

***GREAT LAKES CASTINGS LLC***

**800 N. Washington  
Ludington, Michigan 49431**

***CUPOLA EMISSION CONTROL SYSTEM***

***MALFUNCTION ABATEMENT PLAN***

***(RENEWABLE OPERATING PERMIT NUMBER MI-ROP-A3934-2015)***

***DECEMBER, 1995***

Revised by T. Nelson, June, 2005  
Revised by B. Ellis, January, 2011  
Revised by B. Ellis, July, 2013  
Revised by B. Ellis January, 2020

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# SECTION 1

## INTRODUCTION

### 1.1 PURPOSE

The purpose of this plan is to ensure that at all times Great Lakes Castings LLC operates and maintains the Cupola melting furnace, the affected source, and its related emission control systems in a manner consistent with safety and with air pollution control practices designed to minimize emissions to the levels required by applicable air permit requirements. The plan has been prepared to ensure that Great Lakes Castings LLC is prepared to detect and correct malfunctions as soon as practicable after their occurrence in order to minimize excess emission of regulated air pollutants.

This plan is designed to conform with the requirements of the GLC Renewable Operating Permit number MI-ROP-A3934-2015, with the emission control device Operation and Maintenance Plan (O&M) requirements of 40 CFR Part 63 Subpart ZZZZZ and with the Startup Shutdown Malfunction (SSM) Plan of 40 CFR Part 63.6 (e) as required by Subpart ZZZZZ.

### 1.2 FACILITY CONTACT INFORMATION

The general contact information for individuals related to implementation of this plan are:

Rob Killips	President	231-843-2501	Ext: 200
Bob Ellis	Environmental, Health and Safety Manager	231-843-2501	Ext 238
Gordon Anderson	Environmental, Health and Safety Supervisor	231-843-2501	Ext 205
Mike Cicholski	Plant Engineering Manager	231-843-2501	Ext 209

## SECTION 2

### PREVENTIVE MAINTENANCE PROGRAM

Great lakes Castings LLC has in place a computerized maintenance management system (CMMS). Included in this system are preventive maintenance activities associated with the emission control system as well as an inventory system for the associated spare parts. The system prints a hard copy of the Preventive Maintenance Sheets on the date scheduled. The hard copy is distributed to the assigned GLC personnel. Upon completion of the tasks the hard copy with certification and remarks, when required, is returned to the maintenance office. Maintenance supervision enters the completed task into the system and if additional mechanical follow-up is required opens a Maintenance Work Order to track the repairs. Copies of the Preventive Maintenance Sheets and the Equipment Master List are included as well as an example of the supporting documentation available for equipment repair.

The inspection, maintaining, and repairing activities outlined in this plan will be carried out by Cupola Operators, Waste Water Treatment Operators, and Maintenance technicians based on their availability and the specific activity skill set required or by outside contract personnel when specific activities dictate the need.

#### MAINTENANCE SCHEDULE FOR EMISSION CONTROL UNITS

EMISSION CONTROL UNIT	SCHEDULE
AFTERBURNERS	MONTHLY
AFTERBURNERS	6 MONTH
QUENCHER	WEEKLY
DRAG TANK	WEEKLY
VENTURI	MONTHLY
DEMISTER	WEEKLY
450HP BLOWER	WEEKLY
450HP BLOWER	MONTHLY

P.M. Number: 161001 Date Scheduled: 1/05/19  
===== Shift: 8  
Craft(s): MAINTENANCE WEEK END WAR People: 2 Hours: 2.00  
Equipment: 01610 QUENCHER, Location: WASTEWATER  
Job:

\*\*\*SAFETY RELATED\*\*\*

\*\*\*HAZARDOUS\*\*\*

Description: QUENCHER WEEKLY MECH PM

----- INSTRUCTIONS -----

\*\*\* PROTECT YOURSELF AT ALL TIMES \*\*\*

\*\*\* LOCKOUT EQUIPMENT BEFORE SERVICING \*\*\*

CONDITION CODE DESCRIPTIONS: 1- GOOD CONDITION,  
2- SHOWS NORMAL WEAR, 3- SHOWS EXCESSIVE WEAR,  
4- NEEDS IMMEDIATE REPAIR, 5- REPAIRED

- 1) THIS IS A PERMIT REQUIRED CONFINED SPACE.  
FOLLOW ALL APPLICABLE SAFETY PROCEDURES  
FOR THIS ENTRY.
- 2) OPEN INSPECTION COVER AND CHECK SCREENS. LOOK  
FOR MATERIAL BUILD UP ON SCREENS. CLEAN SCREENS  
AS NEEDED. REMOVE ALL NOZZELS CLEAN OR REPLACE  
AS NEEDED TO ENSURE ALL ARE CLEAR OF DEBRIS AND  
IN GOOD CONDITION.  
CONDITION CODE 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5 ( )
- 3) TURN QUENCHER PUMP ON, CHECK THE FLOW IT SHOULD  
BE 215 GPM OR MORE. CHECK THE DRAIN ENSURE IT IS  
CLEAR. WITH THE PUMP RUNNING ENSURE ALL WATER IS  
GOING DOWN THE DRAIN AND IT IS NOT BACKING UP OR  
ACCUMILATING IN THE BOTTOM OF THE QUENCHER.  
CONDITION CODE 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5 ( )
- 4) REPLACE NOZZLES IF NEEDED. USE P/N TP20XP316  
CONDITION CODE: 1 ( ), 2 ( ), 3 ( ), 4 ( ), 5 ( )
- 5) TOOLS/EQUIPMENT: 3/4" SOCKET, PINCH BAR, 3/4"  
OPEN END WRENCH, 1/2" IMPACT.
- 6) MAKE SURE DRAG TANK IS FULL AND THEN FLUSH OUT  
ALL PIPES.
- 7) INSPECT OUTSIDE OF QUENCHER, PIPES, DUCT WORK  
FOR ANY LEAKS REPAIR AS NEEDED AND RECORD  
FINDINGS ON THIS PM

----- PARTS REQUIRED -----

Material#	Material Description	Qty Reqd	Location
-----------	----------------------	----------	----------

PMR1004  
1/28/20 8:28:31

Great Lakes Castings LLC  
PREVENTIVE MAINTENANCE SHEET

Page 1  
BELLIS

P.M. Number: 162001 Date Scheduled: 0/00/00  
-----  
Craft(s): MAINTENANCE WEEK END WAR People: 2 Shift: 8  
Equipment: 01620 VENTURI, Hours: .50  
Job: Location: WASTEWATER

Description: VENTURI 30 DAY PM

----- INSTRUCTIONS -----  
\*\*\*\* PROTECT YOURSELF AT ALL TIMES \*\*\*\*  
\*\*\*\* LOCKOUT EQUIPMENT BEFORE SERVICING \*\*\*\*

\*\*\* THIS IS A CONFINED SPACE. \*\*\*  
PROPER ENTRY PROCEDURE MUST BE FOLLOWED.

