DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
**ACTIVITY REPORT: Scheduled Inspection**

B166137724

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| **FACILITY:** PIONEER FOUNDRY CO INC | | **SRN / ID:** B1661 |
| **LOCATION:** 606 WATER, JACKSON | | **DISTRICT:** Jackson |
| **CITY:** JACKSON | | **COUNTY:** JACKSON |
| **CONTACT:** Bob Lefere , President | | **ACTIVITY DATE:** 11/22/2016 |
| **STAFF:** Mike Kovalchick | **COMPLIANCE STATUS:** Non Compliance | **SOURCE CLASS:** MINOR |
| **SUBJECT:** Scheduled Inspection over a 2 day period. | | |
| **RESOLVED COMPLAINTS:** | | |

## Opt-Out Source Inspection

## Facility Contact

**Bob LeFere (BL), President ph. 800-922-7220 bob@pioneerfoundry.com**

**Website: pioneerfoundry.com**

## Purpose

**On November 22 & 23, 2016, I conducted an unannounced compliance inspection of Pioneer Foundry Company (Company) in Jackson. The purpose of the inspection was to determine the facility's compliance status with the applicable federal and state air pollution regulations, particularly Michigan Act 451, Part 55, Air Pollution Control Act and administrative rules, Permit to Install (PTI) 207-98, PTI 75-75 and 40 CFR Part 63 Subpart ZZZZZ(NESHAP for Area Sources of Iron & Steel foundries)**

## Facility Location

**The facility is located in the city of Jackson. It is surrounded by commercial/industrial establishments on all sides. See attached photo.**

## Facility Background

**The facility was built in 1905. The facility was last inspected on August 24, 2010 with no violations found. The facility is a small gray iron foundry that deals with specialty castings. Custom gray iron parts in the 10 to 5,000 pound size range are produced for the heavy manufacturing industry. In 1998, the existing cupola was replaced with two-3300 pound capacity electric induction furnaces per PTI 207-98 that was issued on July 22, 1998. PTI 75-75 was issued in 1975 for a shot blast machine controlled by a baghouse filter collector. Since 2009, the facility has been subject to the NESHAP for Area Sources of Iron & Steel foundries. This facility reports to MAERS and is subject to an annual $250 air fee since it is considered an area source under a source category that has been delegated to the State of Michigan to administer on the behalf of EPA. The current permit effectively restricts potential to emit of hazardous air pollutants (HAPS) below major source thresholds by limiting the amount of metal that can be melted. Prior to PTI 207-98, PTI 13-73A acted as an opt-out permit for carbon monoxide (CO) due to emissions from a cupola. The melt rated was limited in the permit to avoid Title V applicability. This melt rate was carried over into newer PTI 207-98 when the cupola was removed and two 3300 pound size electric induction furnaces were installed. CO is not a pollutant of concern with electric induction furnaces. There has never been a Rule 225 toxic air containment analysis done at this facility due to the**

**grandfathered nature of the emission units and the modification from use of the cupola to the electric induction furnaces resulting in less toxic air emissions.**

## Regulatory Applicability

**Active Permits:**

**-PTI 207-98 for 2 electric induction furnaces and related charge handling & inoculation process (EU Handling, EU Furnace, EU Inoculation)**

**-PTI 75-75 for Shot blast machine controlled by a baghouse filter collector (Note: The permit probably could be voided per Rule 285 (l) (vi)(c) )**

**EU Cooling: Historically considered a grandfathered process.**

**EU Grind/Clean: Exempt per Rule 285(l) (vi) Emissions released to in-plant environment**

**EU Pouring: Historically considered a grandfathered process.**

**EU Shakeout: Historically considered a grandfathered process.**

**(Note: Inoculation is a process in which a material is added to molten gray iron to affect the shape, size, or distribution of graphite in the casting.)**

