



January 23, 2012

## **INTRODUCTION**

The following summary was prepared in response to a request from Jennifer Dines, Manager, State implementation Plan and Rule Making Section, Division of Air Pollution Control, at the Ohio Environmental Protection Agency (OEPA). This response summarizes the background of work performed to date to evaluate the facility's potential pollutants in ambient air near the 4150 E. 56<sup>th</sup> Street facility, as well as provide an update on the status of the current dust collector improvements.

## **EXECUTIVE SUMMARY**

In 2010, OEPA contacted Ferro to discuss the National Ambient Air Quality Standard for Lead and to open a dialogue related to the Partial Ambient Lead non-attainment Area (monitor 39-035-0049) near the facility. Specifically, OEPA sought Ferro's cooperation in an effort to understand periodic exceedences of 0.15 mg/M<sup>3</sup> (3-month rolling average) at lead monitor 39-035-0049.

Historically, the E. 56<sup>th</sup> Street facility has operated within the limits of its Title V permit for Differential Pressure across the Bag houses as well as continued operation with no visible emissions. OEPA asked Ferro to cooperate in a joint effort to identify whether or not facility operations contributed to the readings that were identified at the lead monitor. Ferro cooperated and provided OEPA with maintenance and production records to assist OEPA in determining whether there was anything peculiar to Ferro's operations that could contribute to the readings.

On March 3, 2011 Ferro observed a visible emission (Lead) from bag house #9 at the E.56<sup>th</sup> Street facility. The source equipment and associated control units were shut down as soon as practicable after the visible emission was observed. Any dust observed was collected and disposed and an inspection of the control unit was completed. Upon completion of the inspection, the cause of the visible emissions was determined to be a failed retaining clamp on a filter. Repairs were made and the unit was placed back into service on March 7, 2011.

In an effort to prevent future visible emissions events, Ferro commenced a program to evaluate the condition of all bag houses as a result of this event. The inspections were completed in the last half of April early half of May 2011. All sources were shut down and the corresponding control units were visually inspected. To the extent that repairs or preventative maintenance was determined to be necessary, the repairs and/or maintenance to these units was also carried out during this time. Upon completion of any repairs or maintenance, Ferro embarked on a dust collector improvement project designed to prevent any future bag failure and the potential emissions that can be associated with them. The project includes the purchase and installation of (1) bag break protectors, (2) secondary HEPA filters and (3) new blowers at all lead dust collectors. The project also includes replacement of four (4) bag house units.

In order to protect its investment, the facility will implement an enhanced preventative maintenance program designed to ensure adequate operation at all dust collectors. Ferro believes the capital improvements, and enhanced preventative maintenance programs will ensure that the facility will not make any meaningful contribution to any future readings at the above-referenced monitor.

## **BACKGROUND**

OEPA contacted Ferro and asked for information pertaining to its lead-related operations in the first half of 2011. Ferro provided information pertaining to its lead-related production volumes and materials to OEPA in response to its request. OEPA was apparently interested in determining whether there was anything peculiar to Ferro's operations that may have been contributing to exceedences identified at the lead monitor adjacent to the E.56<sup>th</sup> Street facility. Ferro production outputs did not appear to correlate to any elevated air readings at the monitor.

During this process, there was an event that resulted in a visible emission from FEM9. Production was halted, the source and control unit shut down, and the control unit was inspected. The inspection revealed a failed clamp which allowed a cartridge filter to disconnect. The unit was cleaned, repaired and underwent a complete filter change. The unit was placed back into service on March 7, 2011. Normal production resumed.

After completing the repairs noted above, the remaining dust collectors were inspected. Prior to inspection, each dust collector and its corresponding emission unit was shut down. During the inspection process, all lead production (Melting and milling was shut down to allow for visual inspection of clean and dirty air sides of the collectors as well as all blowers and stacks. Several small cracks in the canisters were identified. These cracks were normally located just above the point where the canister attached the floor grate to the cabinet structure. The cause of the cracks was determined to be from cyclic fatigue induced by the flexure from pulsing the cartridges. In all instances these points were plated over. This was accomplished by 100% perimeter welding around a metal plate extending over the area of damage. Dust collectors FEM 1,2,4,5,9,10 and 11 exhibited this fatigue. At no time was material observed on the exterior of the units around the cracks. Also noted were that hopper dump slide gates on units Cerc 5, FEM 5 and FEM 9 showed damage. These slide gates were replaced. The filter cartridges were changed out in all units during this inspection. Pulse air supply regulators were replaced on units FEM 6,7,8,9,11, 12 and 14. Fem 10 had no in line regulator for the pulsars. A regulator was added to this unit. Full production in lead powder milling resumed on May 9, 2011. Full lead batching and melting production resumed May 20, 2011.