CONDITION CODE DESCRIPTIONS: 1= GOOD CONDITION,  
2= SHOWS NORMAL WEAR, 3= SHOWS EXCESSIVE WEAR,  
4= NEEDS IMMEDIATE REPAIR, 5= REPAIRED

- 1) OPEN INSPECTION DOOR ABOVE VENTURI, INSPECT THE INTERIOR TO DETERMINE THE STRUCTURAL INTEGRITY  
CONDITION CODE: 1( ), 2( ), 3( ), 4( ), 5( )
- 2) CHECK FOR BUILD UP IN DUCT. CLEAN AS NECESSARY.  
CONDITION CODE: 1( ), 2( ), 3( ), 4( ), 5( )
- 3) CLEAN/REPLACE PLUGGED OR BAD NOZZLE.  
CONDITION CODE 1( ) 2( ) 3( )\_ 4( ) 5( )
- 4) INSPECT THE VENTURIE GEAR BOX ENSURE THAT IT IS IN GOOD CONDITION AND PROPERLY ADJUSTED.  
CONDITION CODE: 1( ), 2( ), 3( ), 4( ), 5( )
- 5) INSPECT OUTSIDE OF VENTURI, PIPES, DUCT WORK FOR ANY LEAKS AND REPAIR AS NEEDED. RECORD FINDINGS ON THIS PM
- 6) ANY DEFECT OR DEFICIENCY OF THE CAPTURE SYSTEM SHALL BE REPAIRED AS SOON AS PRACTICABLE BUT NO LATER THAN 90 DAYS

----- PARTS REQUIRED -----  
Material# Material Description Qty Req'd Location  
TF-32-FC NOZZLE, SPIRAL 3/4" 316 SS 1 A3-P-1D

2/20/20 12:55:30  
Active and Inactive

EQUIPMENT MASTER LIST  
Equipment Only

SELECTIONS: Group Code: ALL From Eq#: 01630 Thru Eq#: 01630  
From Dept: Thru Dept: 999  
From Grp: Thru Grp: 9999999999

Equipment	Eqp Group	Equipment Description	Dept	Location	Equip Type
01630	POLLUTION DEMISTER		11	WASTEWATER	ENV
	Manufacturer -	MODERN EQUIPMENT CO.	Mfr Model -	?	
	Original Cost -	53135.00	Operation -	Z8MN	

Material Inv#	Material Description	Quantity Required	Life In Days	Last Replaced
BBU-150	CF, 1-1/2" PLASTIC BUSHING	0	0	9/28/10
BL-150	CF, 1-1/2" LOCKNUT APPLETON	0	0	9/28/10
DEMISTER-PAD	PAD, DEMISTER	1	0	4/14/16
EA55-00000-000	ACTUATOR, GAS CONTROL	0	0	11/27/12
HP7.5213T3500	MOTOR, HP 7.5 FR 213T RPM 3500	0	0	8/26/10
P-2275	EYE, PHOTO DELAY RESPONSE	1	0	0/00/00
STG-150	CF, 1-1/2" SEALING GASKET	0	0	9/28/10
TF12FCN316	NOZZLE, SPIRAL 3/8 FOG FOR	0	1	7/14/14
TF20-150-316	NOZZLE, SPIRAL 3/8"	0	0	8/31/15
TN224-1/4	NUT, TWIRL 1/4" B STRUT	0	0	9/28/10
0002-0002-5-003	GASKET, DOOR BUNA N	0	0	5/31/17
0002-0011-5	DOOR, MAN LOWER DEMISTER	0	0	4/01/16
0004-0010-1	WHEEL, TRIP LATCH CHARGE BUCET	0	0	1/25/01
0490589	GAUGE, 0-100 1/4LM 2-1/2"LIQUD	0	0	12/14/94
0490609	GAUGE, 0-160 1/4CBM 2-1/2"LIQ.	0	0	2/03/14
1-1/2"BALL-VLV	VALVE, BALL 1-1/2" BRASS	0	0	12/14/94
1/4"BALL-VLV	VALVE, BALL 1/4"	1	0	0/00/00
10-1-4	ROLLER, BOTTOM CHG BUCKET	0	0	1/25/01
11-1-73	PIN, TRIP LATCH WHEEL CHR G BKT	0	0	1/25/01
2100-14M-40	BELT, DRIVE	0	0	3/22/17
350-BAV	SWITCH, REVERSING DRUM	0	0	12/04/94
3739892	GASKET, GRUV 2" GRINNEL EPDM	1	0	0/00/00
5-1-332	PIN, LATCH CHARGE BUCKET	0	0	1/25/01
6"PVCSCH80SOC-Y	FITTING, 6"PVC SOC WYE SCH 80	0	0	10/27/16
6PVCSCH80CLNOUT	ADAPTER, CLEANOUT PVC SCH 80	0	0	10/27/16
63011	SLEEVE, JES #7 INSERT EPDM	0	0	6/16/95
641103353	GASKET KIT, POWER END	0	0	10/26/04
9103Y2115	WASHER, LOCKING DISA	0	0	10/04/17

## SECTION 3

### MONITORING PLAN

Great Lakes Castings Cupola metal melting furnace and associated equipment is operated by a computer assisted monitoring system. This program continually monitors process measurements from the melting process and emission control systems and makes adjustments to the process to maintain the systems in the normal mode. The program has programmed process set points which will activated visual and audio alarms to alert operators to potential abnormal or out of control events.

Because the systems performance is very sensitive to a large number of variables, GLC personnel perform manual system documentation and recordkeeping to assist in the monitoring and troubleshooting of the metal melting process and emission control systems. Selected readouts are recorded on an hourly basis while other are documented on a per shift or per day basis. Required air quality permit monitoring is included in this documentation. Examples of the forms used are included for reference.

During operational periods when the Renewable Operating Permit (ROP) is applicable, process control operators and waste treatment operators will use the information in our ROP to make regulatory compliance related decisions about the operation of the system, and to document what is needed to assure compliance. It includes determining whether a potential malfunction event qualifies as a ROP permit deviation. Suspected deviations will be documented on the Cupola Emission Control System Monitoring and Recordkeeping Report. All reports will be followed up by the EHS Manager and confirmed deviation of the ROP will be documented in the ROP Deviation Log and a Environmental Health and Safety Incident Information Required to Commence Formal Corrective Action will be filed out and filed. A Formal Corrective Action investigations will commence and subsequent actions will be implemented and documented.



GREAT LAKES CASTINGS LLC

Ludington, Michigan

**CUPOLA EMISSION CONTROL SYSTEM AND WASTEWATER INSPECTION REPORT**

(Inspections and data collection are to be done at the beginning of the shift, or at cupola start-up and at the middle of the shift.)

(Cupola and cupola operating data shall be collected when the blast blower is on and metal is being charged to the cupola ("Production Mode").)

**WASTEWATER OPERATOR DATA:** INITIALS: [ ] DATE: [ ] TIME: [ ]

**BLAST BLOWER DATA:** Blast Mode:  On  Relief  Air Flow Rate: [ ] acfm Back Pressure: [ ] oz  
Oxygen Flow Rate: [ ] scfm Oxygen Line Pressure: [ ] psig Oxygen Tank Pressure: [ ] psig

**GAS TEMPERATURE DATA:** Upper Stack (> 1142 °F): [ ] °F Venturi Inlet: [ ] °F  
Exhaust Blower Inlet: [ ] °F Exhaust Blower Outlet: [ ] °F

**EXHAUST BLOWER DATA:** Motor Amps: [ ] Vibration Monitor: [ ]  
Water in Sump @ Correct Level?:  Yes  No Sump Water pH: [ ] su  
Stack Drain Open?:  Yes  No Stack Drain Water pH: [ ] su

**VENTURI OPERATION DATA:** Mode of Operation: Manual (M) or Automatic (A): [ ] Percent Open: [ ] %

**PRESSURE DROP DATA:** At Cupola: Venturi (>= 30 inches of water): [ ] Demister (>=0.1 inches of water): [ ]  
At WW: Fan: [ ] inches of water Venturi (>= 30 inches of water): [ ] Demister (>=0.1 inches of water): [ ]

**LIQUID FLOW RATE DATA:**  
Quencher Pump(s) (>= 200 gpm): # 1 [ ] gpm # 2 [ ] gpm # 3 [ ] gpm  
Venturi Pump(s) (>= 200 gpm): # 1 [ ] gpm # 2 [ ] gpm # 3 [ ] gpm  
Demister Pump(s) (>= 40 gpm): # 1 [ ] gpm # 2 [ ] gpm # 3 [ ] gpm

