of you to meet any portion of the Permit could result in civil and/or criminal penalties. The Illinois Environmental Protection Agency is ready and willing to assist you in interpreting any of the conditions of the Permit as they relate specifically to your discharge.

The Permit as issued was modified after Public Notice and Public Hearing based on comments received. The final permit no longer authorizes the use of sewage treatment plant sludge from the Village of Coulterville as a soil amendment.

The Permit as issued is effective as of the date indicated on the first page of the Permit. You have the right to appeal any conditions of the Permit to the Illinois Pollution Control Board within a 35 day period following the issuance date.

Should you have questions concerning the Permit, please contact the undersigned at 618/993-7200.

Respectfully,

ENVIRONMENTAL PROTECTION AGENCY

Joseph D. Stitely, P.E.  
Acting Manager, Permit Section  
Mine Pollution Control Program  
Bureau of Water

JDS:IW:cs/6913c/12-9-14

Enclosure: Final Permit

cc: IDNR/Office of Mines and Minerals/Land Reclamation/with Enclosure  
IDNR/Division of Water Resources/with Enclosure  
Joseph Stitely, Marion Region/Mine Pollution Control Program/with Enclosure  
BOW/DWPC/CAS  
BOW/DWPC/Records

NPDES Permit No. IL0062189

Illinois Environmental Protection Agency

Division of Water Pollution Control

1021 North Grand Avenue, East

P.O. Box 19276

Springfield, Illinois 62794-9276

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

Reissued and Modified NPDES Permit

Expiration Date: April 30, 2020

Issue Date: May 27, 2015  
Effective Date: May 27, 2015

Name and Address of Permittee:

Peabody Coulterville Mining, L.L.C.  
7100 Eagle Crest Boulevard, Suite 200  
Evansville, IN 47715-8152

Facility Name and Address:

Peabody Coulterville Mining, L.L.C.  
Gateway Mine  
13101 Zeigler 11 Road  
2 miles south of Coulterville, Illinois  
(Randolph County)

Discharge Number and Classification:

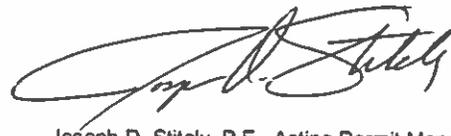
001, 002, 003, 007, 008, 009	Alkaline Mine Drainage
010	Alkaline Mine Drainage
006, 011, 012	Alkaline Mine Drainage

Receiving waters

Unnamed tributary to Marys River
Unnamed tributary to Lick Branch
Unnamed tributary to Plum Creek

In compliance with the provisions of the Illinois Environmental Protection Act, Subtitle C and/or Subtitle D Rules and Regulations of the Illinois Pollution Control Board, and the Clean Water Act, the above-named permittee is hereby authorized to discharge at the above location to the above-named receiving stream in accordance with the standard conditions and attachments herein.

Permittee is not authorized to discharge after the above expiration date. In order to receive authorization to discharge beyond the expiration date, the permittee shall submit the proper application as required by the Illinois Environmental Protection Agency (IEPA) not later than 180 days prior to the expiration date.



Joseph D. Stitely, P.E., Acting Permit Manager  
Mine Pollution Control Program  
Bureau of Water

JDS:IW:cs/6989c/2-10-15

NPDES Coal Mine Permit  
 NPDES Permit No. IL0062189  
 Effluent Limitations and Monitoring

From the effective date of this Permit until the expiration date, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 001 (Alkaline Mine Drainage)

Discharge Condition	Parameters											Flow (MGD)	Settleable Solids (m/l)
	Total Suspended Solids (mg/l) ***		Iron (total) (mg/l) ***		pH** (S.U.) ***	Alkalinity/ Acidity ***	Sulfate (mg/l) ***	Chloride (mg/l) ***	Mn (total) (mg/l) ***		Hardness ***		
	30 day average	daily maximum	30 day average	daily maximum					30 day average	daily maximum			
I	35	70	3.5	7.0	6.5-9.0	Alk.>Acid	2030	500	2.0	4.0	Monitor only	Measure When Sampling	-
II	-	-	-	-	6.0-9.0	-	2030	500	-	-	Monitor only	Measure When Sampling	0.5
III	-	-	-	-	6.0-9.0	-	2030	500	-	-	Monitor only	Measure When Sampling	-
IV	35	70	3.5	7.0	6.5-9.0	Alk.>Acid	2030	500	2.0	4.0	Monitor only	Measure When Sampling	-

- I Dry weather discharge (base flow or mine pumpage) from the outfall.
- II In accordance with 35 Ill. Adm. Code 406.110(a), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b). The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.110(d), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. For outfalls which have no allowed mixing, monitoring requirements and permit limitations of Discharge Condition IV are identical to Discharge Condition I to which the outfall discharge has reverted.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method.

\*\*\* There shall be a minimum of nine (9) samples collected during the quarter when the pond is discharging. Of these 9 samples, a minimum of one sample each month shall be taken during either Discharge Condition I or IV should such discharge condition occur. A "no flow" situation is not considered to be a sample of the discharge. In the event that Discharge Conditions II and/or III occur, grab sample of each discharge caused by the above precipitation events (Discharge Conditions II and/or III) shall be taken and analyzed for the parameters identified in the table above during at least 3 separate events each quarter. For quarters in which there are less than 3 such precipitation events resulting in discharges, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s). Should a sufficient number of discharge events occur during the quarter, the remaining three (3) quarterly samples may be taken during any of the Discharge Conditions described above.

The water quality standards for sulfate and chloride must be met in discharges from the above referenced outfall as well as in the receiving stream.

\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 13 for the discharges from Outfall 001 and unnamed tributary to Marys River receiving such discharges.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

NPDES Coal Mine Permit

NPDES Permit No. IL0062189

Effluent Limitations and Monitoring

From the effective date of this Permit until the expiration date, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 002 (Alkaline Mine Drainage)

Discharge Condition	Parameters											Mercury see Special Condition No. 17	Flow (MGD)	Settleable Solids (mfl)
	Total Suspended Solids (mg/l) ***		Iron (total) (mg/l) ***		pH** (S U) ***	Alkalinity/Acidity ***	Sulfate (mg/l) ***	Chloride (mg/l) ***	Mn (total) (mg/l)		Hardness ***			
	30 day average	daily maximum	30 day average	daily maximum					30 day average	Daily maximum				
I	35	70	35	70	6.5-9.0	Alk > Acid	1810	500	2.0	4.0	Monitor only	Monitor only	Measure When Sampling	-
II	-	-	-	-	6.0-9.0	-	1810	500	-	-	Monitor only	-	Measure When Sampling	0.5
III	-	-	-	-	6.0-9.0	-	1810	500	-	-	Monitor only	-	Measure When Sampling	-
IV	35	70	35	70	6.0-9.0	Alk > Acid	1810	500	2.0	4.0	Monitor only	Monitor only	Measure When Sampling	-

- I Dry weather discharge (base flow or mine pumpage) from the outfall.
- II In accordance with 35 Ill. Adm. Code 406.110(a), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b). The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.110(d), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. At such time that receiving stream flow subsides to the degree that the mixing ratio specified in Special Condition No. 14 is not available, monitoring requirements and permit limitations shall revert to Discharge Condition I.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method.

\*\*\* There shall be a minimum of nine (9) samples collected during the quarter when the pond is discharging. Of these 9 samples, a minimum of one sample each month shall be taken during either Discharge Condition I or IV should such discharge condition occur. A "no flow" situation is not considered to be a sample of the discharge. In the event that Discharge Conditions II and/or III occur, grab sample of each discharge caused by the above precipitation events (Discharge Conditions II and/or III) shall be taken and analyzed for the parameters identified in the table above during at least 3 separate events each quarter. For quarters in which there are less than 3 such precipitation events resulting in discharges, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s). Should a sufficient number of discharge events occur during the quarter, the remaining three (3) quarterly samples may be taken during any of the Discharge Conditions described above.

Discharges from the above referenced outfall that are subject to the requirements of Discharge Conditions II, III and/or IV must meet the water quality standards for sulfate and chloride in the receiving stream.

\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 13 for the discharges from Outfall 002 and the unnamed tributary to Marys River receiving such discharges. Also, discharges from Outfall 002 shall be subject to the limitations, and monitoring and reporting requirements of Special Condition No. 18.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

NPDES Coal Mine Permit

NPDES Permit No. IL0062189

Effluent Limitations and Monitoring

From the effective date of this Permit until the expiration date, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 003 (Alkaline Mine Drainage)

Discharge Condition	Parameters											Mercury see Special Condition No. 17	Flow (MGD)	Settleable Solids (m/l)
	Total Suspended Solids (mg/l)		Iron (total) (mg/l)		pH** (S.U.)	Alkalinity/ Acidity	Sulfate (mg/l)	Chloride (mg/l)	Mn (total) (mg/l)		Hardness			
	30 day average	daily maximum	30 day average	daily maximum					30 day average	Daily maximum				
I	35	70	3.5	7.0	6.5-9.0	Alk.>Acid	500	500	2.0	4.0	Monitor only	Monitor only	Measure When Sampling	-
II	-	-	-	-	6.0-9.0	-	1500	1000	-	-	Monitor only	-	Measure When Sampling	0.5
III	-	-	-	-	6.0-9.0	-	1500	1000	-	-	Monitor only	-	Measure When Sampling	-
IV	35	70	3.5	7.0	6.0-9.0	Alk.>Acid	1500	1000	2.0	4.0	Monitor only	Monitor only	Measure When Sampling	-

- I Dry weather discharge (base flow or mine pumpage) from the outfall at times of "low flow" or "no flow" conditions in the receiving stream as defined in Special Condition No. 14.
- II In accordance with 35 Ill. Adm. Code 406.110(a), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b). The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.110(d), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. At such time that receiving stream flow subsides to the degree that the mixing ratio specified in Special Condition No. 14 is not available, monitoring requirements and permit limitations shall revert to Discharge Condition I.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method.

\*\*\* There shall be a minimum of nine (9) samples collected during the quarter when the pond is discharging. Of these 9 samples, a minimum of one sample each month shall be taken during either Discharge Condition I or IV should such discharge condition occur. A "no flow" situation is not considered to be a sample of the discharge. In the event that Discharge Conditions II and/or III occur, grab sample of each discharge caused by the above precipitation events (Discharge Conditions II and/or III) shall be taken and analyzed for the parameters identified in the table above during at least 3 separate events each quarter. For quarters in which there are less than 3 such precipitation events resulting in discharges, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s). Should a sufficient number of discharge events occur during the quarter, the remaining three (3) quarterly samples may be taken during any of the Discharge Conditions described above.

Discharges from the above referenced outfall that are subject to the requirements of Discharge Conditions II, III and/or IV must meet the water quality standards for sulfate and chloride in the receiving stream.

\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 14 for the discharges from Outfall 003 and the unnamed tributary to Marys River receiving such discharges. Also, discharges from Outfall 002 and 003 shall be subject to the limitations, and monitoring and reporting requirements of Special Condition No. 18.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

NPDES Coal Mine Permit

NPDES Permit No. IL0062189

Effluent Limitations and Monitoring

From the effective date of this Permit until the expiration date, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 006 (Alkaline Mine Drainage)

Discharge Condition	Parameters											Flow (MGD)	Settleable Solids (ml/l)	
	Total Suspended Solids (mg/l) ***		Iron (total) (mg/l) ***		pH** (S.U.) ***	Alkalinity/Acidity ***	Sulfate (mg/l) ***	Chloride (mg/l) ***	Mn (total) (mg/l) ***		Hardness ***			Mercury see Special condition No. 17
	30 day average	daily maximum	30 day average	daily maximum					30 day average	daily maximum				
I	35	70	3.5	7.0	6.5-9.0	Alk.>Acid	1366	500	2.0	4.0	Monitor only	Monitor only	Measure When Sampling	-
II	-	-	-	-	6.0-9.0	-	1366	500	-	-	Monitor only	-	Measure When Sampling	0.5
III	-	-	-	-	6.0-9.0	-	1366	500	-	-	Monitor only	-	Measure When Sampling	-
IV	35	70	3.5	7.0	6.5-9.0	Alk.>Acid	1366	500	2.0	4.0	Monitor only	Monitor only	Measure When Sampling	-

- I Dry weather discharge (base flow or mine pumpage) from the outfall.
- II In accordance with 35 Ill. Adm. Code 406.110(a), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b). The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.110(d), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. For outfalls which have no allowed mixing, monitoring requirements and permit limitations of Discharge Condition IV are identical to Discharge Condition I to which the outfall discharge has reverted.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method.

\*\*\* There shall be a minimum of nine (9) samples collected during the quarter when the pond is discharging. Of these 9 samples, a minimum of one sample each month shall be taken during either Discharge Condition I or IV should such discharge condition occur. A "no flow" situation is not considered to be a sample of the discharge. In the event that Discharge Conditions II and/or III occur, grab sample of each discharge caused by the above precipitation events (Discharge Conditions II and/or III) shall be taken and analyzed for the parameters identified in the table above during at least 3 separate events each quarter. For quarters in which there are less than 3 such precipitation events resulting in discharges, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s). Should a sufficient number of discharge events occur during the quarter, the remaining three (3) quarterly samples may be taken during any of the Discharge Conditions described above.

The water quality standards for sulfate and chloride must be met in discharges from the above referenced outfall as well as in the receiving stream.