**40 CFR Part 63 Subpart ZZZZZ applies to entire foundry.**

## Arrival & Facility Contact

**Visible emissions or odors were not observed upon my approach to the Company's facility. I arrived at approximately 9:00 AM, proceeded to the facility office to request access for an inspection, provided my identification, and met with Bob LeFere (BL) who is the Company President. A pre-inspection conference was held with BL and I provided him a copy of the MDEQ brochure: *Rights and Responsibilities Environmental Regulatory Inspections.* I informed BL of my intent to conduct a facility inspection and to review the various records as necessary. BL extended his full cooperation during the inspection, accompanied me during the full duration of the inspection, and fully addressed my questions.**

## Pre-Inspection Meeting

**BL outlined that the Company is currently operating 1 shift (8 hours) per day, 5 days a week. They currently have 13 employees. The shift begins at 6 am and ends at 4 pm. They melt every other day for 3 hours; this week only Monday and Wednesday. They generally only use one furnace at a time except for a rare large job. We discussed the 2 permits and the various records required by the permits and the foundry NESHAP. There have been no significant changes at the facility since it was last inspected in 2010. We then moved on to the facility tour/inspection.**

## Onsite Inspection Day One

**I asked BL to walk me through the process followed by an inspection of the roof.**

**BL first showed me where the scrap metal is stored prior to being used in the furnaces.**

**The scrap is obtained from nearby Omnisource. It appeared to be clean metal. BL reports that scrap comes originally from Eaton Rapids and passes through Ominisource and is very consistent in nature. See attached photo. They take some from each pile shown in the photo and add it to a metal bin/tray conveyor before being added to a 2500 degree F. electric induction furnace. (They measure the molten metal temperature with a hand-held probe.) The furnaces were not operating on the first day of the inspection. The furnaces have no hoods. On the ceiling directly above the furnaces are roof vents. There are 4 roof fans located in the same area of the roof above the furnaces that exhaust outside vertically to the roof. BL reports that smoke is generated for about a 20 minute period during the melting and also another 20 minutes when the molten metal is poured into approximately 5 or 6 molds. BL reported that smoke is almost completely dissipated prior to reaching the roof vents. The metal is poured in the same room as where the furnaces are located but at some distance so any smoke that is generated goes out through different roof vents. A ladle is moved by a hoist to pour in each mold. Several of the molds were being prepped for tomorrow's melt during the inspection. Directly next to where the molds are poured is a shake-out operation. After cooling for at least ten hours, the molds are set into the machine where it separates the metal from the sand molds. The machine recycles the sand through a storage tank system outside or on the roof of the facility. After the shake out operation, the molds are moved to a separate room and go through a shot blast machine to further clean the metal castings. The shot blast machine looked quite old and generally in poor condition. It is used for an hour every other day. The ventilation system to the baghouse collector that is located outside is turned on when the shot blast machine is in operation. BL reported that the room starts to get dusty if they don't turn on the ventilation. In the same room as the shot blast operation, workers grind any remaining irregularities to the castings after coming out of the shot blast using hand held grinders. The metal castings sit on the floor during this process. It takes approximately 15 minutes to 2 hours to grind clean each metal casting. This operation was active during the inspection. 2 workers were using grinders. No visible particulate emissions could be seen but the room was noticeable dusty as there was no dedicated exhaust system for this operation. (During the Summer months, a large door is left open immediately adjacent to the grinding allowing particulate emission an easier way to escape.) After this step, the final product is ready to ship.**

**Next, BL took me outside to look at the shot blast baghouse and the roof. Of note, outside next to a large door that opened in the grinding room, was red colored dust spread out on the ground over a small area. BL indicated that dust escapes through the door during the Summer time when the door is left open. It appears to be unlikely that enough dust is coming out to create a particulate fallout problem. The shot blast baghouse was located outside on the side of the building. It was not in operation. The bottom cone part of the baghouse empties into a barrel that wasn't there at the time of the inspection. There were no visible contaminants underneath the baghouse. The cone part of the baghouse was visibly damaged caused by dozens of hammer hits to the metal in order to knock out heavy solids from the baghouse into the waste drum. (Note: BL indicated that no hazardous waste is currently being generated from the facility.) BL said the baghouse was maintained as needed but it appears that preventative maintenance is not being done.**