**OTHER OPERATIONS DATA:**

Cupola Emission Control System  
Cooling Tower Pump: # 1 [ ] psig # 2 [ ] psig % TDS: [ ]  
Cooling Tower Water Conductivity: [ ]  
Cooling Tower Influent Temperature: [ ] °F  
Cooling Tower Effluent Temperature: [ ] °F  
Quencher Drag Tank working?:  Yes  No  
EOG Sludge Pump working?: # 1  Yes  No  
RR #1 Pump working?: # 2  Yes  No

AAP Wet Dust Collector System  
Feed Pump: # 1 [ ] psig # 2 [ ] psig  
Return Pump: # 1 [ ] psig # 2 [ ] psig  
Water Flow Rate (100 to 300 gpm): [ ] gpm  
Sump Pump working?:  Yes  No  
Drain open?:  Yes  No  
DCC Sludge Pump working?: # 1  Yes  No  
RR #2 Pump working?: # 2  Yes  No

**pH DATA:** Quencher Drag Tank Effluent: [ ] su @ [ ] °F  
EOG Overflow: [ ] su @ [ ] °F  
DCC Overflow: [ ] su @ [ ] °F

**WATER TREATMENT CHEMICAL DATA:**

Polymer in use @ QDT: [ ] @ [ ] % Solution  
Polymer in use @ EOG: [ ] @ [ ] % Solution  
Polymer in use @ DCC: [ ] @ [ ] % Solution  
Neutralization Chemical in use: [ ] @ [ ] % Solution

Bioicide in use @ EOG: [ ] Bromine Residual @ EOG: [ ] ppm or NA  
Bioicide in use @ Tuyeres: [ ] Bromine Residual @ Tuyeres: [ ] ppm or NA  
Scale & Corrosion Inhibitor in use @ Tuyeres: [ ] Molybdenum Residual @ Tuyeres: [ ] ppm  
Rate of Addition: [ ] Example: Pump timer set @ on 4 times per day, 15 minutes per on cycle, w/pump rate @ 2/10.

Process Equipment	Polymer Pump Data				Neutralization Chemical Pump Data				Effluent Water Clarity *	Sludge Depth	Components Working?		
	Pump Size (GPD)	No. of Pumps	Stroke %	Rate %	Pump Size (GPD)	No. of Pumps	Stroke %	Rate %			Flash Tank Mixer	Floc Tank Mixer	Sludge Tank Rate
QDT	500	1			240	1							
EOG	500/500	2			240	1				1 2 3 4			
DCC	500	1								1 2 3 4			

\* Clarity Ratings: 1-Excellent, 2-Average, 3-Poor and 4-Unacceptable

**TUYERE DATA:** Water Temperature: [ ] °F City Water Valve Functional?:  Yes  No Shell Water: [ ]  
North Pump: [ ] psig pH: [ ] su Water Flow Rate: [ ] gpm Check Meter: [ ]  
South Pump: [ ] psig Conductivity Reading: [ ] % TDS, (Scale down if % TDS is > 2,000)

**COMMENTS:**  
\_\_\_\_\_  
\_\_\_\_\_

Distribution List: Original to Engineering Department, Copies to All Affected Supervisors, Plant Superintendents and President.

Great Lakes Casings Corporation  
**Environmental, Health and Safety Incident Information Required to Commence  
Formal Corrective Action**

CAR No.: \_\_\_\_\_ (To Be Assigned by Quality Systems Manager)  
Date Incident Reported: \_\_\_\_\_ Time Incident Reported: \_\_\_\_\_  
Employee(s) Completing this Report: \_\_\_\_\_  
Employee(s) Who Discovered this Incident: \_\_\_\_\_  
Employee(s) Providing Incident Information: \_\_\_\_\_  
Supervisory Personnel Notified of this Incident: \_\_\_\_\_

Type of Incident: (circle one) Environmental Health & Safety Other  
Date Incident Occurred: \_\_\_\_\_ OR Date Incident Discovered: \_\_\_\_\_  
Time Incident Occurred: \_\_\_\_\_ OR Time Incident Discovered: \_\_\_\_\_  
Description of Incident and Corrective Action Taken: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Note: If this Incident resulted in a Renewable Operating Permit (ROP) Deviation you must also provide the following additional information:**

Date Incident/ROP Deviation Corrected: \_\_\_\_\_  
Time Incident/ROP Deviation Corrected: \_\_\_\_\_  
Duration of Incident/ROP Deviation (Seconds, Minutes, Hours, Days, etc...): \_\_\_\_\_  
Comments: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Suggested Team Captain: \_\_\_\_\_  
Suggested Team Members: \_\_\_\_\_

## SECTION 4

### STARTUP, SHUTDOWN, MALFUNCTION (SSM) PLAN

#### 4.1 INTRODUCTION

40 CFR Part 63.6(e)(3) of Subpart A, General Provisions, Part 63.10900 and Table 3 of Subpart ZZZZZ requires that we develop and implement a Startup, Shutdown, and Malfunction Plan for operations used to comply with the NESHAP for Iron and Steel Foundries Area Sources. Great Lakes Castings has chosen to integrate this plan with the Operation and Maintenance Plan also required by Subpart ZZZZZ and the Malfunction Abatement Plan required by our Renewable Operating Permit.

#### 4.2 DEFINITIONS

##### STARTUP

Startup is defined under Section 63.2 of the MACT General Provisions as the setting in operation of an affected source or portion of an affected source for any purpose. For the purpose of this SSMP, startup will begin when the Cupola Auto-Startup is initiated. Startup ends when the cupola metal melting furnace is on blast, Taped In and when the upper stack temperature reaches 1150 degrees F.

##### SHUTDOWN

Shutdown is defined under Section 63.2 of the MACT General Provisions as the cessation of operation of an affected source or portion of an affected source. For the Cupola Metal melting furnace shutdown will begin when the system goes off blast, charging of metal ceases and the upper stack temperature fall below 1150 degrees F.

##### MALFUNCTION

Section 63.2 of the MACT General Provisions defines a malfunction as any sudden, infrequent, and not reasonably preventable failure of air pollution control, monitoring equipment, process equipment or a process to operate in a normal or usual manner which causes, or has the potential to cause, the emission limitations in an applicable standard to be exceeded. The emission limitations refer to the Subpart ZZZZZ standards for particulate or metal HAPs. For the purposes of this plan, failures resulting in part from operational errors will not be considered malfunctions.

##### OFF BLAST

Off blast means those periods of cupola operation when the cupola is not actively being used to produce molten metal. Off blast conditions include cupola startup when air is introduced to the cupola to preheat the sand bed and other cupola startup procedures as defined in the startup, shutdown, and malfunction plan. Off blast conditions also include idling conditions when the blast air is turned off or down to the point that the cupola does not produce additional molten metal.

**ON BLAST**

On blast means those periods of cupola operation when combustion (blast) air is introduced to the cupola furnace and the furnace is capable of producing molten metal. On blast conditions are characterized by both blast air introduction and molten metal production.

**TAP OUT**

Procedure used to interrupt the flow of Iron from the Cupola and seal the tap hole with a clay ball for extended shut down periods.

**TAP IN**

Procedure used to reinitiate the flow of Iron from a Cupola tap hole after a Tap Out procedure.

**4.3 STARTUP OPERATING PROCEDURES**

Startup periods will be conducted such that excess particulate or metal HAP emissions are minimized during the event. This means that the metal melting furnace will not begin operations until the cupola emission control system has been started and is functioning within the acceptable values. In addition charging of metal to the cupola will not commence until all cupola critical systems are operating normally.