\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 13 for the discharges from Outfall 006 and unnamed tributary to Plum Creek receiving such discharges. Also, discharges from Outfall 006 shall be subject to the limitations, and monitoring and reporting requirements of Special Condition No. 18.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

NPDES Coal Mine Permit

NPDES Permit No. IL0062189

Effluent Limitations and Monitoring

From the effective date of this Permit until the expiration date, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 007 (Alkaline Mine Drainage)

Discharge Condition	Parameters													
	Total Suspended Solids (mg/l) ***		Iron (total) (mg/l) ***		pH** (S.U) ***	Alkalinity/ Acidity ***	Sulfate (mg/l) ***	Chloride (mg/l) ***	Mn (total) (mg/l) ***		Hardness ***	Mercury see Special condition No. 17	Flow (MGD)	Settleable Solids (ml/l)
	30 day average	daily maximum	30 day average	daily maximum					30 day average	daily maximum				
I	35	70	3.0	6.0	6.5-9.0	Alk > Acid	2198	500	2.0	4.0	Monitor only	Monitor only	Measure When Sampling	-
II	-	-	-	-	6.0-9.0	-	2198	500	-	-	Monitor only	-	Measure When Sampling	0.5
III	-	-	-	-	6.0-9.0	-	2198	500	-	-	Monitor only	-	Measure When Sampling	-
IV	35	70	3.0	6.0	6.5-9.0	Alk > Acid	2198	500	2.0	4.0	Monitor only	Monitor only	Measure When Sampling	-

- I Dry weather discharge (base flow or mine pumpage) from the outfall.
- II In accordance with 35 Ill. Adm. Code 406.110(a), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b). The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.110(d), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. For outfalls which have no allowed mixing, monitoring requirements and permit limitations of Discharge Condition IV are identical to Discharge Condition I to which the outfall discharge has reverted.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method.

\*\*\* There shall be a minimum of nine (9) samples collected during the quarter when the pond is discharging. Of these 9 samples, a minimum of one sample each month shall be taken during either Discharge Condition I or IV should such discharge condition occur. A "no flow" situation is not considered to be a sample of the discharge. In the event that Discharge Conditions II and/or III occur, grab sample of each discharge caused by the above precipitation events (Discharge Conditions II and/or III) shall be taken and analyzed for the parameters identified in the table above during at least 3 separate events each quarter. For quarters in which there are less than 3 such precipitation events resulting in discharges, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s). Should a sufficient number of discharge events occur during the quarter, the remaining three (3) quarterly samples may be taken during any of the Discharge Conditions described above.

The water quality standards for sulfate and chloride must be met in discharges from the above referenced outfall as well as in the receiving stream.

\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 13 for the discharges from Outfall 007 and unnamed tributary to Marys River receiving such discharges. Also, discharges from Outfall 007 shall be subject to the limitations, and monitoring and reporting requirements of Special Condition No. 18.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

NPDES Coal Mine Permit  
 NPDES Permit No. IL0062189  
 Effluent Limitations and Monitoring

From the effective date of this Permit until the expiration date, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 008, 009 (Alkaline Mine Drainage)

Discharge Condition	Parameters													
	Total Suspended Solids (mg/l) ***		Iron (total) (mg/l) ***		pH** (S.U.) ***	Alkalinity/Acidity ***	Sulfate (mg/l) ***	Chloride (mg/l) ***	Mn (total) (mg/l) ***		Hardness ***	Mercury see Special condition No. 17	Flow (MGD)	Settleable Solids (ml/l)
	30 day average	daily maximum	30 day average	daily maximum					30 day average	daily maximum				
I	35	70	3.0	6.0	6.5-9.0	Alk.>Acid	2004	500	2.0	4.0	Monitor only	Monitor only	Measure When Sampling	-
II	-	-	-	-	6.0-9.0	-	2004	500	-	-	Monitor only	-	Measure When Sampling	0.5
III	-	-	-	-	6.0-9.0	-	2004	500	-	-	Monitor only	-	Measure When Sampling	-
IV	35	70	3.0	6.0	6.5-9.0	Alk.>Acid	2004	500	2.0	4.0	Monitor only	Monitor only	Measure When Sampling	-

- I Dry weather discharge (base flow or mine pumpage) from the outfall.
- II In accordance with 35 Ill. Adm. Code 406.110(a), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b). The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.110(d), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. For outfalls which have no allowed mixing, monitoring requirements and permit limitations of Discharge Condition IV are identical to Discharge Condition I to which the outfall discharge has reverted.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method.

\*\*\* There shall be a minimum of nine (9) samples collected during the quarter when the pond is discharging. Of these 9 samples, a minimum of one sample each month shall be taken during either Discharge Condition I or IV should such discharge condition occur. A "no flow" situation is not considered to be a sample of the discharge. In the event that Discharge Conditions II and/or III occur, grab sample of each discharge caused by the above precipitation events (Discharge Conditions II and/or III) shall be taken and analyzed for the parameters identified in the table above during at least 3 separate events each quarter. For quarters in which there are less than 3 such precipitation events resulting in discharges, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s). Should a sufficient number of discharge events occur during the quarter, the remaining three (3) quarterly samples may be taken during any of the Discharge Conditions described above.

The water quality standards for sulfate and chloride must be met in discharges from the above referenced outfall as well as in the receiving stream.

\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 13 for the discharges from Outfalls 008 and 009 and unnamed tributary to Marys River receiving such discharges. Also, discharges from Outfall 009 shall be subject to the limitations, and monitoring and reporting requirements of Special Condition No. 18.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

NPDES Coal Mine Permit

NPDES Permit No. IL0062189

Effluent Limitations and Monitoring

From the effective date of this Permit until the expiration date, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 010 (Alkaline Mine Drainage)

Discharge Condition	Parameters											Flow (MGD)	Settleable Solids (ml/l)	
	Total Suspended Solids (mg/l)		Iron (total) (mg/l)		pH** (S.U.)	Alkalinity/Acidity	Sulfate (mg/l)	Chloride (mg/l)	Mn (total) (mg/l)		Hardness			Mercury see Special condition No. 17
	30 day average	daily maximum	30 day average	daily maximum					30 day average	daily maximum				
I	35	70	3.0	6.0	6.5-9.0	Alk > Acid	1301	500	2.0	4.0	Monitor only	Monitor only	Measure When Sampling	-
II	-	-	-	-	6.0-9.0	-	1301	500	-	-	Monitor only	-	Measure When Sampling	0.5
III	-	-	-	-	6.0-9.0	-	1301	500	-	-	Monitor only	-	Measure When Sampling	-
IV	35	70	3.0	6.0	6.5-9.0	Alk > Acid	1301	500	2.0	4.0	Monitor only	Monitor only	Measure When Sampling	-

- I Dry weather discharge (base flow or mine pumpage) from the outfall.
- II In accordance with 35 Ill. Adm. Code 406.110(a), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b). The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.110(d), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. For outfalls which have no allowed mixing, monitoring requirements and permit limitations of Discharge Condition IV are identical to Discharge Condition I to which the outfall discharge has reverted.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method.

\*\*\* There shall be a minimum of nine (9) samples collected during the quarter when the pond is discharging. Of these 9 samples, a minimum of one sample each month shall be taken during either Discharge Condition I or IV should such discharge condition occur. A "no flow" situation is not considered to be a sample of the discharge. In the event that Discharge Conditions II and/or III occur, grab sample of each discharge caused by the above precipitation events (Discharge Conditions II and/or III) shall be taken and analyzed for the parameters identified in the table above during at least 3 separate events each quarter. For quarters in which there are less than 3 such precipitation events resulting in discharges, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s). Should a sufficient number of discharge events occur during the quarter, the remaining three (3) quarterly samples may be taken during any of the Discharge Conditions described above.

The water quality standards for sulfate and chloride must be met in discharges from the above referenced outfall as well as in the receiving stream.

\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 13 for the discharges from Outfall 010 and unnamed tributary to Marys River receiving such discharges. Also, discharges from Outfall 010 shall be subject to the limitations, and monitoring and reporting requirements of Special Condition No. 18.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

NPDES Coal Mine Permit

NPDES Permit No. IL0062189

Effluent Limitations and Monitoring

From the effective date of this Permit until the expiration date, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 011, 012 (Alkaline Mine Drainage)

Discharge Condition	Parameters													
	Total Suspended Solids (mg/l) ***		Iron (total) (mg/l) ***		pH** (S.U.) ***	Alkalinity/ Acidity ***	Sulfate (mg/l) ***	Chloride (mg/l) ***	Mn (total) (mg/l) ***		Hardness ***	Mercury see Special condition No. 17	Flow (MGD)	Settleable Solids (ml/l)
	30 day average	daily maximum	30 day average	daily maximum					30 day average	daily maximum				
I	35	70	3.0	6.0	6.5-9.0	Alk.>Acid	1366	500	2.0	4.0	Monitor only	Monitor only	Measure When Sampling	-
II	-	-	-	-	6.0-9.0	-	1366	500	-	-	Monitor only	-	Measure When Sampling	0.5
III	-	-	-	-	6.0-9.0	-	1366	500	-	-	Monitor only	-	Measure When Sampling	-
IV	35	70	3.0	6.0	6.5-9.0	Alk.>Acid	1366	500	2.0	4.0	Monitor only	Monitor only	Measure When Sampling	-

- I Dry weather discharge (base flow or mine pumpage) from the outfall.
- II In accordance with 35 Ill. Adm. Code 406.110(a), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b). The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.110(d), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.106(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. For outfalls which have no allowed mixing, monitoring requirements and permit limitations of Discharge Condition IV are identical to Discharge Condition I to which the outfall discharge has reverted.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method.

\*\*\* There shall be a minimum of nine (9) samples collected during the quarter when the pond is discharging. Of these 9 samples, a minimum of one sample each month shall be taken during either Discharge Condition I or IV should such discharge condition occur. A "no flow" situation is not considered to be a sample of the discharge. In the event that Discharge Conditions II and/or III occur, grab sample of each discharge caused by the above precipitation events (Discharge Conditions II and/or III) shall be taken and analyzed for the parameters identified in the table above during at least 3 separate events each quarter. For quarters in which there are less than 3 such precipitation events resulting in discharges, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s). Should a sufficient number of discharge events occur during the quarter, the remaining three (3) quarterly samples may be taken during any of the Discharge Conditions described above.

The water quality standards for sulfate and chloride must be met in discharges from the above referenced outfall as well as in the receiving stream.

\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 13 for the discharges from Outfalls 011 and 012 and unnamed tributary to Plum Creek receiving such discharges. Also, discharges from Outfalls 011 and 012 shall be subject to the limitations, and monitoring and reporting requirements of Special Condition No. 18.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

NPDES Coal Mine Permit  
 NPDES Permit No. IL0062189  
 Effluent Limitations and Monitoring

Upon completion of Special Condition 10 and approval from the Agency, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 001 (Reclamation Area Drainage)

Discharge Condition	Parameters					
	pH** (S.U.) ***	Sulfate (mg/l) ***	Chloride (mg/l) ***	Hardness ***	Flow (MGD)	Settleable Solids (mi/l) ***
I	6.5-9.0	2030	500	Monitor only	Measure When Sampling	0.5
II	6.0-9.0	2030	500	Monitor only	Measure When Sampling	0.5
III	6.0-9.0	2030	500	Monitor only	Measure When Sampling	-
IV	6.5-9.0	2030	500	Monitor only	Measure When Sampling	0.5

- I Dry weather discharge (base flow, if present) from the outfall.
- II In accordance with 35 Ill. Adm. Code 406.109(b), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations. The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.109(c), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.109(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. For reclamation area discharges, monitoring requirements and permit limitations of Discharge Condition IV are identical to Discharge Condition I to which the outfall discharge has reverted.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method. A "no flow" situation is not considered to be a sample of the discharge.

\*\*\* One sample per month (1/month) shall be collected if and/or when a discharge occurs under either Discharge Condition I, II or IV and analyzed for the parameters identified in the table above. In addition, at least three (3) grab samples shall be taken each quarter from separate precipitation events under Discharge Condition III and analyzed for parameters indicated in the above table. For quarters in which there are less than 3 such precipitation events, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s).

The water quality standards for sulfate and chloride must be met in discharges from the above referenced outfall as well as in the receiving stream.

\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 13 for the discharges from Outfall 001 and unnamed tributary to Marys River receiving such discharges.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

NPDES Coal Mine Permit  
 NPDES Permit No. IL0062189  
 Effluent Limitations and Monitoring

Upon completion of Special Condition 10 and approval from the Agency, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 002 (Reclamation Area Drainage)

Discharge Condition	Parameters					
	pH** (S.U.) ***	Sulfate (mg/l) ***	Chloride (mg/l) ***	Hardness ***	Flow (MGD)	Settleable Solids (ml/l) ***
I	6.5-9.0	1810	500	Monitor only	Measure When Sampling	0.5
II	6.0-9.0	1810	500	Monitor only	Measure When Sampling	0.5
III	6.0-9.0	1810	500	Monitor only	Measure When Sampling	-
IV	6.5-9.0	1810	500	Monitor only	Measure When Sampling	0.5

- I Dry weather discharge (base flow, if present) from the outfall.
- II In accordance with 35 Ill. Adm. Code 406.109(b), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations. The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.109(c), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.109(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. For reclamation area discharges, monitoring requirements and permit limitations of Discharge Condition IV are identical to Discharge Condition I to which the outfall discharge has reverted.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method. A "no flow" situation is not considered to be a sample of the discharge.