**BL then produced a ladder and we went up on the roof. The roof and ventilation equipment appeared to be fair to good shape. Some of the roof gutters contained sandy fallout material although no recent fallout material was visible on the roof itself.**

**(See attached photos) An adjacent parking lot is located nearby just across the road from the facility which could be impacted by any potential particulate fallout. However, the parking lot is owned by the Company. BL reported that sometimes the sand handling system springs a leak depositing sand on the roof. There were no visible emissions which was consistent with the furnace not operating during the inspection.**

**Recordkeeping Review**

**Attachment (1) is the MSDS for the resin used in making the casting molds.**

**It contains mostly furfuryl alcohol which is used to start the polymerization process for a furfuryl alcohol warm box mold. (Note: Resin compounds like this one that contain the highest levels of furfuryl alcohol generate more toxic emissions than more recent formulations that are being used by some companies that contain a much lower percent of the alcohol.) There is now no methanol present which is regulated substance under the NESHAP. The furfuryl alcohol is not on EPA's hazardous air pollutant (HAP) list but is nevertheless a known carcinogen. The resin now contains phenol and 4,4'-isoprophlidenediphenol at 1 to 5% concentrations. This replaces the 1 to 5% methanol and 0.01 to 0.1% formaldehyde that was previously in the resin. I was unable to conclude whether this change was a meaningful change to emissions as actual emission compounds are driven by partial to full thermal decomposition caused by the molten metal when it is poured into the molds. From this technical report: "Emission of BTEX and PAHs from molding sands with furan cold setting resins containing different contents of free furfuryl alcohol during production of cast iron." Nov 2015**

**" In contrast, ethylbenzene and xylenes occurred only in the gases emitted from resin-bonded sands with the largest furfuryl alcohol content." " In terms of emission of compounds from the PAHs group virtually for all resins, the total content of these substances was comparable (within the limits of error). The main components were: fluoranthene, pyrene and benzo(a) anthracene."**

**Another online source reports emissions are benzene, methanol, phenol, toluene during the core making and benzene, cresole/ cresylic acid, formaldehyde, phenol, toluene, polycyclicorganic matter, and cyanide compounds from the Mold pouring and Mold Shake out processes.**

**From American Foundry Society - Foundry Organic HAP Emissions....2007 for Pouring/Cooling/Shakeout combined; it came up with an emission factor of 1.08 pounds of HAPS per ton of melt poured for a furan no bake system. In 2015 they melted 735 tons which works out to 794 pounds of HAPs.**

**Per 11/28/2016 email from AQD's foundry expert, Eric Grinstern,**

**"Below are the estimated VOC emissions for the Furan Resin mold operation at Pioneer Foundry, using a few of the available emission factors. These are only ballpark numbers since there are number of variables associated with binders and mold making/pouring, cooling, shakeout (PCS) emissions. The emissions are calculated based 2015 usage of 59,380 pounds of resin, 20,000 pounds of catalyst and 735 tons of metal poured.**

**If I remember correctly, you said that the mold making process at Pioneer is currently considered "grandfathered", which is the case at a number of the older foundries in the state. Since the molding making/PCS process at a number of the foundries has remained unchanged they have kept the "grandfathered" status. The mold making process would either have to have been reconstructed or modified, as defined in the rules, to loss its "grandfathered" status.**

**Mosher Article, Pouring-Cooling-Shakeout for a Medium Nitrogen Furan using Toluenesulfonic Acid Catalyst.**
**Total Hydrocarbons = 0.017178 lb./lb. of index (Resin)**
**Total HAPs = 0.0341842 lb./lb. of index (Resin)**
**Based on total resin/catalyst used 79,380 pounds**