As part of the inspection and maintenance operation, all air pulse jets, solenoids and timer boards were evaluated and replaced as necessary. Visual inspection revealed that four bag house units (FEM 6,7,8 and Cerc4) should be scheduled for replacement in the near future. Units FEM 6, 7 & 8, and Cerc 4 are showing corrosion from moisture and will be replaced.

The initial control unit (Fem 9) failure and visual inspections prompted the project described in detail in appendix 2. The purpose of the project is to add monitored bag break detection to notify operators of bag break or leakage while within permit set operating parameters. The addition of the secondary HEPA filters will allow sufficient time to shut down source equipment and bag house while protecting the safety of our employees and the environment. The independent system component descriptions and "cut sheets" are provided in appendices 3 thru 5. Appendix six lists all purchase orders associated with the capital project.

The capital project is on track for expected completion in Q3, 2012. The company is awaiting arrival of two silencer units for the large blower units on Fem14 and Cerc4. It is anticipated that the facility will be able to schedule outages in production for replacements once there is a level of confidence in acceptable weather conditions to permit the removal of the current equipment and installation of new mechanical equipment. All data made available to Ferro from March to present illustrates compliance at the adjacent monitor. To the extent that any contributions to the adjacent monitor were the result of the defects in certain control units, those issues have been rectified and the current data from the monitor indicates compliance with the new standard. The current dust control improvement and maintenance project includes an adequate level of system robustness and redundancy to reduce the potential for and mitigate the effects of any future failure of any control device.

# Appendix 1

## Capital Project ARU15/1138

### APPROPRIATION REQUEST/EXECUTIVE SUMMARY

Original	<input checked="" type="checkbox"/>		AR Number: ARU15/11138		Date: July 21, 2011
Supplement					
Rev. no. 0			Electronics, Color and Glass Materials (ECGM) Group	MBU: EMS	DIV: ECGM

Was this project included in the Current Operation Plan?  Yes  No  Plan  
 Amount: \$ 498,100

<b>Project Title:</b> Dust Collection System Improvements	<b>Site Location:</b> Cleveland, USA
<p><b>Primary Justification:</b></p> <p>The ECGM, US15, requests approval to spend \$498,100 in capital funds and \$2,400 in expense funds to improve the dust collection on site. This project includes: 1) the replacement of four dust collectors and their blowers; 2) the replacement of one air manifold; 3) the addition of HEPA filters to be used as secondary filters for the nine lead dust collectors; 4) the addition of eleven broken bag detectors; 5) the replacement of eight additional blowers; and 6) two bin vibrators. The implementation of AR is required in order for Ferro to ensure being compliant to the EPA's new lead standard for 2012.</p>	
<p><b>Project Scope:</b></p> <p>The scope of this project entails:</p> <ul style="list-style-type: none"> <li>❖ Purchase two 316 stainless steel dust collector and two 316 stainless steel blowers</li> <li>❖ Purchase two 304 stainless steel dust collector and two 316 stainless steel blowers</li> <li>❖ Purchase one air manifold system for the Torit dust collector</li> <li>❖ Purchase nine HEPA filters</li> <li>❖ Purchase eleven broken bag detectors</li> <li>❖ Purchase eight additional blowers</li> <li>❖ Purchase two bin vibrators</li> <li>❖ Fabrication of new dust collector duct work and mechanical installation for the: 1) four replacement dust collectors and blowers; 2) replacement of the Torit air manifold; 3) nine HEPA filters and eleven broken bag detectors; 4) replacement of eight additional blowers; 5) two bin vibrators.</li> <li>❖ Electrical installation</li> <li>❖ Concrete pad replacement for 7FEM blower</li> <li>❖ Close 4CERC as a satellite communication area (EXPENSE ITEM)</li> </ul>	

## Appropriation Request Report

1. **TITLE: Dust Collection System Improvements (ARU15/11138)**

2. **PURPOSE & OBJECTIVES:**

- The ECGM, US15, requests approval to spend \$498,100 in capital funds and \$2,400 in expense funds to improve the dust collection on site. This project includes: 1) the replacement of four dust collectors and their blowers; 2) the replacement of one air manifold; 3) the addition of HEPA filters to be used as secondary filters for the nine lead dust collectors; 4) the addition of eleven broken bag detectors; 5) the replacement of eight additional blowers; and 6) installing two bin vibrators. The implementation of AR is required in order for Ferro to ensure being compliant to the EPA's new lead standard for 2012.