The following Great Lakes Castings Standard Operating Procedures (SOP) are included in this section:

A. Wastewater - Emission Control Startup

**4.4 SHUTDOWN OPERATING PROCEDURES**

Scheduled shutdown periods will be conducted in a manner that should not generate any excess particulate or metal HAP emissions. Scheduled shutdown events include:

RELIEF - short periods due to production demands where charging of the cupola and metal flow is stopped. Relief is an off blast event where upper stack temperature falls below 1150 degrees F. During relief the cupola operations control system and emission control system is operating.

TAP OUT - Extended shutdown period where the cupola is banked and taped out. During tap out events the cupola operations control system and emission control system is shut down

BOTTOM DROP - An event where the cupola is cooled to ambient temperature, opened up, cleaned and refractory repaired or replaced. During bottom drop the cupola operation control system and emission control system is shut down.

The following Great Lakes Castings Standard Operating Procedures (SOP) are included in this section:

A - Wastewater - Shut down emission control system

## 4.5 MALFUNCTION

Malfunctions covered by this plan primarily consist of any sudden, infrequent, and not reasonably preventable failure of the Cupola melting furnace and/or associated emission control and monitoring equipment. All Cupola and emission control equipment malfunctions will be identified and corrected as soon as practicable in order to minimize excess particulate and metal HAP emissions. The health and safety of GLC employees and neighbors should be of the utmost importance in carrying out all malfunction response and corrective action procedures.

In any malfunction situation the same general response steps will be followed:

**A. Malfunction Identification** - Most foreseeable malfunction events are incorporated into the alarm notification system, which provides audible and visual identification of a malfunction occurrence. Other malfunctions will be identified through parameter monitoring equipment or by operator observations.

**B. Verify Malfunction** - Confirm the equipment or system status. Switch to the backup system when available.

**C. Suspension of Operation** - If Computer Assisted Monitoring System has not shut the system down, evaluate malfunction and if the potential exists for discharge of excess emission. Stop charging and initiate a safe and orderly shutdown.

**D. Responsible Official Notification** - Once a malfunction has been identified the most appropriate responsible official at the facility at the time of the event ( Shift Supervisor, Maintenance Supervisor, Plant Superintendent, Environmental Manager) will be notified. The responsible official will provide assistance and guidance, if necessary, to successfully complete the remaining response actions.

**E. Diagnosis and Malfunction Cause Determination** - The cause of the malfunction must be identified to identify the appropriate corrective action steps. Figures 2.1 - 2.7 provide a list of potential conditions or factors that could cause each malfunction event covered by this SSM Plan.

**F. Corrective Action Procedures** - Once the cause of the malfunction has been determined, appropriate corrective action measures will be implemented in a timely manner to resolve the malfunction and restore the Cupola or affected process equipment back to normal operation. Section 5 of this plan gives details of the corrective action methodology used at GLC.

**G. Malfunction Event Documentation** - During operational periods when the Renewable Operating Permit (ROP) is applicable, process control operators and waste treatment operators will use the information in our ROP to make regulatory compliance related decisions about the operation of the system, and to document what is needed to assure compliance. It includes determining whether a potential malfunction event qualifies as a ROP permit deviation. Suspected deviations will be documented on the Cupola and Cupola Emission Control System Monitoring and Recordkeeping Report. All reports will be followed up by the EHS Manager and confirmed deviation of the ROP and/or deviations of the SSMP will be documented in the ROP Deviation Log and a Environmental Health and Safety Incident Information Required to Commence Formal Corrective Action will be filed out and filed. A Formal Corrective Action investigations will commence and subsequent actions will be implemented and documented.

**H. Reporting and Recordkeeping** - Applicable malfunction events will be reported to the permitting authority and records maintained as required by the Great Lakes Castings Renewable Operating Permit. Records of all actions taken during a startup, shutdown event including details of malfunctions, that result in exceedance of an applicable emission standard will be maintained and made available on request by the permitting authority. In addition any actions undertaken during a startup shutdown event that is not consistent with the procedures specified in this plan will be recorded, reported and modification of the plan will be initiated when necessary.



SOP #	CUP-507-05	DATE	7/7/97	SHEET NO.	1 of 1	
PRODUCT	N/A	PREPARED BY	Wastewater			
AREA	Wastewater	APPROVED BY	DEPT.	DATE		
MACHINE NO.	N/A					
OPERATION NAME	Emission Control Start Up					

**PLEASE REFER TO PPE ASSESSMENT # 030 BEFORE BEGINNING THIS TASK!**

#	WORK ELEMENTS	KEY POINT	SKETCH, DRAWING or PHOTO
1	Go upstairs and open the manual Valve(s) for the make-up water		
2	Go to the control panel and bring up page 10.		
3	Press start- Make-up water.		
4	Go to page 11 and check that all three make-up water valves are in Auto.		
5	Go to page 15 and put Quencher pump #1 or #2 manually on.		
6	Go to page 20 and start EC system. Check that venturi pump, rakes and mixer started.		
7	Go to page 21 and check that the fan and cooling tower pump started.		
8	Go to page 22 and check that the demister pump started .		
9	Go to page 31 and turn on Polymer.		

Rev. Date	Rev. Level	Reason for Revision
12/15/2004	1	Update
11/17/2006	2	Update
1/27/2009	3	New format
7/14/2015	4	



# GLC

## GREAT LAKES CASTINGS

HIGH QUALITY GRAY IRON CASTINGS

SOP #	CUP 506-07	DATE 7/7/97	SHEET NO. 1 of 1	
PRODUCT		PREPARED BY	K.H.	
AREA	Wastewater	APPROVED BY	DEPT.	DATE
MACHINE NO.				
OPERATION NAME	Shut Down Emission Control System			

**BEFORE BEGINNING THIS TASK YOU MUST REFER TO THE PPE WORKPLACE HAZARD ASSESSMENT # 030, FOR THE PROPER PPE NEEDED.**

#	WORK ELEMENTS	KEY POINT	SKETCH , DRAWING or PHOTO
1	If open close the ECC to QDT valve located under RR#1.		
2	Go to page 11 and turn off make-up and water for QT and EC manuel off.		
3	Close the manual valves for the Make - up water as well.		
4	On page 20 press the EC System stop button.		
5	On page 15 turn the Quencher pump manually off.		
6	On page 5 Disable both the Emission controls and Quencher system.		

Revision Date	Revision	Reason
12/15/2004	2	Updated
11/15/2008	4	Updated
7/24/2015	5	removed original line 4-6. New format
11/15/2016	6	updated line 1 and 2
4/26/2017	7	updated line 1, 2 and 3



## SECTION 5

### CORRECTIVE ACTION PROCEDURES

#### 5.1 INTRODUCTION

Great lakes Castings has adopted a Corrective Action Procedure that is based on the Abnormal Situation Management model that has been developed by the chemical process industry as a response to the OSHA 29 CFR 1910.119 "Process Safety Management Standard" requirement. Most companies have proven procedures for dealing with normal operating conditions and for dealing with emergencies. The advantage of this approach is that it integrates the monitoring of system operations into a response plan and addresses abnormal conditions before they become out of control or emergency situations. A basic outline of Abnormal Situation Model is as follows.

##### Operations Mode

There are three basic modes of operation: Normal, Abnormal, and Emergency. In the Normal mode of operation, all operating conditions are within the established control limits. In the Abnormal mode, one or more conditions have reached a control limit or have gone out of control and needs corrective action. In the Emergency mode, one or more of the process variables is out of control and cannot be corrected without a shutdown of the process.

##### Plant State

Within the three basic modes of operation, the plant will be faced with four states: Normal, Abnormal, Abnormal - Out of Control and Shutdown. In the Normal state, all conditions are within established control limits. In the Abnormal state, a response is initiated to bring one or more conditions back into the normal operating range. In the Abnormal - Out of Control state, a response is initiated to prevent the Out of Control situation from becoming an Emergency. In the Shutdown state, a response is initiated to shutdown the process to allow corrective actions to be completed.