\*\*\* One sample per month (1/month) shall be collected if and/or when a discharge occurs under either Discharge Condition I, II or IV and analyzed for the parameters identified in the table above. In addition, at least three (3) grab samples shall be taken each quarter from separate precipitation events under Discharge Condition III and analyzed for parameters indicated in the above table. For quarters in which there are less than 3 such precipitation events, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s).

The water quality standards for sulfate and chloride must be met in discharges from the above referenced outfall as well as in the receiving stream.

\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 13 for the discharges from Outfall 002 and unnamed tributary to Marys River receiving such discharges.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

NPDES Coal Mine Permit

NPDES Permit No. IL0062189

Effluent Limitations and Monitoring

Upon completion of Special Condition 10 and approval from the Agency, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 003 (Reclamation Area Drainage)

Discharge Condition	Parameters					
	pH** (S.U.) ***	Sulfate (mg/l) ***	Chloride (mg/l) ***	Hardness ***	Flow (MGD)	Settleable Solids (ml/l) ***
I	6.5-9.0	500	500	Monitor only	Measure When Sampling	0.5
II	6.0-9.0	500	500	Monitor only	Measure When Sampling	0.5
III	6.0-9.0	500	500	Monitor only	Measure When Sampling	-
IV	6.5-9.0	500	500	Monitor only	Measure When Sampling	0.5

- I Dry weather discharge (base flow, if present) from the outfall.
- II In accordance with 35 Ill. Adm. Code 406.109(b), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations. The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.109(c), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.109(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. For reclamation area discharges, monitoring requirements and permit limitations of Discharge Condition IV are identical to Discharge Condition I to which the outfall discharge has reverted.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method. A "no flow" situation is not considered to be a sample of the discharge.

\*\*\* One sample per month (1/month) shall be collected if and/or when a discharge occurs under either Discharge Condition I, II or IV and analyzed for the parameters identified in the table above. In addition, at least three (3) grab samples shall be taken each quarter from separate precipitation events under Discharge Condition III and analyzed for parameters indicated in the above table. For quarters in which there are less than 3 such precipitation events, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s).

The water quality standards for sulfate and chloride must be met in discharges from the above referenced outfall as well as in the receiving stream.

\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 15 for the discharges from Outfall 003 and unnamed tributary to Marys River receiving such discharges.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

NPDES Coal Mine Permit  
 NPDES Permit No. IL0062189  
 Effluent Limitations and Monitoring

Upon completion of Special Condition 10 and approval from the Agency, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 006, 011, 012 (Reclamation Area Drainage)

Discharge Condition	Parameters					
	pH** (S.U.) ***	Sulfate (mg/l) ***	Chloride (mg/l) ***	Hardness ***	Flow (MGD)	Settleable Solids (ml/l) ***
I	6.5-9.0	1366	500	Monitor only	Measure When Sampling	0.5
II	6.0-9.0	1366	500	Monitor only	Measure When Sampling	0.5
III	6.0-9.0	1366	500	Monitor only	Measure When Sampling	-
IV	6.5-9.0	1366	500	Monitor only	Measure When Sampling	0.5

- I Dry weather discharge (base flow, if present) from the outfall.
- II In accordance with 35 Ill. Adm. Code 406.109(b), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations. The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.109(c), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.109(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. For reclamation area discharges, monitoring requirements and permit limitations of Discharge Condition IV are identical to Discharge Condition I to which the outfall discharge has reverted.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method. A "no flow" situation is not considered to be a sample of the discharge.

\*\*\* One sample per month (1/month) shall be collected if and/or when a discharge occurs under either Discharge Condition I, II or IV and analyzed for the parameters identified in the table above. In addition, at least three (3) grab samples shall be taken each quarter from separate precipitation events under Discharge Condition III and analyzed for parameters indicated in the above table. For quarters in which there are less than 3 such precipitation events, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s).

The water quality standards for sulfate and chloride must be met in discharges from the above referenced outfall as well as in the receiving stream.

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\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 13 for the discharges from Outfall 006, 011 and 012 and unnamed tributary to Plum Creek receiving such discharges.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

NPDES Coal Mine Permit  
 NPDES Permit No. IL0062189  
 Effluent Limitations and Monitoring

Upon completion of Special Condition 10 and approval from the Agency, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 007 (Reclamation Area Drainage)

Discharge Condition	Parameters					
	pH** (S.U.) ***	Sulfate (mg/l) ***	Chloride (mg/l) ***	Hardness ***	Flow (MGD)	Settleable Solids (ml/l) ***
I	6.5-9.0	2198	500	Monitor only	Measure When Sampling	0.5
II	6.0-9.0	2198	500	Monitor only	Measure When Sampling	0.5
III	6.0-9.0	2198	500	Monitor only	Measure When Sampling	-
IV	6.5-9.0	2198	500	Monitor only	Measure When Sampling	0.5

- I Dry weather discharge (base flow, if present) from the outfall.
- II In accordance with 35 Ill. Adm. Code 406.109(b), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations. The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.109(c), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.109(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. For reclamation area discharges, monitoring requirements and permit limitations of Discharge Condition IV are identical to Discharge Condition I to which the outfall discharge has reverted.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method. A "no flow" situation is not considered to be a sample of the discharge.

\*\*\* One sample per month (1/month) shall be collected if and/or when a discharge occurs under either Discharge Condition I, II or IV and analyzed for the parameters identified in the table above. In addition, at least three (3) grab samples shall be taken each quarter from separate precipitation events under Discharge Condition III and analyzed for parameters indicated in the above table. For quarters in which there are less than 3 such precipitation events, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s).

The water quality standards for sulfate and chloride must be met in discharges from the above referenced outfall as well as in the receiving stream.

\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 13 for the discharges from Outfall 007 and unnamed tributary to Marys River receiving such discharges.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

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 Effluent Limitations and Monitoring

Upon completion of Special Condition 10 and approval from the Agency, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 008, 009 (Reclamation Area Drainage)

Discharge Condition	Parameters					
	pH** (S.U.) ***	Sulfate (mg/l) ***	Chloride (mg/l) ***	Hardness ***	Flow (MGD)	Settleable Solids (ml/l) ***
I	6.5-9.0	2004	500	Monitor only	Measure When Sampling	0.5
II	6.0-9.0	2004	500	Monitor only	Measure When Sampling	0.5
III	6.0-9.0	2004	500	Monitor only	Measure When Sampling	-
IV	6.5-9.0	2004	500	Monitor only	Measure When Sampling	0.5

- I Dry weather discharge (base flow, if present) from the outfall.
- II In accordance with 35 Ill. Adm. Code 406.109(b), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations. The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.109(c), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.109(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. For reclamation area discharges, monitoring requirements and permit limitations of Discharge Condition IV are identical to Discharge Condition I to which the outfall discharge has reverted.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method. A "no flow" situation is not considered to be a sample of the discharge.

\*\*\* One sample per month (1/month) shall be collected if and/or when a discharge occurs under either Discharge Condition I, II or IV and analyzed for the parameters identified in the table above. In addition, at least three (3) grab samples shall be taken each quarter from separate precipitation events under Discharge Condition III and analyzed for parameters indicated in the above table. For quarters in which there are less than 3 such precipitation events, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s).

The water quality standards for sulfate and chloride must be met in discharges from the above referenced outfall as well as in the receiving stream.

\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 13 for the discharges from Outfall 008, 009 and unnamed tributary to Marys River receiving such discharges.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

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 Effluent Limitations and Monitoring

Upon completion of Special Condition 10 and approval from the Agency, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfall\*: 010 (Reclamation Area Drainage)

Discharge Condition	Parameters					
	pH** (S.U.) ***	Sulfate (mg/l) ***	Chloride (mg/l) ***	Hardness ***	Flow (MGD)	Settleable Solids (ml/l) ***
I	6.5-9.0	1301	500	Monitor only	Measure When Sampling	0.5
II	6.0-9.0	1301	500	Monitor only	Measure When Sampling	0.5
III	6.0-9.0	1301	500	Monitor only	Measure When Sampling	-
IV	6.5-9.0	1301	500	Monitor only	Measure When Sampling	0.5

- I Dry weather discharge (base flow, if present) from the outfall.
- II In accordance with 35 Ill. Adm. Code 406.109(b), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period less than or equal to the 10-year, 24-hour precipitation event (or snowmelt or equivalent volume) shall comply with the indicated limitations. The 10-year, 24-hour precipitation event for this area is considered to be 4.76 inches.
- III In accordance with 35 Ill. Adm. Code 406.109(c), any discharge or increase in the volume of a discharge caused by precipitation within any 24-hour period greater than the 10-year, 24-hour precipitation event (or snowmelt of equivalent volume) shall comply with the indicated limitations instead of those in 35 Ill. Adm. Code 406.109(b).
- IV Discharges continuing 24 hours after cessation of precipitation event that resulted in discharge. For reclamation area discharges, monitoring requirements and permit limitations of Discharge Condition IV are identical to Discharge Condition I to which the outfall discharge has reverted.

Sampling during all Discharge Conditions shall be performed utilizing the grab sampling method. A "no flow" situation is not considered to be a sample of the discharge.

\*\*\* One sample per month (1/month) shall be collected if and/or when a discharge occurs under either Discharge Condition I, II or IV and analyzed for the parameters identified in the table above. In addition, at least three (3) grab samples shall be taken each quarter from separate precipitation events under Discharge Condition III and analyzed for parameters indicated in the above table. For quarters in which there are less than 3 such precipitation events, a grab sample of the discharge shall be required whenever such precipitation event(s) occur(s).

The water quality standards for sulfate and chloride must be met in discharges from the above referenced outfall as well as in the receiving stream.

\* The Permittee is subject to the limitations, and monitoring and reporting requirements of Special Condition No. 13 for the discharges from Outfall 010 and unnamed tributary to Lick Branch receiving such discharges.

\*\* No discharge is allowed from any above referenced permitted outfall during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

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Effluent Limitations and Monitoring

Upon completion of Special Condition No. 11 and approval from the Agency, the effluent of the following discharge shall be monitored and limited at all times as follows:

Outfalls: 001, 002, 003, 006, 007, 008, 009, 010, 011, 012 (Stormwater Discharge)

Parameters	
pH* (S.U.) **	Settleable Solids (ml/l) **
6.0-9.0	0.5

Stormwater discharge monitoring is subject to the following reporting requirements:

Analysis of samples must be submitted with second quarter Discharge Monitoring Reports.

If discharges can be shown to be similar, a plan may be submitted by November 1 of each year preceding sampling to propose grouping of similar discharges and/or updated previously submitted groupings. If updating of a previously submitted plan is not necessary, a written notification to the Agency, indicating such is required. Upon approval from the Agency, one representative sample for each group may be submitted.

Annual stormwater monitoring is required for all discharges until Final SMCRA Bond is released and approval to cease such monitoring is obtained from the Agency.

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\* No discharge is allowed from any above referenced permitted outfalls during "low flow" or "no flow" conditions in the receiving stream unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302.204 for pH.

\*\* One (1) sample per year shall be collected and analyzed for the indicated parameter; however, such sampling and analysis is required only if and/or when a discharge occurs from the individual Outfall(s) identified above.

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Authorization is hereby granted to the above designee to construct and operate the mine and mine refuse area described as follows:

The surface facilities of an underground mine containing 922.07 acres, located in Sections 15, 16, 21, 22, 26 and 27, T4S, R5W, and Section 12 & 13, T5S, R5W, Randolph County. The total area cited herein includes modifications discussed below.

Facilities located at this site include a preparation plant with a closed circuit fine coal (slurry) system, rail loop, fine and coarse refuse disposal areas, fresh water lake, access roads, buildings, drainage control and piping systems and overland belt conveyer system.

As described in IEPA Log Nos. 5174-03 and 3223-05 the surface facilities have been modified to incorporate an additional coal stockpile and coal load-out facility and remove the thickener pond, respectively. All runoff from these modified surface facilities is tributary to existing sedimentation basins.

In accordance with IEPA Log No. 2358-06 a pole building with concrete pad and topsoil stockpiles will be constructed. These additions to the surface facilities located within the watershed of freshwater lake and Outfall 009.

The following additional areas are being incorporated into the NPDES Permit under this Construction Authorization.

As proposed and described in IEPA Log No. 3283-05, 2.0 acres are incorporated into this permit to accommodate construction of an access road. Alternate sediment control measures will be used for this area instead of a sedimentation basin. All runoff from this area shall be monitored in accordance with stormwater monitoring requirements of Special Condition No. 12 of this NPDES Permit. This additional area is included in the total permit acreage cited above.

An additional 5.18 acres as described in IEPA Log No. 2355-06 are incorporated into this permit for construction of a helicopter pad. Alternate sediment control measures will be used for this area instead of a sedimentation basin. All runoff from this area shall be monitored in accordance with stormwater monitoring requirements of Special Condition No. 12 of this NPDES Permit. This additional area is included in the total permit acreage cited above.

As proposed and described in IEPA Log No. 2356-06, 15.5 acres are incorporated into this permit for development and expansion of the fine coal (slurry) refuse disposal area. The fine coal refuse disposal expansion will consist of the development of Slurry Cell No. 4 as described and depicted in IEPA Log No 2469-05. Runoff from the additional area and the expanded slurry disposal operation will initially be tributary to basin and Outfall 006. Drainage from this area will later be revised to become tributary to the surface drainage control system developed with the construction of Slurry Cell No. 5 discussed below. Refer to Condition No. 15 for groundwater monitoring requirements. This additional area is included in the total permit acreage cited above.