3. **SCOPE OF WORK:**

The scope of this project entails the items below. Please refer to Table #1 for each dust collector emission source, and Drawing #1 for the location of each dust collector.

- 1) Purchase two 316 stainless steel dust collector and two 316 stainless steel blowers to replace the existing carbon steel collectors for 6FEM and 7FEM. These collectors are non-lead, and are located on the outside of Building 33. The air volume and motor of the existing dust collectors and the new collectors are 2,500 CFM and 10 HP, respectively.

3 inch thick mineral wool insulation (7# density) with 16 gauge mild steel cover sheets stitch-welded and caulked, with external mild steel surfaces to receive SP-3 prep and one coat of Sherwin-Williams, DTM Enamel (1.5-2 mils min. DFT) will be applied to both collectors for outdoor operations.

- 2) Purchase two 304 stainless steel dust collector and two 316 stainless steel blowers to replace the existing carbon steel dust collector for 8FEM and 4CERC. 8FEM is utilized as a lead dust collector, and it is located on the outside of Building 29. 8FEM will be disposed of a hazardous because of the lead material. 4CERC is a non-lead collector, and it is located on the outside of the CERC Building. The air volume of the existing 8FEM dust collector and its new collector is 2,500 CFM, and the motor of the blowers is 10 HP. The air volume of the existing 4CERC dust collector and its new collector is 5,000 CFM, and the motor of the new blower will increase to 20 HP from 15 HP.

3 inch thick mineral wool insulation (7# density) with 16 gauge mild steel cover sheets stitch-welded and caulked, with external mild steel surfaces to receive SP-3 prep and one coat of Sherwin-Williams, DTM Enamel (1.5-2 mils min. DFT) will be applied to both collectors for outdoor operations.

- 3) Purchase and replace the air manifold system for the Torit dust collector 5CERC because it is worn out. 5CERC collector is also a non-lead dust collector that is located on the outside of the CERC Building. (See Photo #5).
- 4) Purchase nine High Efficiency Particle Arresting (HEPA) filters for the lead dust collectors 1FEM, 2FEM, 5FEM, 8FEM, 9FEM, 10FEM, 11FEM, 12FEM, and 14FEM. The HEPA filters will be utilized as secondary filters, and will be installed on the duct pipe after the blower. For dust collection, HEPA filters are best used as post filters on a multiple filter dust collection system to remove light atmospheric dust.

These HEPA filters are rated for the air volume of each collector. Therefore, 1FEM, 2FEM, 5FEM, 8FEM, 9FEM, 10FEM, 11FEM will be rated for 2,500 CFM each, 12FEM will be rated for 1,500 CFM, and 14FEM will be rated for 9,500 CFM.

- 5) Purchase eleven broken bag detectors for 1FEM, 2FEM, 5FEM, 7FEM, 8FEM, 9FEM, 10FEM, 11FEM, 12FEM, 14FEM, and 4CERC. The priority is to install these detectors on our nine dust collectors. We will also install detectors on non-lead collectors 7FEM and 4CERC because of the damp environment their cartridges experience.

These detectors are designed to detect leaks in the dust collector; hence, we will have these detectors hooked up to an audible alarm and a light indicator so that the operators are aware if a filter is leaking. If the alarm sounds, then our operators will be trained to immediately shutdown that specific emission source equipment. If the operator does not shutdown that equipment, then the timer that we will built in the alarm panel will automatically shutdown the circuit to the dust collector motor starter. Please note that EH&S and Engineering will discuss this acceptable allowable time for the operator to manually shutdown the equipment.

- 6) Purchase eight additional blowers for 1FEM, 2FEM, 5FEM, 9FEM, 10FEM, 11FEM, 12FEM, 14FEM. The replacement of these additional blowers is required because we will lose 2" of static pressure on the existing blowers by installing the HEPA filters. The existing blowers are made out of carbon steel and have 12" of static pressure. The new blowers will also be made out of carbon steel, but will have 14" of static pressure. In addition, we will increase the motor of the dust collector blowers from 7.5 HP to 10 HP for collectors 2FEM, 5FEM, 10FEM, and 11FEM, since collectors 1FEM and 9FEM already have 10 HP motors. The motor for dust collector 12FEM will remain at 7.5 HP, since the air volume of this collector is 1,500 CFM. The power of the blower for dust collector 14FEM will increase from 25 HP to 40 HP because of the increased static pressure.
- 7) Purchase two bin vibrators for dust collectors 3FEM and 4FEM. Both of these dust collectors are located inside Building 32. The bin vibrators are being proposed so that the accumulated dust in the collector's bin can properly flow into the bulk bag that is used for the waste.
- 8) Fabrication of new dust collector duct work and mechanical installation for the: 1) four replacement dust collectors and blowers; 2) replacement of the Torit air manifold; 3) nine HEPA filters; 4) eleven broken bad detectors; 5) replacement of eight additional blowers; and 6) two bin vibrators.