**Total Hydrocarbons = 1,363 pounds**
**Total HAPs = 2,537 pounds**

**Technikon Study # 1411-113GI – HA International Enviroset 22 Furan No-Bake**
**Mix/Make/Cure = 0.0023 lb./lb. Binder**
**Storage = 0.004 lb./lb. Binder**
**Pouring/Cooling/Shakeout = 0.0234 lb./lb. Binder**

**Total VOC = 2,071 pounds**

**Technikon Study # RE 100119 DX – Ashland Iron/Furan No-Bake**
**Pouring/Cooling/Shakeout = 2.62 lb. VOC/ton of metal**

**Total VOC = 1,925.7 pounds "**

**I also made an inquiry to the manufacturer of the resins /acid catalyst in an attempt to get more clarification on what the toxic emissions are which will be added to this report if a response is received. In any case, it appears that due to the low melt rate, HAP/toxic emissions from EU Cooling, EU Pouring and EU Shakeout emission units are not high enough to be of concern. There is some question on whether these emissions units should be considered grandfathered since they likely have been modified over time. However, due to the expected low levels of emissions, it is quite possible that they would be considered exempt per Rule 290 unless the initial threshold screening levels (ITSL) of one of the pollutants is less than 0.04 micrograms per cubic meter.**

**Attachment (2) is the amount of resin used since 2013.**

**Attachment (3) is the MSDS for the Acid Catalyst that is used.**

**Attachment (4) is the amount of acid catalyst used since 2013.**

**Attachment (5) is an email dated 3/21/2006 from the Company that manufactures the acid catalyst that indicates that the toluenesulfonic acid catalyst does not break down into toluene and remains encapsulated in the resin matrix even. More recent online data suggests that it does indeed produce toluene emissions.**

**Attachment (6) is the MSDS for the Graphidox inoculant. (Note that it contains up to 0.5% chromium.)**

**Attachment (7) is the MSDS for the Grafadin inoculant.**

**Attachment (8) are the usage records for Graphidox and Grafadin since 2013. These compounds were first noted as being used as an inoculant in AQD activity report that was written in 2010.**

**Attachment (9) was the last Semiannual Compliance Report for NESHAP Subpart ZZZZZ. It was for the period beginning 6/30/2014 and ending 12/31/2014. No reports have been submitted for the 2015 or 2016. Otherwise, the Company does appear to be complying with Subpart ZZZZZZ including recordkeeping.**

**Attachment (11) is the number of furnace "heat" per month, per year since 2013. It**

**shows that there were 939 tons melted in 2013, 826 tons in 2014, 735 tons in 2015 and 564 tons so far in 2016. This is well under the permit limit of 4,900 tons per 12 month rolling.**

**A review of the permit application for 207-98 shows that the toxic substances found in Graphidox and Grafadin inoculants that are currently used were not described in the original permit application.(No Air Toxics review was done of the permit application.) A meaningful change analysis was done. It was assumed that maximum amount of inoculant used(Graphidox & Grafadin combined at a ratio of 1:3) is 16 pounds from each furnace or 32 pounds in one hour. See Attachment (12).**

**Otherwise, looking at emission factors for emissions coming directly from electric induction furnaces from other iron foundries as determined by the American Foundry Society gave a HAP emission factor of 0.040 pounds per ton of metal melted along with 0.0015 pounds per ton of metal melted for melt support operations like inoculation. For 2015, this works out to about 30 pounds. It is likely mostly manganese and lead which are constituents in the scrap iron. (Note: HAPS are a subset of toxic air contaminants so the emission factor doesn't fully characterize emissions.)**

**Post-Inspection Meeting**

**I held a brief post-inspection meeting with BL. I reviewed my findings that the Company appeared to be generally in compliance with their Permit. However, I indicated that the Company be cited for failing to submit NESHAP Subpart ZZZZZ required semi-annual notifications forms. I also would need to review all the records that he had given me to make final compliance determinations. I thanked BL for his time and cooperation, and departed the facility at approximately 11:15 AM.**