As proposed in IEPA Log No. 9362-09 and previously approved under Subtitle D Permit No. 2010-MO-9362, 3.5 acres is incorporated into this permit for development of an airshaft for the underground mining operations. Surface runoff from this area will be controlled with the use of mulch, silt fencing and/or straw bale containment check dams and by timely revegetation of all areas distributed for construction activities (with exception of rocked areas) and shall be monitored in accordance with stormwater monitoring requirements of Special Condition No. 12 of this NPDES Permit. This additional area is included in the total permit acreage cited above. This area was subsequently modified as discussed below to incorporate a sedimentation basin and Outfall 010 for treatment of underground pumpage.

As proposed in IEPA Log No. 9561-09, 20.00 acres are incorporated into this permit for a soil borrow area to obtain cover material for future reclamation of refuse disposal Cells 1, 2, 3 and 4. Runoff from this additional area will be tributary to Pond and Outfall 009. This additional area is included in the total permit acreage cited above.

An additional 36.00 acres as depicted in IEPA Log No. 6172-12 and located immediately west of the 20.00 acre area depicted in IEPA Log No. 9561-09 as described above are being incorporated into this NPDES Permit as a potential future soil borrow area. This 36.00 acres area was subsequently over-permitted by OMM Permit No. 426 as described below.

As proposed in IEPA Log No. 8233-10, 1.0 acre is incorporated into this permit for installation of a rock dust borehole facility. Alternate sediment control measures will be used for this area instead of a sedimentation basin. All runoff from this area shall be monitored in accordance with stormwater monitoring requirements of Special Condition No. 12 of this NPDES Permit. This additional area is included in the total permit acreage cited above.

As proposed in IEPA Log No. 7317-11 and previously approved under 2011-MA-7317, 1.0 acre is incorporated into this permit for installation of a rock dust borehole. This area is located in Section 14, Township 5 South, Range 5 West, Randolph County. Alternate drainage control will be provided by silt fence, straw bale dikes and vegetation. Runoff from this area shall be monitored in accordance with Special Condition No. 12. This additional area is included in the total permit acreage cited above.

An additional 1.5 acres located adjacent to the railroad loop access road is being incorporated into this NPDES Permit. This additional area is included in the total permit acreage cited above.

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As proposed in IEPA Log No. 4279-14 and 4279-14-C, 100.00 acres identified as OMM Permit No. 426 are incorporated into this permit for construction and development of Slurry Cell No. 5 which is located immediately west of Slurry Cell No. 4. Runoff from this additional area and the expanded slurry disposal operation will be tributary to Basins 011 (Cell A and Cell B) and 012 (Cell A and Cell B). Groundwater monitoring for the slurry Cell No. 5 area will include monitoring Well Nos. W3-08R, W3-11, W3-12, W3-13, W3-14, W3-15 and W3-16. Surface drainage control and groundwater protection for this area is discussed in more detail farther below. Refer to Condition No. 15 for groundwater monitoring requirements. This additional area is included in the total permit acreage cited above.

As proposed and described in IEPA Log No. 4555-14, 20.00 acres are incorporated in to this permit for soil stockpiling. Runoff from the northern portion of this additional area will be tributary to basin and Outfall 001, Cell B, located in the OMM Permit 426 area. The southern portion of the affected area will be tributary to NPDES Outfall 008. This additional area is included in the total permit acreage cited above.

Pursuant to information contained in IEPA Log No. 1552-07, monitoring of Outfall 005 has been terminated and the 20.00 acre area tributary to this basin has been abandoned from this permit as the watershed to this basin has been reclaimed in accordance with 35 Ill. Adm. Code 405.109 and the approved abandonment plan for the area; therefore, Outfall 005 has been deleted from this Permit.

Surface drainage control at this facility consists of ten (10) sedimentation basins with discharges designated and located as indicated below:

Location and receiving stream of the Outfalls at this facility is as follows:

Outfall Number	Latitude			Longitude			Receiving Water
	DEG	MIN	SEC	DEG	MIN	SEC	
001	38°	09'	15"	89°	37'	00"	Unnamed tributary to Marys River
002	38°	10'	27"	89°	38'	01"	Unnamed tributary to Marys River
003	38°	10'	27"	89°	38'	01"	Unnamed tributary to Marys River
006	38°	10'	43"	89°	38'	45"	Unnamed tributary to Plum Creek
007	38°	09'	06"	89°	36'	49"	Unnamed tributary to Marys River
008	38°	09'	39"	89°	38'	23"	Unnamed tributary to Marys River
009	38°	09'	39"	89°	38'	22"	Unnamed tributary to Marys River
010	38°	05'	30"	89°	36'	12"	Unnamed tributary to Lick Branch
011	38°	10'	21"	89°	39'	06"	Unnamed tributary to Plum Creek
012	38°	10'	44"	89°	39'	06"	Unnamed tributary to Plum Creek

Surface drainage is controlled at this facility as follows:

Basin and Outfall 001 receives runoff from the belt slope and transfer area. Outfalls 002, 003 and 006 receive runoff from the refuse disposal outslope areas and potential refuse contact drainage. Basin with discharge designated as Outfall 007 will control runoff from the office and parking lot, storage areas, shaft and underground pumpage.

As previously approved under Subtitle D Permit No. 2014-MO-4344, and described and depicted in IEPA Log Nos. 6240-12 and 4344-14, two cells identified as East Basin and West Basin (Harp Pond) have been constructed to improve the discharge water quality from Outfall 008. At such time that proposed Outfall 009 is approved under this permit, the discharge structure from the West Basin will be modified to direct flow to Outfall 009. The receiving waters for Outfall 009 will be the Fresh Water Lake which discharges to unnamed tributary to Marys River. When Outfall 009 becomes active, the watershed to Outfall 008 will be reduced to an area of approximately 2.0 acres of stormwater runoff.

As proposed in IEPA Log No. 4344-14, however not previously approved under the Subtitle D Permit No. 2014-MO-4344 discussed above, under this NPDES Permit a drop inlet spillway may be installed in the Recirculation Lake to convey any overflow into the East Basin.

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As previously approved under Subtitle D Permit No. 2014-MO-4343, and described in IEPA Log No. 4343-14, an additional sediment cell identified as Basin 012 Cell B was approved to be constructed upstream of Basin and Outfall 006 to further improve the discharge water quality from this Outfall. The addition of Basin 012 Cell B approved under this permit proposed no additional loading or expansion of Outfall 006 as this area was tributary to the referenced Outfall. Under this NPDES Permit basin, Outfall 006 will be eliminated with the construction and development of Slurry Cell 5. At such time that Basin 006 is eliminated, the discharge from Basin 012 Cell B will be redirected to Basin 012 Cell A which will be constructed with the development of Slurry Cell 5 (OMM Permit No. 426).

As previously approved under Subtitle D Permit No. 2014-MO-4345, and described in IEPA Log No. 4345-14, a 12.5" I.D. (inside diameter) HDPE pipe will be installed to direct the low flows from the Cell 2 refuse disposal area which will result from coarse refuse being placed within this RDA as part of the reclamation of this area. The low flows will be directed through the bypass HDPE pipe to a down drain structure which will convey this flow to the closed slurry circuit system (Recirculation Pond). High flows due to rainfall will overflow the bypass pipe and will continue to be conveyed through Drain D to Pond and Outfall 002. As this bypass pipe is proposed to facilitate reclamation activities, this pipe shall be removed or grouted throughout the entire length as part of final reclamation of the facility.

As proposed in IEPA Log No. 8455-10 and 8455-10-A, basin and Outfall 010 will be constructed at the south airshaft area previously approved under Subtitle D Permit No. 2010-MO-9362 as discussed above. This basin will treat underground pumpage from the airshaft.

As proposed and described in IEPA Log No. 4279-14 and 4279-14-C (OMM Permit No. 426 area), four (4) basin cells with two discharges identified as Outfalls 011 and 012 will be constructed to control the runoff from the out slopes of Refuse Disposal Area Cell 5. Outfall 011 will be the discharge from Basin 011 Cell A and Outfall 012 will be the discharge from Basin 012 Cell A. It is noted that as discussed above Basin 012 Cell B was previously approved to be constructed. At such a time that Basin 012 Cell A is constructed and the discharge from Basin 012 Cell B will be directed to Cell A, the construction of the RDA Cell 5 will eliminate Basin and Outfall 006.

Coarse and fine coal refuse was previously disposed in refuse disposal areas identified as Slurry Cell Nos. 1, 2, and 3. Additional Slurry Cell Nos. 4 and 5 are incorporated under this permit.

Foundation preparation for Slurry Cell No. 5 shall consist of the construction of a four (4) foot compacted clay liner. Compacted clay liners of four (4) foot thickness shall also be constructed for Sedimentation Basins 011 (Cell A and Cell B) and 012 (Cell A and Cell B). The liner geometry for Slurry Cell No. 5, the surrounding embankment and all sedimentation basin cells will consist of scarification and re-compaction of twelve (12) inches of in-situ material overlain by three (3) successive lifts of twelve (12) inches of material. The final compacted total thickness of these liners shall be a minimum of forty-eight (48) inches.

All drainage control structures (ditches) associated with or conveying runoff from Slurry Cell No. 5 shall also be constructed by scarification and re-compaction of eight (8) inches of in-situ material overlain by three (3) successive lifts of eight (8) inches of material. The final compacted total thickness of the liners constructed for these drainage control structures shall be a minimum of thirty-two (32) inches.

Construction of all four (4) foot compacted clay liners for the slurry cell, sedimentation basins and associated ditches shall also be subject to and in accordance with the specifications and testing requirements of Condition No. 12. With prior Agency approval as to thickness and installation procedures, an HDPE synthetic liner may be utilized in lieu of the compacted clay liners proposed for the sedimentation basin cells and drainage control structures.

The following previous approvals for utilization of water treatment plant lime sludge are hereby incorporated into this NPDES Permit:

As previously approved under Subtitle D Permit No. 2006-MD-7331, water treatment plant lime sludge from the City of Collinsville and Rend Lake Conservancy District may be utilized for neutralization of potentially acidic coarse and fine (slurry) refuse areas as described in IEPA Log Nos. 3456-05 and 2237-06, respectively. Lime sludge may be applied to Cell 1, Cell 2, Cell 3 Phase 1 and Cell 3 Phase 2. Utilization of lime sludge from these sources is subject to Condition No. 13.

As previously approved under Subtitle D Permit No. 2012-MD-6235, water treatment Plant Lime Sludge from Prairie State Generating Station (PSGS) may be used as an agricultural lime substitute on the coarse and fine refuse disposal areas as described in IEPA Log No. 6235-12. The PSGS material may be utilized to neutralize the coarse refuse and slurry Cells 1, 2, 3 and 4. Utilization of lime sludge from these sources is subject to Condition No. 13.

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As proposed and described in IEPA Log No. 9071-09, water treatment plant lime sludge from the Liberty Missouri Treatment Plant may be utilized as an amendment material on the coarse refuse and fine coal (slurry) disposal areas. Lime sludge may be applied to areas Cell 1, Cell 2, Cell 3 Phase 1 and Cell 3 Phase 2. Utilization of water treatment lime sludge for coal refuse neutralization is subject to requirements of Condition No. 13.

Application rates for any combination of water treatment plant lime sludge approved herein shall not exceed 500 tons per acre on coarse refuse material or 150 tons per acre on fine coal refuse material.

The following previous approvals for coal combustion waste disposal are hereby incorporated into this NPDES Permit:

As described in IEPA Log No. 0146-08 and previously approved under Subtitle D Permit No. 2008-MW-0146, coal combustion waste from sources identified as Anheuser Busch, University of Illinois (gypsum/ash mixture) and SIU-Carbondale (fly/bottom ash mixture) is approved for disposal in areas depicted in IEPA Log No. 0146-08. Disposal of CCW in approved areas shall be in accordance with procedures outlined in IEPA Log No. 0080-98 which was originally approved under Subtitle D Permit No. 2002-MW-6440-1 and which is replaced by the above referenced Subtitle D Permit. Annual disposal of CCW from Anheuser Busch, University of Illinois and SIU-Carbondale shall be limited to 25,000, 37,000 and 12,000 tons, respectively. Disposal of CCW from the sources approved herein shall be subject to the requirements of Condition No. 14. Monitoring of groundwater Well Nos. W3-04, W3-08 and W3-09, associated with CCW disposal, shall be as outlined in Condition No. 15.

Groundwater monitoring at this facility includes Well Nos. W3-04, W3-05, W3-06, W3-07, W3-08, W3-08R, W3-09, W3-10, W3-11, W3-12, W3-13, W3-14, W3-15 and W3-16. It is noted that Well Nos. W3-04, W3-05, W3-06, W3-07, W3-08, W3-09, W3-10, are also identified as GWM-4, GWM-5, GWM-6, GWM-7, GWM-8, GWM-9 and GWM-10 respectively. Monitoring requirements for wells located at this facility are outlined in Condition No. 15.

This Permit is being transferred from Coulterville Coal Company, L.L.C.-Gateway Mine to Peabody Coulterville Mining, L.L.C.-Gateway Mine.