- 9) Electrical installation for dust collector blowers, broken bag detectors, alarm panels & timers, and bin vibrators.
- 10) Concrete pad replacement for 7FEM blower. This is required because the soil underneath the existing concrete is undermining. (See Photo # 6).
- 11) Close 4CERC as a satellite communication area. This was requested by EH&S because many years ago lead was used in this location, but US15 does not use lead anymore in the CERC Building.

Table #1:  
Dust Collector  
Sources

<u>Dust Collector</u>	<u>Emission Source</u>	<u>Type</u>
1FEM	Lead Milling	Lead
2FEM	Batching & Old Blending	Lead
3FEM	Non-Lead Batching	Non-Lead
4FEM	Non-Lead Milling	Non-Lead
5FEM	Milling	Lead
6FEM	P111-1	Non-Lead
7FEM	P111-3	Non-Lead
8FEM	Melter 1 & 2	Lead
9FEM	Melter 3 & 5	Lead
10FEM	Melter 9 & 10, and Drop Bottom #4	Lead
11FEM	Drop Bottom #1 & 5	Lead
12FEM	Solvent Mill Room	Lead
14FEM	Dust Hood for Crucible Melter, and Drop Bottom #2, 3 & 6	Lead
4CERC	Melter H & Day Tank	Non-Lead
5CERC	Packaging Area & CERC Milling	Non-Lead

Dust  
Emission





Photo #1: 6FEM Dust Collector



Photo #2: 7FEM Dust Collector



Photo #3: 8FEM Dust Collector



Photo #4: 4CERC Dust Collector



#### 4. TECHNOLOGY STATEMENT:

- One improvement is the installation of the HEPA filters on the nine lead dust collectors. For dust collection, these HEPA filters are best used as post filters on a multiple filter dust collection system to remove light atmospheric dust.
- The second improvement in the project is the broken bag detectors. These detectors are designed to detect leaks in the dust collector; hence, we will have these detectors hooked up to an audible alarm and a light indicator so that the operators are aware if a filter is leaking. The operators will be trained to immediately shutdown the equipment associated to the collector whose alarm is assigned to.
- The third improvement proposed in this project is that the replacement dust collectors for 6FEM, 7FEM, 8FEM, and 4CERC will be made out of stainless steel instead of mild carbon steel. The stainless steel material will increase the useful life of these collectors, and for 6FEM and 7FEM.

#### 5. RISK ASSESSMENT:

- If the delivery times get extended from our supplier, this could potentially delay the project.
- Availability of production downtime for mechanical and electrical installation could cause delays in equipment installation.
- Availability of scheduling mechanical and electrical installers could cause delays in installation timeline.

# Appendix 3

## Bag Break Protection

**Flex-Kleen Division**

**Flex-Sense FS-15**

### Flex-Sense<sup>TM</sup> Leak Gauge

The Leak Gauge is an easy to use, ultra-reliable device designed for detecting leaks in baghouses and cartridge filter dust collectors. Leakage is "gauged" in real time, on the spot, without prior baseline data and without signal tuning! Simply apply power and the condition of any fabric filter is instantly indicated by the Leak Gauge.

When the gauge reads "Low" there are no leaks. At mid-range, developing leaks are present and at "High" the filter is leaking. An alarm point can be easily set by moving an indicator up and down the gauge with the adjustable key pad. For more detailed monitoring and precise alarm point control, the Leak Gauge includes an absolute digital readout corresponding to the analog gauge.

To handle the very wide signal variations caused by filter clearing cycles and developing leaks, the gauge scale is logarithmic. The log scale enables monitoring both low baseline levels (clearing cycle off) and high leak signals (clearing cycle on) to detect leaks well before emissions are visible for preventative maintenance.

The informative operator interface of the Leak Gauge, combined with the field-proven reliability of Electri-Zone Technology, have made the Leak Gauge the device of choice for most leak detection applications. For advanced leak detection and continuous mass monitoring in mills? or grief refer to the model FS-EZG.