##### Operational Goals

The Operational Goals are related to the plant state. If the Plant State is Normal, then the Operational Goal is to keep it Normal. If the Plant state is Abnormal, then the Operational Goal is to return it to Normal. If the Plant State is Abnormal - Out of Control, then the Operational Goal is to bring it to a Safe State. If the Plant State is Shutdown, then the Operational Goal is to Minimize the Impact on the Environment, minimize the extent of equipment damage and to not jeopardize the safety of employees.

### Critical Systems

In order to meet the Operational Goals, there are Critical Systems that have to be maintained. In order to keep the process Normal, there need to be Automatic Controls, Process Monitoring Devices and Standard Operating Procedures. In order to return to Normal from Abnormal, there must be Manual Controls to regulate the process and Corrective Action Procedures. In order to bring the process to a Safe State from Abnormal - Out of Control, there needs to be Shutdown procedures. In order to Minimize the Impact on the environment, there must be a Shutdown Response Plan.

### Operations and Support Activities

In order to ensure that the Critical Systems are functional, there have to be on-going Operations and Support Activities. To make sure that the Automatic Controls and Process Monitoring devices are working properly, there needs to be manual monitoring activities, routine testing of systems and preventive maintenance on critical equipment. To make sure that the manual controls are used properly to correct an Abnormal State and that the Shutdown procedures are followed properly, Corrective Action Procedures, Troubleshooting Procedures and Manual Intervention Procedures need to be in place. Additionally, Operations and Maintenance personal need to be trained in their use. To make sure that the Impact on the environment from a Shutdown is minimized, Emergency Response Procedures need to be in place. Additionally, Operations and Maintenance personnel need to be trained in their use.

See Figure 1 for a graphic example of these relationships.

## **5.2 CORRECTIVE ACTION PLAN**

Based on the Abnormal Situation Management model, the Cupola Malfunction Abatement Plan integrates the Monitoring and Corrective Action sections. As the attached chart indicates, GLCC personnel have identified sixty-five (65) Control Points within the Melting and Emission Control systems. Control limits for Normal, Abnormal, Abnormal - Out of Control and Shutdown States have been Identified for most Control Points. For the most part, those that have not been established are related to the operation of cooling towers. For the purposes of this plan, an Abnormal Response, an Out of Control Response, a Shutdown Response and Reporting Requirements have been listed along with the title of the individual responsible for taking the appropriate action. The Control Points that have related Permit Conditions have been identified. The Reporting Requirements are spelled out along with general statements regarding potential malfunction scenarios, the reporting hierarchy and instructions for the involvement of Maintenance personnel in Out of Control and Shutdown Responses. This is shown in Figure 2.

As an example, refer to Control Point #1 in Figure 2: Venturi Pressure Drop. The Normal operating range for the pressure drop across the Venturi is above 38" of water column. The minimum allowable pressure drop indicated in the permit is 33" of water column. This has been established as the lower control limit and is considered to be an Abnormal State.

The necessary Shutdown response is to: "Cease charging metallics until problem is corrected, Shut down blast blower as necessary, shut down exhaust blower as necessary", until the pressure drop is returned to the Normal range and the other permit conditions are met. The Plant Superintendent and the Melting Supervisor will make this determination. In accordance with the established Reporting Requirements, the EHS Manager will make the appropriate reports to the District Supervisor

## ABNORMAL SITUATION MANAGEMENT - FIGURE 1

OPERATIONS MODE	NORMAL	ABNORMAL	EMERGENCY
PLANT STATE	NORMAL	ABNORMAL OUT OF CONTROL	SHUTDOWN
OPERATIONAL GOAL	KEEP NORMAL	RETURN TO NORMAL	BRING TO SAFE STATE MINIMIZE IMPACT
CRITICAL SYSTEMS	AUTOMATIC CONTROLS PROCESS MONITORING STANDARD OPERATING PROCEDURES	MANUAL CONTROLS CORRECTIVE ACTION PROCEDURES	SHUTDOWN PROCEDURES ..... SHUTDOWN RESPONSE PLAN
OPERATIONS AND SUPPORT ACTIVITIES	MONITORING, TESTING PREVENTIVE MAINTENANCE	MANUAL INTERVENTION TROUBLESHOOTING PROCEDURES	EMERGENCY RESPONSE PROCEDURES

**GLC CUPOLA MALFUNCTION ABATEMENT PLAN - FIGURE 2**

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OPERATIONS MODE:		NORMAL	ABNORMAL	ABNORMAL	ABNORMAL	OUT OF CONTROL	EMERGENCY	SHUTDOWN	REPORTING
PLANT STATE:		NORMAL	ABNORMAL	RESPONSE	OUT OF CONTROL	RESPONSE	SHUTDOWN	RESPONSE	REQUIREMENTS
#	CONTROL POINT								
<i>Pressure Drops</i>									
1	Venturi	above 38"	33" to 38"	Remove water and debris from pressure lines and verify pressure, verify position of variable throat, check exhaust blower amps, check water flow rate, check water temperature. (Cupola Operator. Wastewater Operator)	32" alarm activated	Check calibration of monitoring device (Melting Supervisor, Wastewater Operator, Maintenance)	32" alarm verified	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor)	1,2 (EHS) Manager
2	Demister	0.05" to 0.8"	*0.04" or 0.9"	Remove water and debris from pressure lines and verify pressure, verify position of variable throat, check exhaust blower amps, check water flow rate, check water temperature. (Cupola Operator. Wastewater Operator)	<0.01" or >0.9" alarm activated	Check calibration of monitoring device Inspect condition of mesh bed filter, clean, repair or replace as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	<0.01" or >0.9" alarm verified	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor)	1,2 (EHS) Manager
3	Exhaust Blower	40" - 44"	38"	Remove water and debris from pressure lines and verify pressure, verify position of variable throat, check exhaust blower amps, check water flow rate, check water temperature. (Cupola Operator. Wastewater Operator)	<35"	Verify operation of monitoring device with hand held manometer (Melting Supervisor, Wastewater Operator, Maintenance)	<33"	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary, inspect exhaust fan and housing (Plant Superintendent, Melting Supervisor)	N/A
<i>Liquid Flow Rates</i>									
4	Quencher	250 gpm	*200 gpm	Remove water and debris from pressure lines and verify pressure, check pump pressure, switch to alternate pump and clean strainer. (Cupola Operator. Wastewater Operator)	<200 alarm activated	Check calibration of monitoring device. Check nozzles for plugging as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	<200 alarm verified	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary, replace plugged nozzles as necessary, clean transducer pressure lines (Plant Superintendent, Melting Supervisor)	1,2 (EHS) Manager
5	Venturi	250 gpm	*200 gpm	Remove water and debris from pressure lines and verify pressure, check pump pressure, switch to alternate pump, clean strainer when pump can be shut down. (Cupola Operator. Wastewater Operator)	<200 alarm activated	Check calibration of monitoring device. Check nozzles for plugging as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	<200 alarm verified	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary, replace plugged nozzles as necessary, clean transducer pressure lines (Plant Superintendent, Melting Supervisor)	1,2 (EHS) Manager
6	Demister	*50 gpm	*40 gpm	Remove water and debris from pressure lines and verify pressure, check pump pressure, switch to alternate pump, clean strainer when pump can be shut down. (Cupola Operator. Wastewater Operator)	<40 alarm activated	Check calibration of monitoring device. Check nozzles for plugging as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	<40 alarm verified	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary, replace plugged nozzles as necessary, clean transducer pressure lines (Plant Superintendent, Melting Supervisor)	1,2 (EHS) Manager
7	ECS Cooling Tower			Check pump pressure, shutdown pump and clean strainer, switch to alternate pump as necessary. (Wastewater Operator)		Check calibration of monitoring device. Install new gauge as necessary, operate both pumps as necessary, switch to city water as necessary. (Melting Supervisor, Wastewater Operator, Maintenance)		Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor)	N/A