All water remaining upon abandonment must meet the requirements of 35 Ill. Adm. Code 406.202. For the constituents not covered by Parts 302 or 303, all water remaining upon abandonment must meet the requirements of 35 Ill. Adm. Code 406.106.

This Construction Authorization supersedes and replaces Construction Authorization No. 7086-91 and State Permit Nos. 2002-MW-6440-1, 2006-MD-7331, 2008-MW-0146 and 2010-MO-9362, 2012-MD-6235, 2012-MO-6240, 2014-MO-4343, 2014-MO-4344 and 2014-MO-4345 previously issued for the herein permitted facilities and activities.

The abandonment plan shall be executed and completed in accordance with 35 Ill. Adm. Code 405.109.

This Authorization is issued subject to the following Conditions. If such Conditions require additional or revised facilities, satisfactory engineering plan documents must be submitted to this Agency for review and approval to secure issuance of a Supplemental Authorization to Construct.

1. If any statement or representation is found to be incorrect, this permit may be revoked and the permittee thereupon waives all rights thereunder.
2. The issuance of this permit (a) shall not be considered as in any manner affecting the title of the premises upon which the mine or mine refuse area is to be located; (b) does not release the permittee from any liability for damage to person or property caused by or resulting from the installation, maintenance or operation of the proposed facilities; (c) does not take into consideration the structural stability of any units or parts of the project; and (d) does not release the permittee from compliance with other applicable statutes of the State of Illinois, or with applicable local laws, regulations or ordinances.
3. Final plans, specifications, application and supporting documents as submitted by the person indicated on Page 1 as approved shall constitute part of this permit in the records of the Illinois Environmental Protection Agency.
4. There shall be no deviations from the approved plans and specifications unless revised plans, specifications and application shall first have been submitted to the Illinois Environmental Protection Agency and a supplemental permit issued.

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5. The permit holder shall notify the Environmental Protection Agency (217/782-3637) immediately of an emergency at the mine or mine refuse area which causes or threatens to cause a sudden discharge of contaminants into the waters of Illinois and shall immediately undertake necessary corrective measures as required by 35 Ill. Adm. Code 405.111. (217/782-3637 for calls between the hours of 5:00 p.m. to 8:30 a.m. and on weekends.)
6. The termination of an NPDES discharge monitoring point or cessation of monitoring of an NPDES discharge is not authorized by this Agency until the permittee submits adequate justification to show what alternate treatment is provided or that untreated drainage will meet applicable effluent and water quality standards.
7. Initial construction activities in areas to be disturbed shall be for collection and treatment facilities only. Prior to the start of other activities, surface drainage controls shall be constructed and operated to avoid violations of the Act or Subtitle D. At such time as runoff water is collected in the sedimentation pond, a sample shall be collected and analyzed, for the parameters designated as 1M through 15M under Part 5-C of Form 2C and the effluent parameters designated herein with the results sent to this Agency. Should additional treatment be necessary to meet the standards of 35 Ill. Adm. Code 406.106, a Supplemental Permit must be obtained. Discharge from ponds is not allowed unless applicable effluent and water quality standards are met in the basin discharge(s).
8. This Agency must be informed in writing and an application submitted if drainage, which was previously classified as alkaline (pH greater than 6.0), becomes acid (pH less than 6.0) or ferruginous (base flow with an iron concentration greater than 10 mg/l). The type of drainage reporting to the basin should be reclassified in a manner consistent with the applicable rule of 35 Ill. Adm. Code 406 as amended in R84-29 at 11 Ill. Reg. 12899. The application should discuss the treatment method and demonstrate how the discharge will meet the applicable standards.
9. A permittee has the obligation to add a settling aid if necessary to meet the suspended solids or settleable solids effluent standards. The selection of a settling aid and the application practice shall be in accordance with a. or b. below
  - a. Alum ( $Al_2(SO_4)_3$ ), hydrated lime ( $Ca(OH)_2$ ), soda ash ( $Na_2CO_3$ ), alkaline pit pumpage, acetylene production by-product (tested for impurities), and ground limestone are acceptable settling aids and are hereby permitted for alkaline mine drainage sedimentation ponds.
  - b. Any other settling aids such as commercial flocculents and coagulants are permitted only on prior approval from the Agency. To obtain approval a permittee must demonstrate in writing to the Agency that such use will not cause a violation of the toxic substances standard of 35 Ill. Adm. Code 302.210 or of the appropriate effluent and water quality standards of 35 Ill. Adm. Code parts 302, 304, and 406.
10. A general plan for the nature and disposition of all liquids used to drill boreholes shall be filed with this Agency prior to any such operation. This plan should be filed at such time that the operator becomes aware of the need to drill unless the plan of operation was contained in a previously approved application.
11. Any of the following shall be a violation of the provisions required under 35 Ill. Adm. Code 406.202:
  - a. It is demonstrated that an adverse effect on the environment in and around the receiving stream has occurred or is likely to occur.
  - b. It is demonstrated that the discharge has adversely affected or is likely to adversely affect any public water supply.
  - c. The Agency determines that the permittee is not utilizing Good Mining Practices in accordance with 35 Ill. Adm. Code 406.204 which are fully described in detail in Sections 406.205, 406.206, 406.207 and 406.208 in order to minimize the discharge of total dissolved solids, chloride, sulfate, iron and manganese. To the extent practical, such Good Mining Practices shall be implemented to:
    - i. Stop or minimize water from coming into contact with disturbed areas through the use of diversions and/or runoff controls (Section 406.205).
    - ii. Retention and control within the site of waters exposed to disturbed materials utilizing erosion controls, sedimentation controls, water reuse or recirculation, minimization of exposure to disturbed materials, etc. (Section 406.206).

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- iii. Control and treatment of waters discharged from the site by regulation of flow of discharges and/or routing of discharges to more suitable discharge locations (Section 406.207).
  - iv. Utilized unconventional practices to prevent the production or discharge of waters containing elevated contaminant concentrations such as diversion of groundwater prior to entry into a surface or underground mine, dewatering practices to remove clean water prior to contacting disturbed materials and/or any additional practices demonstrated to be effective in reducing contaminant levels in discharges (Section 406.208).
12. The four (4) foot thick compacted clay liners to be constructed beneath Refuse Disposal Area Cell 5, Sedimentation Basins 011 Cell A and B and 012 Cell A and B as well as the thirty-two (32) inch compacted clay liners to be constructed in all associated and connecting drainage control structures shall be subject to the following specifications and procedures.

**Construction Specifications**

- a. All soils to be used for compacted clay liner shall be free of grass, vines, vegetation, and rock or stones greater than 4 inches in diameter.
- b. At the location of the compacted clay liners, approximately 18 inches of material shall be removed following topsoil removal. Approximately 6 inches of the resulting base material shall be scarified and re-compacted to achieve the minimum permeability requirements cited below.
- c. Each successive soil lift shall be placed to a loose thickness sufficient to result in a compacted lift of approximately 8 or 12 inches, as appropriate.
- d. Each soil lift shall be compacted to the minimum Standard Proctor (ASTM D698) density identified in Item No. 12(q) below, at moisture content 0% to 5% above the optimum moisture content of the soil.
- e. Inter-lift surfaces shall be adequately scarified to ensure inter-lift bonding.
- f. Liner construction shall be performed to ensure consistent achievement of density, moisture content, and hydraulic conductivity for each successive lift.
- g. The placement of frozen material or the placement of material on frozen ground shall be prohibited.
- h. Contemporaneous placement or protective covering shall be provided to prevent drying, desiccation and/or freezing where necessary.
- i. Liner construction shall be completed in a manner which reduces void spaces within the soil and liner.
- j. All construction stakes shall be removed during construction, and all test holes are to be backfilled with bentonite.
- k. The compacted clay liner shall be constructed in a manner to achieve a uniform barrier with a hydraulic conductivity of  $1 \times 10^{-7}$  cm/sec.
- l. In the event that acceptable compaction results are not achieved, the soil lift shall be re-processed or removed and replaced. If moisture content is less than optimum, or greater than 5% above optimum, the failing material shall be wetted or dried to moisture content within specification and re-compacted. If the dry density is below specification, the failing material shall be re-compacted until a passing test is achieved.
- m. In the event of a failing conductivity test, the soil may be removed or re-compacted and retested until a passing result is obtained; or the soil immediately above and below the test specimen from the same Shelby tube may be tested. If both tests pass, the original test shall be nullified. If either test fails, that portion of the liner shall be rejected and shall be reconstructed and retested until passing results are obtained. The limits of necessary reconstruction shall be determined by additional sampling and testing within the failed region, thereby isolating the failing area of work.

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**Testing Specifications**

- n. Prior to initiating soil liner construction, borrow soils shall be identified, qualified, and verified. At a minimum, a representative sample of each soil type identified within the borrow area is to be collected and analyzed for gradation, compaction, and hydraulic conductivity characteristics.
  - o. Samples collected from the borrow area shall be evaluated in accordance with ASTM D422, D4318 and D2487 to ensure classification criteria are met.
  - p. Samples collected from the borrow area shall be tested in accordance with ASTM D698 to determine maximum dry density and optimum moisture content of the soil.
  - q. Samples collected from the borrow area shall be compacted to 90% and 95% standard Proctor density at or near optimum moisture content. The hydraulic conductivity of the re-compacted samples shall be determined in accordance with ASTM D5084 procedures. The results of this testing shall be used to establish the minimum dry density for soil liner compaction necessary to achieve a hydraulic conductivity of  $1 \times 10^{-7}$  cm/sec or less.
  - r. Moisture and density testing by nuclear methods (ASTM D2922 and D3017) shall be conducted at a rate of at least one test per 1 acre per lift placed. Testing locations shall be random, and shall not be known to the earthwork contractor prior to lift placement.
  - s. Survey checks shall be conducted along established cross-sections to verify liner thickness. To verify liner thickness, the survey checks shall be taken before and after liner construction.
13. Annual analysis of the water treatment plant lime sludge shall be submitted to this Agency in accordance with Special Condition No. 3 of this NPDES Permit on or before December 31<sup>st</sup> of each year in which this material is utilized. Such annual analyses shall be performed utilizing test method ASTM D3987-85 and shall include the following constituents:

Aluminum	Cyanide	Silver
Antimony	Fluoride	Sulfate
Arsenic	Iron	Thallium
Barium	Lead	Total Dissolved Solids
Beryllium	Manganese	Vanadium
Boron	Mercury	Zinc
Cadmium	Molybdenum	pH
Chloride	Nickel	
Chromium	Selenium	
Cobalt		
Copper		

In addition quarterly notification of the volume (tonnage) of water treatment plant lime sludge utilized shall be submitted to this Agency. These quarterly reports shall be submitted on the schedule outlined in Special Condition No. 5 of this Permit.

14. Coal Combustion Waste disposal shall be subject to the following:
- a. Coal Combustion Waste analysis shall be conducted as follows:

A Toxicity Characteristics Leaching Procedure (TCLP) shall be conducted for the following contaminants:

Aluminum	Cobalt	Phenol
Antimony	Copper	Selenium
Arsenic	Iron	Silver
Barium	Lead	Thallium
Beryllium	Manganese	Vanadium
Boron	Mercury	Zinc
Cadmium	Molybdenum	
Chromium	Nickel	

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An appropriate leaching procedure shall be conducted for the following contaminants:

Chloride	Fluoride	Sulfate
Cyanide		

An appropriate laboratory analysis on a slurry paste shall include the following:

Acidity (CaCO<sub>3</sub> Equivalent)  
 Alkalinity (CaCO<sub>3</sub> Equivalent)  
 pH  
 Total Dissolved Solids

A quarterly analysis of each individual coal combustion waste approved herein and a CCW/refuse weighted composite shall be submitted to this Agency. The quarterly analysis is required only for quarters during which CCW disposal occurs. For quarters during which no CCW disposal occurs, a written notification to the Agency indicating such is required.

The quarterly analysis required herein shall include an estimate of the volume of coal combustion waste disposed from each source during the quarter.

Should a new or revised leachate test method be approved by U.S. Environmental Protection Agency, such methodology shall be utilized for coal combustion waste (CCW) analysis in lieu of TCLP analysis required above.