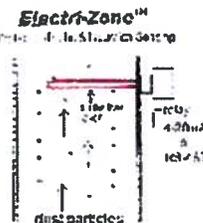


Control box with sensor attached to probe (FS-15)

#### PRINCIPLE OF OPERATION

Electri-Zone is a unique combination of induction-sensing and pin-point-probe technologies. As particles escape a filter and flow near a probe placed downstream of the filter, small signals are induced into the probe by particle electrons (i.e. charge). A Digital Signal Processor converts the induced signal into an audible output. The probe's protected layer, in combination with induction-sensing, ensures reliable operation even with condensate or conductive dust on the probe.

- Avoid false readings from moisture, oil, sludge, excessive dust, dust collector dust, dust traps
- For baghouses, cartridge filters, & bin vents
- For more reliable than triboelectric & opacity



#### COST EFFECTIVE PERFORMANCE

- 0 Prevent the loss of valuable product
- 0 Minimize unplanned shutdowns & manual inspections
- 0 Detect emissions before concentrators are visible
- 0 Lower cost of baghouse inspections and clean-up
- 0 Protect downstream equipment such as silencers
- 0 Gauge filter efficiency on the spot without prior data
- 0 Comply with federal and local emissions standards

**North America's #1 Dust Collector Supplier**



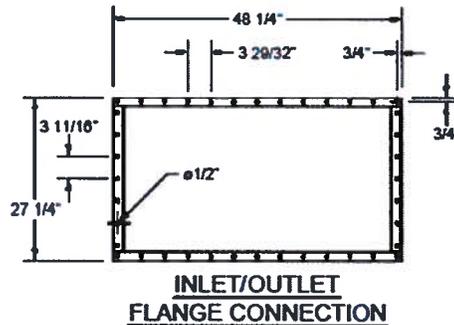
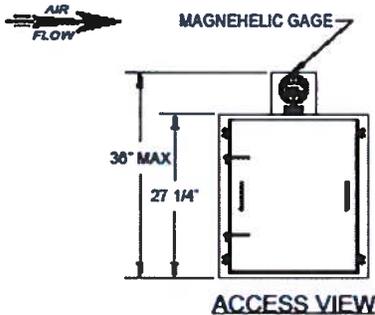
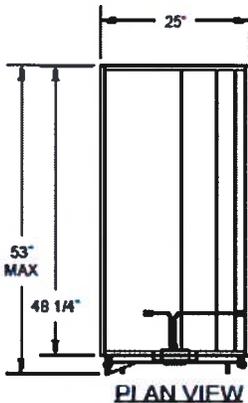
# Appendix4 HEPA Filters

## SPECIFICATIONS

- SEVEN (7) UNITS REQUIRED; SEVEN (7) RIGHT HAND ACCESS
- UNIT IS INTERMITTENTLY WELDED AND CAULKED.
- MATERIAL: UNIT SHALL BE MANUFACTURED FROM 12 GA. AND 14 GA. GALVANIZED STEEL MATERIAL. WING NUTS SHALL BE USED TO RETAIN DOORS. OPTIONAL DOOR HINGES ARE AVAILABLE UPON REQUEST.
- PLASTIC STAR KNOBS AND STUDS SHALL BE USED TO RETAIN DOORS. A NEOPRENE GASKET SHALL SEAL THE DOOR EDGES TO THE ENCLOSURE.
- UNIT COMES EQUIPPED WITH A REMOVABLE LOCKING TRAY MECHANISM FOR GASKET SEAL FILTERS.
- ALL HEPA FILTERS SHALL SEAL ON THE DOWNSTREAM SIDE OF THE UNIT.
- UNIT IS DESIGNED TO ACCOMMODATE THE FOLLOWING FILTERS  
TWO (2) 24" x 24" x 2" NOMINAL MERV8 PREFILTERS  
TWO (2) 24" x 24" x 11-1/2" ACTUAL HEPA FILTERS

### GAGE INFORMATION

MODEL (HEPA): 2004  
 RANGE: 0-4" W.G.  
 FITTINGS: BRASS  
 TUBING: SST



**APPROVAL PRINT**  
 APPROVED AS NOTED SIGNATURE \_\_\_\_\_  
 REVISE AND RESUBMIT DATE \_\_\_\_\_

**P&G MANUFACTURING**  
 WASHINGTON N.C. 27889  
 PHONE NO.: 252-946-9110  
 FAX NO.: 252-946-4823

DRAWN BY: DAB		TITLE: HEPA SIDE ACCESS W/ 2" MERV8 PREFILTERS GH1-212P-10H20W-GALV	
DATE: 10/31/11		CONTROL NO.:	
APPROVED BY: JHW		DATE: 11/1/11	
DATE: 11/1/11		DRAWING NO.:	SHEET
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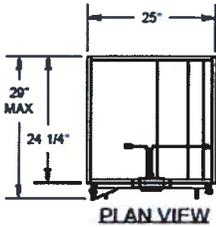
Filters for FEM 1,2,5,8,9,10 & 11