	OPERATIONS MODE:	NORMAL	ABNORMAL	ABNORMAL	ABNORMAL	OUT OF CONTROL	EMERGENCY	SHUTDOWN	REPORTING
	PLANT STATE:	NORMAL	ABNORMAL	RESPONSE	OUT OF CONTROL	RESPONSE	SHUTDOWN	RESPONSE	REQUIREMENTS
#	CONTROL POINT								
<i>Liquid Flow Rates</i>									
8	Tuyere Cooling Tower	200-250	<200	Check pump pressure, shutdown pump and clean strainer, switch to alternate pump as necessary. (Wastewater Operator, Cupola Operator)	175	Check operation of monitoring device. Install new gauge as necessary, operate both pumps as necessary, switch to city water as necessary. (Melting Supervisor, Wastewater Operator, Maintenance)	<175	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor)	N/A
<i>Liquid Pressures</i>									
9	Quencher	110 psi	90 psi	Remove water and debris from pressure lines and verify pressure, check pump pressure, switch to alternate pump, clean strainer when pump can be shut down. (Wastewater Operator)	<90 psi	Check operation of monitoring device, Install new gauge as necessary, operate both pumps as necessary, check nozzles for plugging (Melting Supervisor, Wastewater Operator, Maintenance)	80 psi	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor)	N/A
10	Venturi	60 psi	50 psi	Remove water and debris from pressure lines and verify pressure, check pump pressure, switch to alternate pump, clean strainer when pump can be shut down. (Wastewater Operator)	<50 psi	Check operation of monitoring device, Install new gauge as necessary, operate both pumps as necessary, check nozzles for plugging (Melting Supervisor, Wastewater Operator, Maintenance)	45 psi	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor)	N/A
11	Demister	80 psi	60 psi	Remove water and debris from pressure lines and verify pressure, check pump pressure, switch to alternate pump, clean strainer when pump can be shut down. (Wastewater Operator)	<60 psi	Check operation of monitoring device, Install new gauge as necessary, operate both pumps as necessary, check nozzles for plugging (Melting Supervisor, Wastewater Operator, Maintenance)	55 psi	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor)	N/A
12	ECS Cooling Tower	20 psi	15 psi	Check pump flow. Check strainers (Wastewater Operator)	<15 psi	Check operation of monitoring device. Switch to back up for verification, switch to alternate pump as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	10 psi	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor)	N/A
13	Tuyere Pump	35 psi	25 psi	Check pump flow. Check strainers (Cupola Operator, Wastewater Operator)	<25	Check operation of monitoring device. Switch to back up for verification, switch to alternate pump as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	20 psi	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor)	N/A
<i>Temperatures (Gas Phase)</i>									
14	Upper Stack	Ramp to 1600F	*1150F	Check position of Venturi, check exhaust blower amps, check blast blower rate, check operation of afterburners. (Cupola Operator, Wastewater Operator)	<1150F or >1675F alarm activated	Check operation of monitoring device. Switch to back up for verification (Melting Supervisor, Wastewater Operator, Maintenance)	<1150F or >1675F alarm verified	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary and open cupola cap as necessary (Plant Superintendent, Melting Supervisor)	1,2 (EHS Manager)
15	Venturi Inlet	170F	175F	Check position of Venturi, check Quencher flow, check exhaust blower amps, check blast blower rate, check operation of afterburners. (Cupola Operator, Wastewater Operator)	>180F alarm activated	Check operation of monitoring device, verify with handheld thermometer. (Melting Supervisor, Wastewater Operator, Maintenance)	>200F alarm verified	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary and open cupola cap and necessary. (Plant Superintendent, Melting Supervisor)	N/A

	OPERATIONS MODE:	NORMAL	ABNORMAL	ABNORMAL	ABNORMAL	OUT OF CONTROL	EMERGENCY	SHUTDOWN	REPORTING
	PLANT STATE:	NORMAL	ABNORMAL	RESPONSE	OUT OF CONTROL	RESPONSE	SHUTDOWN	RESPONSE	REQUIREMENTS
#	CONTROL POINT								
<i>Temperatures (Gas Phase)</i>									
16	Demister	170F	175F No monitoring device currently installed	Check position of Venturi, check exhaust blower amps, check blast blower rate, check operation of afterburners. (Cupola Operator, Wastewater Operator)	180F No monitoring device currently installed	No monitoring device currently installed (Melting Supervisor, Wastewater Operator, Maintenance)	>200F	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary and open cupola cap and necessary. (Plant Superintendent, Melting Supervisor)	N/A
17	Exhaust Blower Inlet	170F	175F	Check position of Venturi, check exhaust blower amps, check blast blower rate, check water flows. Check water temperatures. (Cupola Operator, Wastewater Operator)	>180F	Check operation of monitoring device, verify with handheld thermometer. (Melting Supervisor, Wastewater Operator, Maintenance)	>200F	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary and open cupola cap and necessary. (Plant Superintendent, Melting Supervisor)	N/A
18	Exhaust Blower outlet	180F	185F	Check position of Venturi, check exhaust blower amps, check blast blower rate, check water flows. Check water temperatures. (Cupola Operator, Wastewater Operator)	>200F	Check operation of monitoring device, verify with handheld thermometer. (Melting Supervisor, Wastewater Operator, Maintenance)	>200F	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary and open cupola cap and necessary. (Plant Superintendent, Melting Supervisor)	N/A
<i>ECS Cooling Tower (Liquid)</i>									
19	Inlet		No monitoring device currently installed		No monitoring device currently installed		No monitoring device currently installed	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor)	N/A
20	Outlet		No monitoring device currently installed		No monitoring device currently installed		No monitoring device currently installed	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor)	N/A
<i>Tuyere Cooling Tower (Liquid)</i>									
21	Inlet				>115F	Check temperature with hand held thermometer, activate city water as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	120F	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor)	N/A
22	Outlet	90F or less	>90F	Check pump pressure, check operation of fan, check water inlet temperature (Cupola Operator, Wastewater Operator)	>115F	Check operation of monitoring device, switch to back up for verification Activate city water make up valve as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	150f	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary and open cupola cap and necessary. (Plant Superintendent, Melting Supervisor)	N/A
<i>Electrical Control System Status</i>									
23-A	Operational	Indicator light	Indicator light	Use the test switch to check lights (Cupola Operator)					N/A
23-B	Not Operational				Indicator light	Use test switch to test lights, check circuit breaker (Melting Supervisor, Wastewater Operator, Maintenance)	Indicator light	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary. (Plant Superintendent, Melting Supervisor)	N/A