- b. The quarterly TCLP analysis required under Condition 14 (a) above shall be submitted to the Agency in accordance with Special Condition Nos. 3 and 5 of this NPDES Permit.
  - c. Fugitive dust from the coal combustion waste material shall not leave the disposal area. Timely covering, incorporation and/or wetting shall be utilized as necessary to protect exposed surfaces from wind erosion. If during disposal operations, such procedures do not sufficiently control fugitive dust, disposal activities shall cease until such time that more favorable conditions exist or modified operation procedures are proposed and approved by this Agency.
  - d. During periods of inclement weather, the operating procedures may be modified as described in Log No. 0235-98. That is, the CCW delivered to the site may be placed in temporary dumping area located near the preparation plant. The CCW temporarily placed in this area shall be loaded onto the refuse belt and transported to the refuse disposal area within 24 hours from the time of delivery. Fugitive dust from the transfer operation must be controlled as described in Special Condition No. 14 (c).
  - e. Any proposed changes or modifications to the approved conditions, operating procedures waste source or source characteristics require notification and approval by the Agency prior to such changes or modifications being implemented.
15. Groundwater monitoring at this facility consists of Well Nos. W3-04, W3-05, W3-06, W3-07, W3-08, W3-08R, W3-09, W3-10, W3-11, W3-12, W3-13, W3-14, W3-15 and W3-16.
- a. Ambient background monitoring shall be performed for all referenced wells for which such background monitoring has not been previously completed. Such ambient monitoring shall consist of six (6) samples collected during the first year (approximately bi-monthly) following well installation but no later than during the first year of operation or disturbance to determine ambient background concentrations. Background monitoring shall include the following list of constituents:

Aluminum	Fluoride	Sulfate
Antimony	Iron (dissolved)	Thallium
Arsenic	Iron (total)	Total Dissolved Solids
Barium	Lead	Vanadium
Beryllium	Manganese (dissolved)	Zinc
Boron	Manganese (total)	pH
Cadmium	Mercury	Acidity
Chloride	Molybdenum	Alkalinity
Chromium	Nickel	Hardness
Cobalt	Phenols	Static Water Elevation
Copper	Selenium	
Cyanide	Silver	

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Monitoring Well No. W3-16 to be located within the OMM Permit No. 225 area shall be installed within 30 days following permit issuance with ambient background monitoring to be initiated immediately. In the event that Monitoring Well No. W3-16 is installed and background monitoring initiated as required, installation of Monitoring Well Nos. W3-08R, W3-14 and W3-15 may be delayed until such time the Sedimentation Basins 011 and 012 and Slurry Cell No. 5 disposal area construction has progressed to the point that risk has been minimized of these wells being destroyed by construction equipment working in the area

- b. For all existing wells routine monitoring shall be performed on a quarterly basis as follows. In addition, following the ambient monitoring as required under Condition No. 15(a) above, routine monitoring shall continue on a quarterly basis as follows:
  - i. Monitoring Well Nos. W3-04, W3-08, W3-08R, W3-09, W3-11, W3-12, W3-13, W3-14, W3-15 and W3-16 shall continue to be monitored quarterly for the contaminants identified in Condition No. 15(a) above.
  - ii. Monitoring Well Nos. W3-05, W3-06, W3-07 and W3-10 shall be monitored quarterly as required by IDNR/OMM for the following list of constituents:
 

Chloride	Total Dissolved Solids
Iron (dissolved)	Hardness
Iron (total)	Acidity
Manganese (dissolved)	Alkalinity
Manganese (total)	pH
Sulfate	Static Water Elevation
Barium	
- c. Following completion of active mining and reclamation, post-mining monitoring of the above referenced wells shall consist of six (6) samples collected during a 12-month period (approximately bi-monthly) to determine post-mining concentrations. Post-mining monitoring shall include the list of constituents identified in Condition No. 15(a) above.
- d. Groundwater monitoring reports shall be submitted to the Agency in accordance with Special Condition Nos. 3 and 5 of this NPDES permit.
- e. A statistically valid representation of background and/or post mining water quality required under Condition No. 15(a) and 15(c) above shall be submitted utilizing the following method. This method shall be used to determine the upper 95 percent confidence limit for each parameter listed above.

Should the Permittee determine that an alternate statistical method would be more appropriate based on the data being evaluated, the Permittee may request utilization of such alternate methodology. Upon approval from the Agency, the alternate methodology may be utilized to determine a statistically valid representation of background and/or post mining water quality.

This method should be used to predict the confidence limit when single groundwater samples are taken from each monitoring (test) well.

- i. Determine the arithmetic mean  $(\bar{X}_b)$  of each indicator parameter for the sampling period. If more than one well is used, an equal number of samples must be taken from each well.

$$\bar{X}_b = \frac{X_1 + X_2 + \dots + X_n}{n}$$

Where:

$\bar{X}_b$  = Average value for a given chemical parameter

$X_n$  = Values for each sample

n = the number of samples taken

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- ii. Calculate the background and/or post mining variance ( $S_b^2$ ) and standard deviation ( $S_b$ ) for each parameter using the values ( $X_n$ ) from each sample of the well(s) as follows:

$$S_b^2 = \frac{(X_1 - \bar{X}_b)^2 + (X_2 - \bar{X}_b)^2 + \dots + (X_n - \bar{X}_b)^2}{n - 1}$$

$$S_b = \sqrt{S_b^2}$$

- iii. Calculate the upper confidence limit using the following formula:

$$CL = \bar{X}_b \pm t \sqrt{1 + 1/n} (S_b)$$

Where:

CL = upper confidence limit prediction  
(upper and lower limits should be calculated for pH)  
t = one-tailed t value at the required significance level and at n-1 degrees of freedom from Table 1  
(a two-tailed t value should be used for pH)

- iv. If the values of any routine parameter for any monitoring well exceed the upper confidence limit for that parameter, the permittee shall conclude that a statistically significant change has occurred at that well.
- v. When some of the background and/or post mining values are less than the Method Detection Limit (MDL), a value of one-half (1/2) the MDL shall be substituted for each value that is reported as less than the MDL. All other computations shall be calculated as given above.

If all the background and/or post mining values are less than the MDL for a given parameter, the Practical Quantitation Limit (PQL), as given in 35 Ill. Adm. Code Part 724 Appendix I shall be used to evaluate data from monitoring wells. If the analytical results from any monitoring well exceed two (2) times the PQL for any single parameter, or if they exceed the PQLs for two or more parameters, the permittee shall conclude that a statistically significant change has occurred.

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**Table 1**  
Standard t-Tables Level of Significance

Degrees of freedom	t-values (one-tail)		t-values (two-tail)*	
	99%	95%	99%	95%
4	3.747	2.132	4.604	2.776
5	3.365	2.015	4.032	2.571
6	3.143	1.943	3.707	2.447
7	2.998	1.895	3.499	2.365
8	2.896	1.860	3.355	2.306
9	2.821	1.833	3.250	2.262
10	2.764	1.812	3.169	2.228
11	2.718	1.796	3.106	2.201
12	2.681	1.782	3.055	2.179
13	2.650	1.771	3.012	2.160
14	2.624	1.761	2.977	2.145
15	2.602	1.753	2.947	2.131
16	2.583	1.746	2.921	2.120
17	2.567	1.740	2.898	2.110
18	2.552	1.734	2.878	2.101
19	2.539	1.729	2.861	2.093
20	2.528	1.725	2.845	2.086
21	2.518	1.721	2.831	2.080
22	2.508	1.717	2.819	2.074
23	2.500	1.714	2.807	2.069
24	2.492	1.711	2.797	2.064
25	2.485	1.708	2.787	2.060
30	2.457	1.697	2.750	2.042
40	2.423	1.684	2.704	2.021

Adopted from Table III of "Statistical Tables for Biological Agricultural and Medical Research" (1947, R.A. Fisher and F. Yates).

\* For pH only when required.

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**Special Condition No. 1:** No effluent from any mine related facility area under this permit shall, alone or in combination with other sources, cause a violation of any applicable water quality standard as set out in the Illinois Pollution Control Board Rules and Regulations, Subtitle C: Water Pollution.

**Special Condition No. 2:** Samples taken in compliance with the effluent monitoring requirements shall be taken at a point representative of the discharge, but prior to entry into the receiving stream.

**Special Condition No. 3:** All periodic monitoring and reporting forms, including Discharge Monitoring Report (DMR) forms, shall be submitted to the Agency according to the schedule outlined in Special Condition No. 4 or 5 below with one (1) copy forwarded to each of the following addresses:

Illinois Environmental Protection Agency  
Division of Water Pollution Control  
1021 North Grand Ave., East  
P.O. Box 19276  
Springfield, IL 62794-9276

Illinois Environmental Protection Agency  
Mine Pollution Control Program  
2309 West Main Street, Suite 116  
Marion, Illinois 62959

Attn: Compliance Assurance Section

The Permittee may choose to submit electronic DMRs (NetDMR) instead of submitting paper DMRs. Information, including registration information for the NetDMR program can be obtained on the IEPA website, <http://www.epa.state.il.us/water/net-dmr/index.html>.

Should electronic filing (NetDMR) be elected for DMR monitoring and reporting requirements, a written notification shall be submitted to the Mine Pollution Control Program at the Marion, Illinois address indicated above that such electronic monitoring has been elected providing an indication of the date and/or quarter in which this electronic filing will be initiated.

**Special Condition No. 4:** Completed Discharge Monitoring Report (DMR) forms as well as upstream and downstream monitoring results, shall be retained by the Permittee for a period of three (3) months and shall be mailed and received by the IEPA at the addresses indicated in Special Condition No. 3 above in accordance with the following schedule, unless otherwise specified by the permitting authority.

Period	Received by IEPA
January, February, March	May 1
April, May, June	August 1
July, August, September	November 1
October, November, December	February 1

The Permittee shall record discharge monitoring results on Discharge Monitoring Report (DMR) forms using one such form for each Outfall and Discharge Condition each month. In the event that an Outfall does not discharge during a monthly reporting period or under a given Discharge Condition, the DMR form shall be submitted with "No Discharge" indicated.

In the event that electronic filing is being utilized, any and all monitoring results, other than NPDES outfall discharge results reported through NetDMR, shall be submitted to the Agency at the addresses indicated in Special Condition No. 3 above.

**Special Condition No. 5:** Completed periodic monitoring and reporting not required under Special Condition No. 4 above; such as, groundwater monitoring, coal combustion waste analyses, water treatment plant lime sludge analyses, etc., shall be retained by the Permittee for a period of three (3) months and shall be mailed and received by the IEPA at the addresses indicated in Special Condition No. 3 above in accordance with the following schedule, unless otherwise specified by the permitting authority.

Period	Received by IEPA
January, February, March	May 1
April, May, June	August 1
July, August, September	November 1
October, November, December	February 1

**Special Condition No. 6:** The Agency may revise or modify the permit consistent with applicable laws, regulations or judicial orders.

**Special Condition No. 7:** If an applicable effluent standard or limitation is promulgated under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the Clean Water Act and that effluent standard or limitation is more stringent than any effluent limitation in the permit or controls a pollutant not limited in the NPDES Permit, the Agency shall revise or modify the permit in accordance with the more stringent standard or prohibition and shall so notify the permittee.

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**Special Condition No. 8:** The permittee shall notify the Agency in writing by certified mail within thirty days of abandonment, cessation, or suspension of active mining for thirty days or more unless caused by a labor dispute. During cessation or suspension of active mining, whether caused by a labor dispute or not, the permittee shall provide whatever interim impoundment, drainage diversion, and wastewater treatment is necessary to avoid violations of the Act or Subtitle D.

**Special Condition No. 9:** Plans must be submitted to and approved by this Agency prior to construction of a sedimentation pond. At such time as runoff water is collected in the sedimentation pond, a sample shall be collected and analyzed for the parameters designated as 1M-15M under Part 5-C of Form 2C and the effluent parameters designated herein with the results sent to this Agency. Should additional treatment be necessary to meet these standards, a Supplemental Permit must also be obtained. Discharge from a pond is not allowed unless applicable effluent and water quality standards are met.

**Special Condition No. 10:** The special reclamation area effluent standards of 35 Ill. Adm. Code 406.109 apply only on approval from the Agency. To obtain approval, a request form and supporting documentation shall be submitted to request the discharge be classified as a reclamation area discharge. The Agency will notify the permittee upon approval of the change.

**Special Condition No. 11:** The special stormwater effluent standards apply only on approval from the Agency. To obtain approval, a request with supporting documentation shall be submitted to request the discharge to be classified as a stormwater discharge. The documentation supporting the request shall include analysis results indicating the discharge will consistently comply with reclamation area discharge effluent standards. The Agency will notify the permittee upon approval of the change.

**Special Condition No. 12:** Annual stormwater monitoring is required for all discharges not reporting to a sediment basin until Final SMCR Bond is released and approval to cease such monitoring is obtained from the Agency.

- A. Each discharge must be monitored for pH and settleable solids annually.
- B. Analysis of samples must be submitted with second quarter Discharge Monitoring Reports. A map with discharge locations must be included in this submittal.
- C. If discharges can be shown to be similar, a plan may be submitted by November 1 of each year preceding sampling to propose grouping of similar discharges and/or update previously submitted groupings. If updating of a previously submitted plan is not necessary, a written notification to the Agency indicating such is required. Upon approval from the Agency, one representative sample for each group may be submitted.

**Special Condition No. 13:** Sediment Pond Operation and Maintenance (Outfalls 001, 002, 006, 007, 008, 009, 010, 011 and 012):

- a. During all Discharge Conditions, in addition to the contaminants listed on the effluent page, discharges from Outfalls 001, 002, 006, 007, 008, 009, 010, 011 and 012 shall be monitored and reported for Discharge Rate, Sulfate, Chloride and Hardness.
- b. The following sampling and monitoring requirements are applicable to flow in the unnamed tributaries to Marys River which receives discharges from Outfalls 001, 002, 007, 008 and 009, unnamed tributary to Lick Branch which receives discharges from Outfall 010, and the unnamed tributary to Plum Creek which receives discharges from Outfalls 006, 011 and 012.
  - i. All sampling and monitoring required under 13(b)(ii) and (iii) below shall be performed during a discharge and monitoring event from the associated outfall.
  - ii. Marys River, unnamed tributary to Lick Branch, and the unnamed tributary to Plum Creek shall be monitored and reported quarterly for Discharge Rate, Chloride, Sulfate and Hardness downstream of the associated outfall. This downstream monitoring shall be performed a sufficient distance downstream of the associated outfall to ensure that complete mixing has occurred. At such time that sufficient information has been collected regarding receiving stream flow characteristics and in-stream contaminant concentrations the permittee may request a re-evaluation of the monitoring frequency required herein for possible reduction or elimination. For the purpose of re-evaluating the downstream monitoring frequency of the receiving stream, "sufficient information" is defined as a minimum of ten (10) quarterly sampling events.