**SPECIFICATIONS**

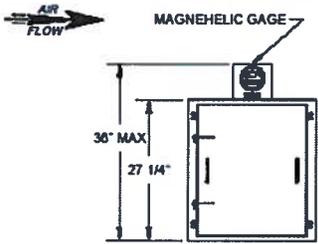
1. ONE (1) UNITS REQUIRED, ONE (1) RIGHT HAND ACCESS
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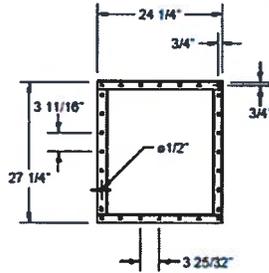
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 RANGE: 0-4" W.G.  
 FITTINGS: BRASS  
 TUBING: SST



**PLAN VIEW**



**ACCESS VIEW**



**INLET/OUTLET FLANGE CONNECTION**

**APPROVAL PRINT**

APPROVED SIGNATURE \_\_\_\_\_  
 APPROVED AS NOTED \_\_\_\_\_  
 REVISE AND RESUBMIT DATE \_\_\_\_\_

**P&G MANUFACTURING**  
 WASHINGTON N.C. 27680  
 PHONE NO.: 252-948-9110  
 FAX NO.: 252-948-4823



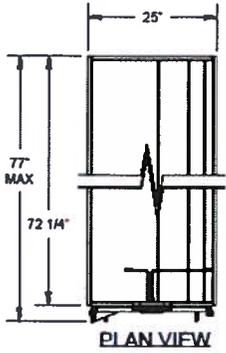
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<b>APPROVED BY:</b> JNW <b>DATE:</b> 11/17/11		<b>CONTROL NO:</b> _____ <b>DRG WEIGHT:</b> _____ <b>NTS:</b> _____	
<b>REVISIONS:</b> A ADDED DRILLED FLANGE DETAIL DATE: 11/17/11		<b>REVISIONS:</b> 1 ALL DIMENSIONS ARE IN INCHES 2 TOLERANCES FRACTIONAL DECIMALS ANGULAR 3 REGULAR	
<b>REV</b>		<b>DATE</b>	
<b>DESCRIPTION</b>		<b>DATE</b>	

**SPECIFICATIONS**

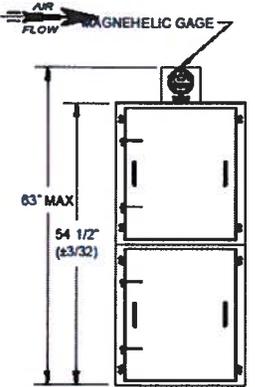
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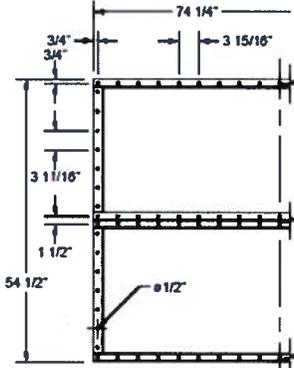
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 RANGE: 0-4" W.G.  
 FITTINGS: BRASS  
 TUBING: SST