	OPERATIONS MODE:	NORMAL	ABNORMAL	ABNORMAL	ABNORMAL	OUT OF CONTROL	EMERGENCY	SHUTDOWN	REPORTING
	PLANT STATE:	NORMAL	ABNORMAL	RESPONSE	OUT OF CONTROL	RESPONSE	SHUTDOWN	RESPONSE	REQUIREMENTS
#	CONTROL POINT								
	<i>Afterburners</i>								
24	Pilot mode	Indicator light not operational			Indicator light	Check operation of Indicator light, relight pilot as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	Indicator light	Cease charging metallics until problem is corrected Shut down blast blower as necessary (Plant Superintendent, Melting Supervisor)	N/A
	<i>Full fire mode</i>								
25	Burner #1	Indicator light not operational			Indicator light	Check operation of Indicator light, relight pilot as necessary, check operation of burner blower (Melting Supervisor, Wastewater Operator, Maintenance)	Indicator light	Cease charging metallics until problem is identified Shut down blast blower as necessary, repair or replace burner as necessary at next drop (Plant Superintendent, Melting Supervisor)	N/A
26	Burner #2	Indicator light not operational			Indicator light	Check operation of Indicator light, relight pilot as necessary, check operation of burner blower (Melting Supervisor, Wastewater Operator, Maintenance)	Indicator light	Cease charging metallics until problem is identified Shut down blast blower as necessary, repair or replace burner as necessary at next drop (Plant Superintendent, Melting Supervisor)	N/A
27	Burner #3	Indicator light not operational			Indicator light	Check operation of Indicator light, relight pilot as necessary, check operation of burner blower (Melting Supervisor, Wastewater Operator, Maintenance)	Indicator light	Cease charging metallics until problem is identified Shut down blast blower as necessary, repair or replace burner as necessary at next drop (Plant Superintendent, Melting Supervisor)	N/A
	<i>Exhaust Blower</i>								
28	Motor Amps	290-350	>400	Check position of Venturi, check blast blower rate, check water flows, check water temperature (Cupola Operator)	>500 alarm activated	Check operation of monitoring device with clamp on ammeter (Melting Supervisor, Cupola Operator, Maintenance)	>500 alarm verified	Cease charging metallics until problem is corrected Shut down blast blower as necessary (Plant Superintendent, Melting Supervisor)	N/A
	<i>Blast Blower</i>								
29	CFM	6000-8000	>8500	Check position of venturi	Not running	Check control circuit, check overloads (Melting Supervisor, Cupola Operator, Maintenance)	Not running	Cease charging metallics until problem is corrected (Plant Superintendent, Melting Supervisor)	N/A
30	Blast Back Pressure (oz)	12							N/A
31	Percent Oxygen	0							N/A
32	Tuyere Sleeve Size	5.3"							N/A
33	Charge Scales	In calibration			Out of calibration	Arrange for calibration of scale. Check weight using truck scale (Melting Supervisor, Maintenance)	Not working	Cease charging metallics, melt down, tap out (Plant Superintendent, Melting Supervisor)	N/A
34	Water Droplets on Roof	Normal			Excessive	Identify source(s) and issue maintenance work order(s) for cor-rection(s), check exhaust stack drain, check demister pressure drop, check demister drain (Melting Supervisor, Maintenance, WW)			N/A
35	Plume Color	White	Nearly White	Consult with Melting Supervisor	Color	Consult with EHS Manager	Dark Color	Cease charging metallics until problem is corrected Shut down blast blower as necessary, shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor)	1,2 Manager) (EHS



	OPERATIONS MODE:	NORMAL	ABNORMAL	ABNORMAL	ABNORMAL	OUT OF CONTROL	EMERGENCY	SHUTDOWN	REPORTING
	PLANT STATE:	NORMAL	ABNORMAL	RESPONSE	OUT OF CONTROL	RESPONSE	SHUTDOWN	RESPONSE	REQUIREMENTS
#	CONTROL POINT								
	<i>Plume Opacity</i>								
36	Visible Emissions	<20%	20%	Consult with Melting Supervisor	>20%	Consult with EHS Manager	>20%	Cease charging metallics until problem is corrected Shut down blast blower as necessary shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor)	2 (EHS Manager)
	<i>Fugitive emissions</i>								
37	At the charge door	Normal	Excessive	Consult with Melting Supervisor	Excessive	Check position of venturi Check operation of afterburners, check operation of exhaust blower (Melting Supervisor, Maintenance, EHS Manager)	Excessive	Cease charging metallics until problem is corrected Shut down blast blower as necessary shut down exhaust blower as necessary (Plant Superintendent, Melting Supervisor, Environmental Engineer)	N/A
38	Water in exhaust blower pit	Yes			No	Add water to blower pit (Wastewater Operator)			N/A
39	Exhaust blower housing drain	Open	Backed up	Clean drain (Wastewater Operator)	Not open	Check operation of sump pump, use portable pump as necessary (Wastewater Operator, Maintenance)	Not open	Replace sump pump (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
40	Exhaust Stack Drain	Open	Backed up	Clean drain (Wastewater Operator)	Not open	Check demister pressure drop (Wastewater Operator, Maintenance)	Not open	cease charging metallics until problem is corrected shut down blast blower as necessary necessary (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
	<i>Exhaust blower/Stack drain</i>								
41	Sump system	Functioning	Backed up	Clean drain (Wastewater Operator)	Malfunctioning	Check operation of sump pump, use portable pump as necessary (Wastewater Operator, Maintenance)	Not Functioning	Replace sump pump (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
	<i>Neutralization Chemical Pumps</i>								
42	Quencher Drag Tank	Functioning			Malfunctioning	Check operation of pump and pump output (Wastewater Operator and Maintenance)	Not Functioning	Install spare pump (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
43	EC Clarifier	Functioning			Malfunctioning	Check operation of pump and pump output (Wastewater Operator and Maintenance)	Not Functioning	Install spare pump (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
44	Neutralization Chemical Inventory	Minimum of two day supply on hand at all times.	Less than two day supply	Expedite order through purchasing (Wastewater Operator)	One day supply on hand	Call vendor for immediate delivery (Melting Supervisor)	Out	Cease charging metallics, melt down, tap out (Plant Superintendent, Melting Supervisor)	N/A
	<i>Polymer Pumps</i>								
45	Quencher Drag Tank	Functioning			Malfunctioning	Check operation of pump and pump output (Wastewater Operator and Maintenance)	Not Functioning	Install spare pump (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
46	EC Clarifier	Functioning			Malfunctioning	Check operation of pump and pump output (Wastewater Operator and Maintenance)	Not Functioning	Install spare pump (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
47	Polymer Inventory	Minimum of two week supply on hand at all times.	Less than one week supply	Expedite order through purchasing (Wastewater Operator)	One day supply on hand	Call vendor for immediate delivery (Melting Supervisor)	Out	Cease charging metallics, melt down, tap out (Plant Superintendent, Melting Supervisor)	N/A
	<i>pH meter reading</i>								
48	Quencher Drag Tank Effluent	7.5 to 8.5	6.5 to 7.5 or 8.5 to 9.0	Adjust output of neutralization pump (Wastewater Operator)	<6.5 or >9.0	Check operation of pump Check for plugged lines (Melting Supervisor, Wastewater Operator and Maintenance)	<5.5 to >9.5	Install spare pump Replace plugged lines (Melting Supervisor, Wastewater Operator, Maintenance)	N/A