In the event that downstream monitoring of the receiving waters is eliminated during the term of this permit based on an evaluation of the quarterly data, a minimum of three (3) additional samples analyzed for the parameters identified above must be submitted with the permit renewal application a minimum of 180 days prior to expiration of this permit.
  - iii. The unnamed tributaries to Marys River, unnamed tributary to Lick Branch and the unnamed tributary to Plum Creek shall be monitored and reported annually for Discharge Rate, Chloride, Sulfate and Hardness upstream of the associated outfall.
- c. All results of sampling and monitoring performed in accordance with Special Condition 13(a) and (b) shall be submitted to the Agency in accordance with Special Condition Nos. 3 and 4 above.

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**Special Condition No. 14:** Sediment Pond Operation and Maintenance (Outfall 003):

- a. No discharge is allowed from Outfall No. 003 during "low flow" or "no flow" conditions in the receiving stream, unless such discharge meets the water quality standards of 35 Ill. Adm. Code 302. For purposes of this Special Condition "low flow" shall be defined as any condition wherein the upstream flow available for mixing is less than the ratio times the flow rate being discharged from the respective outfall. These ratios are as follows:

Outfall No.	Flow Ratio of Receiving Stream to Outfall Discharge
003	15:1

Pursuant to 35 Ill. Adm. Code 302.120, discharges from the referenced outfalls that otherwise would not meet the water quality standards of 35 Ill. Adm. Code 302 may be permitted if sufficient flow exists in the receiving stream to ensure that applicable water quality standards are met. That is, discharges not meeting the water quality standards of 35 Ill. Adm. Code 302 may only be discharged in combination with stormwater discharges from the basin, and only at such times that sufficient flow exists in the receiving stream to ensure that water quality standards in the receiving stream beyond the area of allowed mixing will not be exceeded. Following any such stormwater discharge, but prior to the flow in the receiving stream subsiding, the impounded water in the basin may be pumped or otherwise evacuated sufficiently below the discharge elevation to provide capacity for holding a sufficient volume of mine pumpage and/or surface runoff to preclude the possibility of discharge until such time that a subsequent precipitation event results in discharge from the basin. Should the Permittee elect to pump impounded water from the basin in accordance with this Special Condition, the pump intake shall be "floated" near the impounded water surface or otherwise managed to prevent re-suspension and subsequent discharge of previously accumulated sediments. At times of stormwater discharge, in addition to the alternate effluent (Discharge Condition Nos. II and III) monitoring requirements, as indicated on the applicable effluent pages of this Permit, discharges from Outfall No. 003 shall be monitored and reported for Discharge Rate, Sulfate, Chloride and Hardness.

- b. The following sampling and monitoring requirements are applicable to flow in unnamed tributary to Marys River which receives the discharges from Outfall 003.
  - i. All sampling and monitoring required under 14(b)(ii) and (iii) below shall be performed during a discharge and monitoring event from the associated outfall.
  - ii. Unnamed tributary to Marys River shall be monitored and reported quarterly for Discharge Rate, Sulfate, Chloride and Hardness downstream of the associated outfall. This downstream monitoring shall be performed a sufficient distance downstream of the associated outfall to ensure that complete mixing has occurred. At such time that sufficient information has been collected regarding stream flow characteristics and in-stream contaminant concentrations, the permittee may request a re-evaluation of the monitoring frequency required herein for possible reduction or elimination. For the purpose of re-evaluating the downstream monitoring frequency of the receiving stream, "sufficient information" is defined as a minimum of ten (10) quarterly sampling events.
 

In the event that downstream monitoring of the receiving waters is eliminated during the term of this permit based on an evaluation of the quarterly data, a minimum of three (3) additional samples analyzed for the parameters identified above must be submitted with the permit renewal application a minimum of 180 days prior to expiration of this permit.
  - iii. Unnamed tributary to Marys River shall be monitored and reported annually for Discharge Rate, Sulfate, Chloride and Hardness upstream of the associated outfall.
- c. All results of sampling and monitoring performed in accordance with Special Condition 14(a) and (b) shall be submitted to the Agency in accordance with Special Condition Nos. 3 and 4 above.

**Special Condition No. 15:** Sediment Pond Operation and Maintenance (Outfall 003 – Reclamation Area Drainage):

- a. For discharges resulting from precipitation events, in addition to the alternate effluent (Discharge Condition Nos. II and III) monitoring requirements, as indicated on the applicable effluent pages of this Permit, discharges from Outfall 003 shall be monitored and reported for Discharge Rate, Sulfate, Chloride and Hardness.
- b. The following sampling and monitoring requirements are applicable to flow in the unnamed tributary to Marys River which receives discharges from Outfall 003.

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- i. All sampling and monitoring required under 15(b)(ii) and (iii) below shall be performed during a discharge and monitoring event from the associated outfall.
- ii. Unnamed tributary to Marys River shall be monitored and reported quarterly for Discharge Rate, Chloride, Sulfate and Hardness downstream of the associated outfall. This downstream monitoring shall be performed a sufficient distance downstream of the associated outfall to ensure that complete mixing has occurred. At such time that sufficient information has been collected regarding receiving stream flow characteristics and in-stream contaminant concentrations the permittee may request a re-evaluation of the monitoring frequency required herein for possible reduction or elimination. For the purpose of re-evaluating the downstream monitoring frequency of the receiving stream, "sufficient information" is defined as a minimum of ten (10) quarterly sampling events.

In the event that downstream monitoring of the receiving waters is eliminated during the term of this permit based on an evaluation of the quarterly data, a minimum of three (3) additional samples analyzed for the parameters identified above must be submitted with the permit renewal application a minimum of 180 days prior to expiration of this permit.

- iii. Unnamed tributary to Marys River shall be monitored and reported annually for Discharge Rate, Chloride, Sulfate and Hardness upstream of the associated outfall.
- c. All results of sampling and monitoring performed in accordance with Special Condition 15(a) and (b) shall be submitted to the Agency in accordance with Special Condition Nos. 3 and 4 above.

**Special Condition No. 16:** Data collected in accordance with Special Condition Nos. 13, 14 and 15 above will be utilized to evaluate the appropriateness of the effluent limits established in this Permit. Should the Agency's evaluation of this data indicate revised effluent limits are warranted; this permit may be reopened and modified to incorporate more appropriate effluent limitations. This data will also be used for determination of effluent limitations at the time of permit renewal.

**Special Condition No. 17:** Mercury shall be monitored quarterly until a minimum of ten (10) samples have been collected. This Mercury monitoring is required only under Discharge Condition Nos. I and/or IV and only during quarters in which there are discharges from the outfall which occur under Discharge Condition Nos. I and/or IV. Samples shall be collected and tested in accordance with USEPA 1631E using the option at Section 11.1.1.2 requiring the heating of samples at 50°C for 6 hours in a BrCl solution in closed vessels. This test method has a Method Detection Limit (MDL) of 0.5 ng/l (nanograms/liter). The results of such testing must be reported in "ng/l" (nanograms/liter) and submitted with the quarterly Discharge Monitoring Reports (DMRs). The Permittee may submit a written request to the Agency to discontinue quarterly Mercury monitoring if the sampling results show no reasonable potential to exceed the Mercury water quality standard.

**Special Condition No. 18:** Discharges from Outfall Nos. 002, 003, 006, 007, 008, 009, 010, 011 and 012 shall be monitored twice annually with such monitoring spaced at approximately 6-month intervals during the entire 5-year term of this NPDES Permit. Sampling of the discharges shall be performed utilizing the grab sampling method and analyzed for total (unfiltered) concentrations. The results of the sampling required under this Special Condition shall be submitted twice annually to the Agency in January and July of each calendar year to the addresses indicated in the Special Condition No. 2 above. The parameters to be sampled and the detection limits (minimum reported limits) are as follows:

<u>Parameter</u>	<u>Detection Limit</u>
Arsenic	0.05 mg/l
Barium	0.50 mg/l
Cadmium	0.001 mg/l
Chromium (hexavalent)	0.01 mg/l
Chromium	0.05 mg/l
Copper	0.005 mg/l
Lead	0.05 mg/l
Manganese	0.50 mg/l
Mercury*	1.00 ng/l**
Nickel	0.005 mg/l
Phenols	0.005 mg/l
Selenium	2.000 µg/l***
Silver	0.003 mg/l
Zinc	0.025 mg/l

\* Utilize USEPA Method 1631E and the digestion procedure described in Section 11.1.1.2 of 1631E.  
 \*\* 1.00 ng/l (nanogram/liter) = 1 part per trillion.  
 \*\*\* µg/l = micrograms/liter

## Attachment H

## Standard Conditions

## Definitions

**Act** means the Illinois Environmental Protection Act, 415 ILCS 5 as Amended.

**Agency** means the Illinois Environmental Protection Agency.

**Board** means the Illinois Pollution Control Board.

**Clean Water Act** (formerly referred to as the Federal Water Pollution Control Act) means Pub. L 92-500, as amended. 33 U.S.C. 1251 et seq.

**NPDES** (National Pollutant Discharge Elimination System) means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 402, 318 and 405 of the Clean Water Act.

**USEPA** means the United States Environmental Protection Agency.

**Daily Discharge** means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurements, the "daily discharge" is calculated as the average measurement of the pollutant over the day.

**Maximum Daily Discharge Limitation** (daily maximum) means the highest allowable daily discharge.

**Average Monthly Discharge Limitation** (30 day average) means the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

**Average Weekly Discharge Limitation** (7 day average) means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

**Best Management Practices** (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

**Aliquot** means a sample of specified volume used to make up a total composite sample.

**Grab Sample** means an individual sample of at least 100 milliliters collected at a randomly-selected time over a period not exceeding 15 minutes.

**24-Hour Composite Sample** means a combination of at least 8 sample aliquots of at least 100 milliliters, collected at periodic intervals during the operating hours of a facility over a 24-hour period.

**8-Hour Composite Sample** means a combination of at least 3 sample aliquots of at least 100 milliliters, collected at periodic intervals during the operating hours of a facility over an 8-hour period.

**Flow Proportional Composite Sample** means a combination of sample aliquots of at least 100 milliliters collected at periodic intervals such that either the time interval between each aliquot or the volume of each aliquot is proportional to either the stream flow at the time of sampling or the total stream flow since the collection of the previous aliquot.

- (1) **Duty to comply.** The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action, permit termination, revocation and reissuance, modification, or for denial of a permit renewal application. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirements.
- (2) **Duty to reapply.** If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. If the permittee submits a proper application as required by the Agency no later than 180 days prior to the expiration date, this permit shall continue in full force and effect until the final Agency decision on the application has been made.
- (3) **Need to halt or reduce activity not a defense.** It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
- (4) **Duty to mitigate.** The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.
- (5) **Proper operation and maintenance.** The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up, or auxiliary facilities, or similar systems only when necessary to achieve compliance with the conditions of the permit.
- (6) **Permit actions.** This permit may be modified, revoked and reissued, or terminated for cause by the Agency pursuant to 40 CFR 122.62 and 40 CFR 122.63. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.
- (7) **Property rights.** This permit does not convey any property rights of any sort, or any exclusive privilege.
- (8) **Duty to provide information.** The permittee shall furnish to the Agency within a reasonable time, any information which the Agency may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with the permit. The permittee shall also furnish to the Agency upon request, copies of records required to be kept by this permit.

(9) **Inspection and entry.** The permittee shall allow an authorized representative of the Agency or USEPA (including an authorized contractor acting as a representative of the Agency or USEPA), upon the presentation of credentials and other documents as may be required by law, to:

- (a) Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
- (b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
- (c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
- (d) Sample or monitor at reasonable times, for the purpose of assuring permit compliance, or as otherwise authorized by the Act, any substances or parameters at any location.

(10) **Monitoring and records.**

- (a) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
- (b) The permittee shall retain records of all monitoring information, including all calibration and maintenance records, and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of this permit, measurement, report or application. Records related to the permittee's sewage sludge use and disposal activities shall be retained for a period of at least five years (or longer as required by 40 CFR Part 503). This period may be extended by request of the Agency or USEPA at any time.
- (c) Records of monitoring information shall include:
  - (1) The date, exact place, and time of sampling or measurements;
  - (2) The individual(s) who performed the sampling or measurements;
  - (3) The date(s) analyses were performed;
  - (4) The individual(s) who performed the analyses;
  - (5) The analytical techniques or methods used; and
  - (6) The results of such analyses.
- (d) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit. Where no test procedure under 40 CFR Part 136 has been approved, the permittee must submit to the Agency a test method for approval. The permittee shall calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals to ensure accuracy of measurements.

(11) **Signatory requirement.** All applications, reports or information submitted to the Agency shall be signed and certified.