**PLAN VIEW**



**ACCESS VIEW**



**INLET/OUTLET FLANGE CONNECTION**

**APPROVAL PRINT**  
 APPROVED  
 APPROVED AS NOTED  
 REVISE AND RESUBMIT

**P&G MANUFACTURING**  
 WASHINGTON N.C. 27889  
 PHONE NO.: 252-946-9110  
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DESIGNED BY: <b>DAS</b>	TITLE: <b>HEPA SIDE ACCESS W/ 2" MERV8 PREFILTERS</b>
DATE: <b>10/31/11</b>	QTY: <b>GM1-212P-2DH30W-GALV</b>
APPROVED BY: <b>JW</b>	CONTROL NO.
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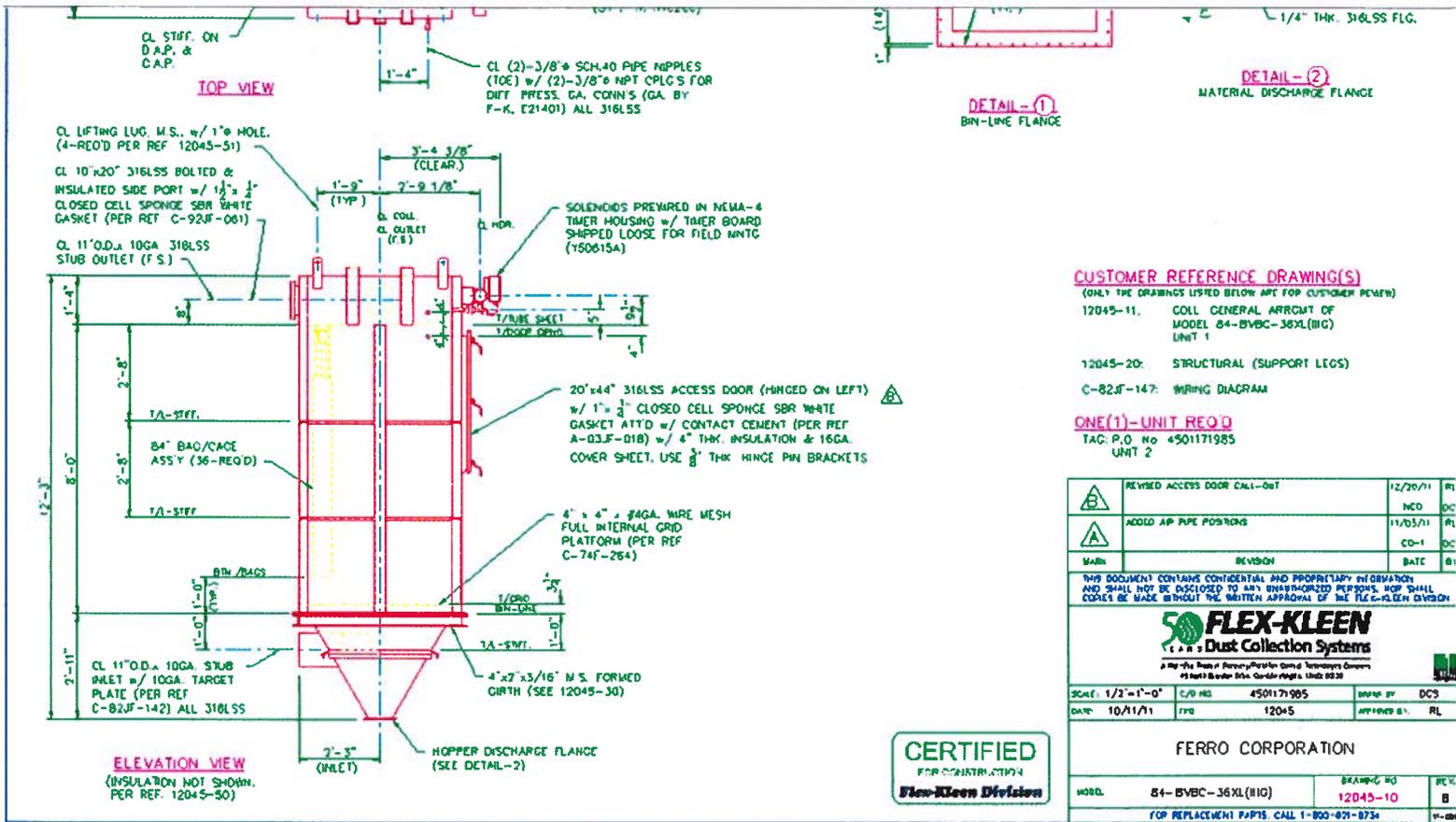
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DIMENSIONS UNLESS OTHERWISE SPECIFIED  
 \* ALL DIMENSIONS ARE IN INCHES  
 TOLERANCES FRACTION DECIMAL ANGULAR  
 .005 .015 .030 .063 .125 .250 .500 .750 1.000

**FEM14**







**CUSTOMER REFERENCE DRAWING(S)**  
 (ONLY THE DRAWINGS LISTED BELOW ARE FOR CUSTOMER REVIEW)

- 12045-11: COLL. GENERAL ARRANG. OF MODEL 84-BVBC-36XL(HIG) UNIT 1
- 12045-20: STRUCTURAL (SUPPORT LEGS)
- C-82JF-147: WIRING DIAGRAM

**ONE(1)-UNIT REQ'D**  
 TAG: P.O. No. 4501171985  
 UNIT 2

△	REVISED ACCESS DOOR CALL-OUT	12/20/11	RI
		INC'D	DC
△	ADDED AIR PIPE POSITIONS	11/05/11	RI
		CD-1	DC
MAK	REVISION	DATE	BY