OPERATIONS MODE:		NORMAL	ABNORMAL	ABNORMAL	ABNORMAL	OUT OF CONTROL	EMERGENCY	SHUTDOWN	REPORTING
PLANT STATE:		NORMAL	ABNORMAL	RESPONSE	OUT OF CONTROL	RESPONSE	SHUTDOWN	RESPONSE	REQUIREMENTS
#	CONTROL POINT								
<i>pH meter reading</i>									
49	EC Clarifier Effluent	7.5 to 8.5	6.5 to 7.5 or 8.5 to 9.0	Adjust output of neutralization pump (Wastewater Operator)	<6.5 or >9.0	Check operation of pump Check for plugged lines (Melting Supervisor, Wastewater Operator and Maintenance)	<5.5 to >9.5	Install spare pump Replace plugged lines (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
50	Filtrate to Sanitary Sewer	8.5 to 9.5	<6.0 or >9.6	Verify pH reading with manual test (Wastewater Operator)	<5 or >10	Stop filter press cycle and adjust pH accordingly (melting Supervisor, Wastewater Operator, Maintenance)	<4.5 to >10	Cease filter press operations until problem is corrected (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
<i>Effluent Clarity</i>									
51	Quencher Drag Tank	Clean	Dirty	Check level of polymer in mix tank, check operation of polymer pump, check operational status QDT drag chain (Wastewater operator)	Dirty	Conduct jar test in lab, determine pump pressure loss from abrasion (Melting Supervisor, Wastewater Operator, Maintenance, Engineering)	Dirty	Identify source of problem and take corrective action. Replace pump as necessary (Melting Supervisor, Wastewater Operator, Maintenance, Engineering)	N/A
52	EC Clarifier Overflow	Clean	Dirty	Check level of polymer in mix tank, check operation of polymer pump, check operational status of Rakes and mixer (Wastewater operator)	Dirty	Conduct jar test in lab, determine pump pressure loss from abrasion (Melting Supervisor, Wastewater Operator, Maintenance, Engineering)	Dirty	Identify source of problem and take corrective action. Replace pump as necessary (Melting Supervisor, Wastewater Operator, Maintenance, Engineering)	N/A
53	Filtrate to Sanitary Sewer	Clean	Dirty	Grab a sample to determine clarity, if <3 continue with press cycle (Wastewater Operator)	Dirty	Grab a sample to determine clarity, if = to or >3 switch to the recycle mode and empty press after full and find problem (Melting Supervisor, Wastewater Operator)	Dirty	Locate bad filter cloths and replace as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
<i>misc. components</i>									
54	Quencher Drag Tank Drag Chain and flights	Functioning			Malfunctioning	Troubleshoot and repair components as necessary (Wastewater Operator, Maintenance)	Not Functioning	Replace components as necessary, provide for additional sludge storage (Melting Supervisor, Wastewater Operator, Maintenance, Engineering)	N/A
55	EC Clarifier Flash Tank Mixer	Functioning			Malfunctioning	Troubleshoot and repair mixer as necessary (Wastewater Operator, Maintenance)	Not Functioning	Replace mixer as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
56	EC Clarifier Floc Tank Rake	Functioning			Malfunctioning	Troubleshoot and repair rake components as necessary (Wastewater Operator, Maintenance)	Not Functioning	Replace rake as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
57	ECC Sludge Rake Torque Meter	Functioning			Malfunctioning	Troubleshoot and repair meter as necessary (Wastewater Operator, Maintenance)	Not Functioning	Replace meter as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
58	EC Clarifier Sludge Rake	Functioning			Malfunctioning	Troubleshoot and repair rake components as necessary (Wastewater Operator, Maintenance)	Not Functioning	Replace rake as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	N/A

	OPERATIONS MODE:	NORMAL	ABNORMAL	ABNORMAL	ABNORMAL	OUT OF CONTROL	EMERGENCY	SHUTDOWN	REPORTING
	PLANT STATE:	NORMAL	ABNORMAL	RESPONSE	OUT OF CONTROL	RESPONSE	SHUTDOWN	RESPONSE	REQUIREMENTS
#	CONTROL POINT								
59	EC Thickener Sludge Pump	Functioning			Malfunctioning	Check operation of pump, flush pump, blow compressed air into clarifier (Wastewater Operator and Maintenance)	Not Functioning	Install spare pump (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
60	WW PLC Sludge Pump Counter	Functioning			Malfunctioning	Reprogram PLC counter (Wastewater Operator, Maintenance)	Not Functioning	Troubleshoot and repair counter as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
61	Sludge Conditioning Tank Mixer	Functioning			Malfunctioning	Troubleshoot and repair mixer as necessary (Wastewater Operator, Maintenance, Engineering)	Not Functioning	Replace mixer as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
62	Sludge Cond. Agent Conv. Sys.	Functioning			Malfunctioning	Troubleshoot and repair conveyor as necessary (Wastewater Operator, Maintenance, Engineering)	Not Functioning	Replace conveyor as necessary (Melting Supervisor, Wastewater Operator, Maintenance)	N/A
63	Sludge Conditioner Inventory	Minimum of one week supply on hand at all times.	Less than one week supply on hand	Expedite order through purchasing (Wastewater Operator)	One day supply on hand	Call vendor for immediate delivery (Melting Supervisor)	Out	Provide for additional sludge storage (Plant Superintendent, Melting Supervisor, Engineering)	N/A
64	Filter Press Sludge Pump	Functioning			Malfunctioning	Check operation of pump Use alternate pump (Wastewater Operator, Maintenance)	Not Functioning	Install spare pump provide for additional sludge storage (Plant Superintendent, Melting Supervisor, Engineering)	N/A
65	Municipal Flow Meter	Functioning			Malfunctioning	Notify City of Ludington (Engineering)	Not Functioning	Ensure that Filter Press Log is maintained (Plant Superintendent, Melting Supervisor)	N/A

\* PERMIT CONDITION

#### REPORTING REQUIREMENTS

The Reporting Requirements associated with ROP Permit No. A3934-2015 are as follows:

1) As contained in ROP-A3934-2015, GLC shall keep a written record of all occurrences where the monitored pressure drop across the venturi or demister, or the liquid flow rates to the quencher, venturi or demister, or the temperature in the upper cupola stack for the cold blast operations deviate from the levels specified in Special Conditions of ROP-A3934-2015. The requirements of the appropriate sections of the Malfunction Abatement Plan and Preventive Maintenance Program as approved by the District Supervisor of the Air Quality Division must be satisfied. Such records shall include the date and time of each occurrence, the suspected cause of the occurrence and the actions taken to correct the occurrence and prevent recurrence. GLC shall submit this record to the District Supervisor of the Air Quality Division semiannually or more frequently if required.

2) As contained in General Permit Conditions of ROP-A3934-2015, GLC must provide notice of an abnormal condition, start-up, shutdown or malfunction that results in emissions of a hazardous or toxic air pollutant in excess of standards for more than one hour or of any air contaminant in excess of standards for more than two hours, as required in this rule, to the District Supervisor of the Air Quality Division. The notice shall be provided not later than two days after the start-up, shutdown or discovery of the abnormal condition or malfunction. Written reports, if required, must be filed with the District Supervisor within 10 days, with the information required in this rule.

Note: Air Permit No. A3934-2015 contains other record keeping requirements which are not directly incorporated into this Malfunction Abatement Plan.

In all potential malfunction scenarios, it should be understood that charging metallics to the cupola will not resume until the upper stack temperature reaches 1150 deg. F, until the designated pressure drops for the Venturi and demister are achieved, and until the designated flow rates for the Quencher, Venturi and Demister are achieved.

#### REPORTING HIERARCHY

1) If the control point status remains in an Abnormal Operations mode after completing all of the appropriate Abnormal Response procedures, notify the Melting Supervisor immediately and the Maintenance and Engineering Departments as necessary.

2) If the Control point status reaches an Abnormal - Out of Control Operations mode, notify the Melting Supervisor immediately and the Maintenance and Engineering Departments as necessary. Proceed with the appropriate Out of Control response procedures. If the Control Point Status remains in an Abnormal - Out of Control mode after completing all of the appropriate Out of Control procedures, notify the Plant Superintendent immediately and the Maintenance and Engineering Departments as necessary.

3) If the Control Point status escalates to the Emergency mode, proceed with the appropriate Shutdown procedures and Emergency Response procedures as necessary

#### OUT OF CONTROL RESPONSE:

An Out of Control Response that requires Maintenance Department personnel is to be initiated by a work order and notification of the Maintenance Supervisor or Lead Person by Wastewater Operator, Cupola Operator, or Melting Supervisor. If a Shutdown Response is anticipated, the Plant Superintendent is to be notified immediately.

#### SHUTDOWN RESPONSE:

A Shutdown Response that requires Maintenance Department personnel is to be initiated by a phone call to the Maintenance Supervisor or Lead Person by a work order. This is to be accomplished by the Wastewater Operator, Cupola Operator, Melting Supervisor or Plant Superintendent.