- (a) **Application.** All permit applications shall be signed as follows:
  - (1) For a corporation: by a principal executive officer of at least the level of vice president or a person or position having overall responsibility for environmental matters for the corporation;
  - (2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or
  - (3) For a municipality, State, Federal, or other public agency: by either a principal executive officer or ranking elected official.
- (b) **Reports.** All reports required by permits, or other information requested by the Agency shall be signed by a

person described in paragraph (a) or by a duly authorized representative of that person. A person is a duly authorized representative only if:

- (1) The authorization is made in writing by a person described in paragraph (a); and
  - (2) The authorization specifies either an individual or a position responsible for the overall operation of the facility, from which the discharge originates, such as a plant manager, superintendent or person of equivalent responsibility; and
  - (3) The written authorization is submitted to the Agency.
- (c) **Changes of Authorization.** If an authorization under (b) is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of (b) must be submitted to the Agency prior to or together with any reports, information, or applications to be signed by an authorized representative.
- (d) **Certification.** Any person signing a document under paragraph (a) or (b) of this section shall make the following certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

(12) **Reporting requirements.**

- (a) **Planned changes.** The permittee shall give notice to the Agency as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required when:
  - (1) The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source pursuant to 40 CFR 122.29 (b); or
  - (2) The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements pursuant to 40 CFR 122.42 (a)(1).
  - (3) The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.
- (b) **Anticipated noncompliance.** The permittee shall give advance notice to the Agency of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.
- (c) **Transfers.** This permit is not transferable to any person except after notice to the Agency.
- (d) **Compliance schedules.** Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

- (e) **Monitoring reports.** Monitoring results shall be reported at the intervals specified elsewhere in this permit.
- (1) Monitoring results must be reported on a Discharge Monitoring Report (DMR).
  - (2) If the permittee monitors any pollutant more frequently than required by the permit, using test procedures approved under 40 CFR 136 or as specified in the permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR.
  - (3) Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Agency in the permit.
- (f) **Twenty-four hour reporting.** The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24-hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and time; and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. The following shall be included as information which must be reported within 24-hours:
- (1) Any unanticipated bypass which exceeds any effluent limitation in the permit.
  - (2) Any upset which exceeds any effluent limitation in the permit.
  - (3) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Agency in the permit or any pollutant which may endanger health or the environment.  
The Agency may waive the written report on a case-by-case basis if the oral report has been received within 24-hours.
- (g) **Other noncompliance.** The permittee shall report all instances of noncompliance not reported under paragraphs (12) (d), (e), or (f), at the time monitoring reports are submitted. The reports shall contain the information listed in paragraph (12) (f).
- (h) **Other information.** Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to the Agency, it shall promptly submit such facts or information.
- (13) **Bypass.**
- (a) **Definitions.**
    - (1) Bypass means the intentional diversion of waste streams from any portion of a treatment facility.
    - (2) Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
  - (b) Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs (13)(c) and (13)(d).
- (c) **Notice.**
- (1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.
  - (2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in paragraph (12)(f) (24-hour notice).
- (d) **Prohibition of bypass.**
- (1) Bypass is prohibited, and the Agency may take enforcement action against a permittee for bypass, unless:
    - (i) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
    - (ii) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
    - (iii) The permittee submitted notices as required under paragraph (13)(c).
  - (2) The Agency may approve an anticipated bypass, after considering its adverse effects, if the Agency determines that it will meet the three conditions listed above in paragraph (13)(d)(1).
- (14) **Upset.**
- (a) **Definition.** Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.
  - (b) **Effect of an upset.** An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph (14)(c) are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.
  - (c) **Conditions necessary for a demonstration of upset.** A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
    - (1) An upset occurred and that the permittee can identify the cause(s) of the upset;
    - (2) The permitted facility was at the time being properly operated; and
    - (3) The permittee submitted notice of the upset as required in paragraph (12)(f)(2) (24-hour notice).
    - (4) The permittee complied with any remedial measures required under paragraph (4).
  - (d) **Burden of proof.** In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

- (15) **Transfer of permits.** Permits may be transferred by modification or automatic transfer as described below:
- (a) Transfers by modification. Except as provided in paragraph (b), a permit may be transferred by the permittee to a new owner or operator only if the permit has been modified or revoked and reissued pursuant to 40 CFR 122.62 (b) (2), or a minor modification made pursuant to 40 CFR 122.63 (d), to identify the new permittee and incorporate such other requirements as may be necessary under the Clean Water Act.
- (b) Automatic transfers. As an alternative to transfers under paragraph (a), any NPDES permit may be automatically transferred to a new permittee if:
- (1) The current permittee notifies the Agency at least 30 days in advance of the proposed transfer date;
  - (2) The notice includes a written agreement between the existing and new permittees containing a specified date for transfer of permit responsibility, coverage and liability between the existing and new permittees; and
  - (3) The Agency does not notify the existing permittee and the proposed new permittee of its intent to modify or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement.
- (16) All manufacturing, commercial, mining, and silvicultural dischargers must notify the Agency as soon as they know or have reason to believe:
- (a) That any activity has occurred or will occur which would result in the discharge of any toxic pollutant identified under Section 307 of the Clean Water Act which is not limited in the permit, if that discharge will exceed the highest of the following notification levels:
    - (1) One hundred micrograms per liter (100 ug/l);
    - (2) Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4,6 dinitrophenol; and one milligram per liter (1 mg/l) for antimony.
    - (3) Five (5) times the maximum concentration value reported for that pollutant in the NPDES permit application; or
    - (4) The level established by the Agency in this permit.
  - (b) That they have begun or expect to begin to use or manufacture as an intermediate or final product or byproduct any toxic pollutant which was not reported in the NPDES permit application.
- (17) All Publicly Owned Treatment Works (POTWs) must provide adequate notice to the Agency of the following:
- (a) Any new introduction of pollutants into that POTW from an indirect discharge which would be subject to Sections 301 or 306 of the Clean Water Act if it were directly discharging those pollutants; and
  - (b) Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
  - (c) For purposes of this paragraph, adequate notice shall include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.
- (18) If the permit is issued to a publicly owned or publicly regulated treatment works, the permittee shall require any industrial user of such treatment works to comply with federal requirements concerning:
- (a) User charges pursuant to Section 204 (b) of the Clean Water Act, and applicable regulations appearing in 40 CFR 35;
  - (b) Toxic pollutant effluent standards and pretreatment standards pursuant to Section 307 of the Clean Water Act; and
  - (c) Inspection, monitoring and entry pursuant to Section 308 of the Clean Water Act.
- (19) If an applicable standard or limitation is promulgated under Section 301(b)(2)(C) and (D), 304(b)(2), or 307(a)(2) and that effluent standard or limitation is more stringent than any effluent limitation in the permit, or controls a pollutant not limited in the permit, the permit shall be promptly modified or revoked, and reissued to conform to that effluent standard or limitation.
- (20) Any authorization to construct issued to the permittee pursuant to 35 Ill. Adm. Code 309.154 is hereby incorporated by reference as a condition of this permit.
- (21) The permittee shall not make any false statement, representation or certification in any application, record, report, plan or other document submitted to the Agency or the USEPA, or required to be maintained under this permit.
- (22) The Clean Water Act provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Clean Water Act is subject to a civil penalty not to exceed \$25,000 per day of such violation. Any person who willfully or negligently violates permit conditions implementing Sections 301, 302, 306, 307, 308, 318 or 405 of the Clean Water Act is subject to a fine of not less than \$2,500 nor more than \$25,000 per day of violation, or by imprisonment for not more than one year, or both. Additional penalties for violating these sections of the Clean Water Act are identified in 40 CFR 122.41 (a)(2) and (3).
- (23) The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than \$10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than \$20,000 per day of violation, or by imprisonment of not more than 4 years, or both.
- (24) The Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.
- (25) Collected screening, slurries, sludges, and other solids shall be disposed of in such a manner as to prevent entry of those wastes (or runoff from the wastes) into waters of the State. The proper authorization for such disposal shall be obtained from the Agency and is incorporated as part hereof by reference.
- (26) In case of conflict between these standard conditions and any other condition(s) included in this permit, the other condition(s) shall govern.
- (27) The permittee shall comply with, in addition to the requirements of the permit, all applicable provisions of 35 Ill. Adm. Code, Subtitle C, Subtitle D, Subtitle E, and all applicable orders of the Board or any court with jurisdiction.
- (28) The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit is held invalid, the remaining provisions of this permit shall continue in full force and effect.

**APPENDIX F**  
**SAMPLE CLASSIFICATION**  
**TABLES**

Illinois Sediment Basin Water Sample Classification

**Illinois Sediment Basin - Acid** **IL-SB-ACID**

Field Measurements  
Condition 1, 3, or 4: Flow, pH, Temp  
Condition 2: Flow, pH, Temp, Settleable Solids  
Lab Containers & Preservative  
Condition 1, or 4: Plastic 1-Liter, Plastic 500 mL w/ HNO<sub>3</sub>  
Condition 2: Plastic 1-Liter  
Analytes  
Condition 1 or 4: Acidity, Alkalinity, pH (lab), Fe, Mn, Cl, SO<sub>4</sub>, TSS, Hardness  
Condition 2 or 3: pH (lab), Cl, SO<sub>4</sub>, Hardness  
Field Containers & Preservative  
Condition 2: Plastic 1-Liter Bottle

**Illinois Sediment Basin - Alkaline Type 1** **IL-SB-ALK-1**

Field Measurements  
Condition 1, 3, or 4: Flow, pH, Temp  
Condition 2: Flow, pH, Temp, Settleable Solids  
Lab Containers & Preservative  
Condition 1, or 4: Plastic 1-Liter, Plastic 500 mL w/ HNO<sub>3</sub>  
Condition 2: Plastic 1-Liter  
Analytes  
Condition 1 or 4: Acidity, Alkalinity, pH (lab), Fe, Mn, Cl, SO<sub>4</sub>, TSS, Hardness  
Condition 2 or 3: pH (lab), Cl, SO<sub>4</sub>, Hardness  
Field Containers & Preservative  
Condition 2: Plastic 1-Liter Bottle

**Illinois Sediment Basin - Reclamation** **IL-SB-REC**

Field Measurements  
Condition 1, 2, or 4: Flow, pH, Temp, Settleable Solids  
Condition 3: Flow, pH, Temp  
Lab Containers & Preservative  
Condition 1, 2, 3, or 4: Plastic 1-Liter  
Analytes:  
Condition 1, 2, 3, or 4: pH (lab), Hardness, SO<sub>4</sub>, Cl  
Field Containers & Preservative  
Condition 1, 2, or 4: Plastic 1-Liter Bottle

**Illinois Sediment Basin - Mercury** **IL-SB-Hg**

Field Measurements  
Condition 1 or 4: Flow, pH, Temp  
Lab Containers & Preservative  
Condition 1 or 4: Sampling Kit; Lab must receive within 48 hr  
Analytes:  
Condition 1 or 4: Hg, Hg (diss), Field Blank

**Illinois Sediment Basin - Stormwater** **IL-SB-STORM**

Field Measurements: Flow, pH, Temp, Settleable Solids  
Lab Containers & Preservative: NA  
Analytes: NA  
Analytes: NA  
Field Containers & Preservative  
Condition 1, 2, or 4: Plastic 1-Liter Bottle

Illinois Sediment Basin Water Sample Classification

**Illinois Sediment Basin - Semiannual Metals**

**IL-SB-Metals**

Field Measurements

Condition 1, 3, or 4: Flow, pH, Temp  
Condition 2: Flow, pH, Temp, Settleable Solids

Lab Containers & Preservative

Condition 1, 2, 3, or 4: Plastic 1-Liter, Plastic 500 mL, Plastic 500 mL w/ HNO<sub>3</sub>, 250 mL Glass Amber w/ H<sub>2</sub>SO<sub>4</sub>, Mercury Kit (if sampled)

Analytes

Condition 1 or 4: Acidity, Alkalinity, pH (lab), Fe, Mn, Cl, SO<sub>4</sub>, TSS, Hardness, As, Ba, Cd, Cr, Cr6, Cu, Pb, Mn, Ni, Phenols, Se, Ag, Zn, low level Hg (if low level Hg kit included)  
Condition 2: pH (lab), Cl, SO<sub>4</sub>, Hardness, As, Ba, Cd, Cr, Cr6, Cu, Pb, Mn, Ni, Phenols, Se, Ag, Zn, low level Hg (if low level Hg kit included)

Field Containers & Preservative

Condition 2: Plastic 1-Liter Bottle

**Illinois Sediment Basin - Pre-discharge**

**IL-SB-PRE**

Field Measurements: Flow, pH, Temp

Lab Containers & Preservative: Plastic 1-Liter, Plastic 500 mL w/HNO<sub>3</sub>, Plastic 500 mL w/ NaOH, Plastic 500 mL w/ H<sub>2</sub>SO<sub>4</sub>

Analytes: Acidity, Alkalinity, pH (lab), Hardness, Fe, Mn, Cl, SO<sub>4</sub>, TSS, TDS, Phenols, CN, Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Tl, Zn

**Illinois Surface Water Sample Classification**

**Illinois Surface Water**

**IL-SW**

Field Measurements: Flow, pH, Temp  
Lab Containers: Plastic 1-Liter, Plastic 500 mL w/ HNO<sub>3</sub>  
Preservative: Deliver to Lab Same Day As Sample  
Analytes: Acidity, Alkalinity, pH (lab), Fe, Mn, Cl, SO<sub>4</sub>, TDS, TSS, Hardness

**Illinois Surface Water - NPDES**

**IL-SW-NPDES**

Field Measurements: Flow, pH, Temp  
Lab Containers & Preservative: Plastic 1-Liter  
Analytes: pH (lab), Cl, SO<sub>4</sub>, Hardness