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SCALE: 1/2"=1'-0"	C/D NO.	4501171985	DRAWN BY	DC3
DATE: 10/11/11	TYPE	12045	APPROVED BY:	RL
<b>FERRO CORPORATION</b>				
MODEL:	84-BVBC-36XL(HIG)	DRAWING NO.	12045-10	REV.
				B
FOR REPLACEMENT PARTS CALL 1-800-821-8734				



FEM 8



# Appendix 6

## Capital Project Purchase orders

List of Purchase Orders issued against project

Year	frm	Object	Cost elem.	Cost element name	OffAct	Offst. acct	Name of offsetting account	Purch doc	Item	Plant	Val.in rep.cur.	Posting date	Created on
011	009	ARU15/11138	699500	Supplies-third party	S	212200	Envirofab Inc.	4501171984	00010	US15	57,420.00	09/07/2011	09/07/2011
011	009	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00010	US15	8,022.30	09/14/2011	09/14/2011
011	009	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00020	US15	8,022.30	09/14/2011	09/14/2011
011	009	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00030	US15	6,265.20	09/14/2011	09/14/2011
011	009	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00040	US15	9,303.90	09/14/2011	09/14/2011
011	009	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00050	US15	453.00	09/14/2011	09/14/2011
011	009	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00070	US15	1,752.00	09/14/2011	09/14/2011
011	009	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00060	US15	4,378.50	09/14/2011	09/14/2011
011	009	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00080	US15	10,338.90	09/14/2011	09/14/2011
011	011	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00010	US15	10,696.40	11/01/2011	11/01/2011
011	011	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00020	US15	10,696.40	11/01/2011	11/01/2011
011	011	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00030	US15	8,353.60	11/01/2011	11/01/2011
011	011	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00040	US15	12,405.20	11/01/2011	11/01/2011
011	011	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00050	US15	604.00	11/01/2011	11/01/2011
011	011	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00070	US15	2,336.00	11/01/2011	11/01/2011
011	011	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00060	US15	5,838.00	11/01/2011	11/01/2011
011	011	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00080	US15	13,785.20	11/01/2011	11/01/2011
011	011	ARU15/11138	699500	Supplies-third party	S	212200	South Shore Controls Inc	4501171986	00010	US15	22,092.00	11/30/2011	11/30/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00040	US15	-8,996.00	12/06/2011	12/06/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00040	US15	-13,494.00	12/06/2011	12/06/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00020	US15	-6,651.84	12/16/2011	12/16/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00030	US15	-6,651.84	12/16/2011	12/16/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00010	US15	-6,651.84	12/19/2011	12/19/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00050	US15	4,420.00	12/02/2011	12/02/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00040	US15	8,996.00	12/06/2011	12/06/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00040	US15	8,996.00	12/06/2011	12/06/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00040	US15	13,494.00	12/06/2011	12/06/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00040	US15	13,494.00	12/06/2011	12/06/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00040	US15	4,498.00	12/07/2011	12/07/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00020	US15	6,651.84	12/16/2011	12/16/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00030	US15	6,651.84	12/16/2011	12/16/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00020	US15	6,651.84	12/16/2011	12/16/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00030	US15	6,651.84	12/16/2011	12/16/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00010	US15	6,651.84	12/19/2011	12/19/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00010	US15	6,651.84	12/19/2011	12/19/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00070	US15	10,523.76	12/20/2011	12/20/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00050	US15	453.00	12/21/2011	12/21/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00060	US15	4,378.50	12/21/2011	12/21/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00070	US15	1,752.00	12/21/2011	12/21/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00080	US15	10,338.90	12/21/2011	12/21/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501192428	00060	US15	9,330.88	12/22/2011	12/22/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501196465	00010	US15	2,050.00	12/29/2011	12/29/2011
011	012	ARU15/11138	699500	Supplies-third party	S	212200	New York Blower	4501196465	00020	US15	2,710.00	12/29/2011	12/29/2011
012	001	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00010	US15	8,022.30	01/12/2012	01/12/2012
012	001	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00020	US15	8,022.30	01/12/2012	01/12/2012
012	001	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00030	US15	6,265.20	01/12/2012	01/12/2012
012	001	ARU15/11138	699500	Supplies-third party	S	212200	Met-Pro Environmental Air Solutions	4501171985	00040	US15	9,303.90	01/12/2012	01/12/2012

With exception of silencers for FEM14 and Cerc 4 all components on hand at facility as of January 23, 2012.