**On Site Inspection Day Two**

**I returned to the facility on November 23, 2016 to observe the furnaces in operation, to assess any opacity issues, to discuss with BL issues related to the inoculants they now used compared to what was previously described in the permit application and also emissions from the molds not having been included in the previous PTI permit.**

**I arrived at 8:45 AM and observed the facility's roof till 9:10 AM. I didn't observe any visible emissions during that time. (BL later confirmed that pouring into the molds occurred around 9:00) Observing conditions were poor due to clouds, rain and very little sky contrast. (Note: I n order to make a valid Method 9 opacity reading, it is likely the observer would need to be on the roof itself when smoke is being generated from the furnaces due to location of the roof vents.) I then went to the office and had another meeting to discuss the issues that came out after starting a records review after the previous day's inspection.**

**I asked BL to further describe the inoculation process. He said that 12 pounds of Grafidin and 4 pounds of Graphidox(in powder form) are combined in a bucket. The mixture is then added to the bottom of the ladle by an operator just before the 3500 pounds of molten metal is poured into the ladle that also has a 3500 pound capacity. (Note: PTI permit application lists furnace capacity as 3300 pounds. Currently, metal charges are often 3500 pounds. The difference is about a 6% increase in capacity over**

**what was described in the permit application which is not a meaningful change.)**

**I told BL that inoculants described in the original permit did not include toxic compounds that are now found in the inoculants such as barium, titanium, vanadium, chromium, manganese, and nickel. I indicated to BL that I was checking with our AQD Toxic's unit whether or not that this represents a meaningful change to the existing Permit or not.**

**I also discussed with BL concerns that emissions from the molds were not included in the original furnace permit application despite the fact that emissions from this type of process can be significant for VOC's and air toxics. I indicated to BL that I was checking with our in house expert on foundries on how to proceed to resolve this issue. BL indicated that the formal way to describe the molding process was "furan based air set sand system".**

**We then went out to the plant to observe the furnaces and mold area. When we arrived, 4 of 11 molds that were sitting on the floor had already been poured about 20 minutes before. (See attached photo.) Small flames were coming from the molds but little smoke was coming from them. BL indicated that about once a day, one of the wooden pallets that the molds sit on catches fire. They generally push sand on the flames to put the fire out.**

**Next we observed the furnaces; one of which was being operated. The pivoting conveyor that charges the furnace had completed metal addition and lid was reapplied for a short time to allow the melt to complete. We then observed an operator place a bucket of inoculant into the bottom of the ladle and then observed the furnace being tipped/pouring the molten metal in the ladle. (See attached photos.) A considerable amount of smoke was being generated before the pouring started and especially during the pouring into the ladle. The smoke went straight up to the ceiling and exited the building via the 2 roof fans that were operating at the time. Just before the pouring occurred, we both went outside to across the street to see if any smoke was visible. No smoke was visible coming from the roof although the sky contrast was very poor. We then went back inside to observe the pouring. The higher amounts of smoke that were being generated during the pour only lasted about a minute. The opacity of the smoke near the ceiling was probably no more than 20% so it was assumed that smoke outside the building is probably even less especially if it was averaged over the required 6 minute averaging time. We then left the building and briefly discussed going forward in BL's office. I promised to follow-up with BL when compliance determinations had been made.**

Compliance Summary

**Based upon the facility inspection, review of the records, and review of applicable requirements, the Company was out of the compliance with the requirement to file required semi-annual reports for the federal NESHAP 40 CFR Part 63 Subpart ZZZZZ for Iron and Steel Foundries. Furthermore, the Company is now using an inoculant which contains chromium and other toxic metals that has resulted in a meaningful change to emissions compared to how emissions were described in PTI 207-98 which is considered a violation of Rule 201. Otherwise, the Company is in compliance.**

**Image 1(Aerial photo) :** Aerial photo

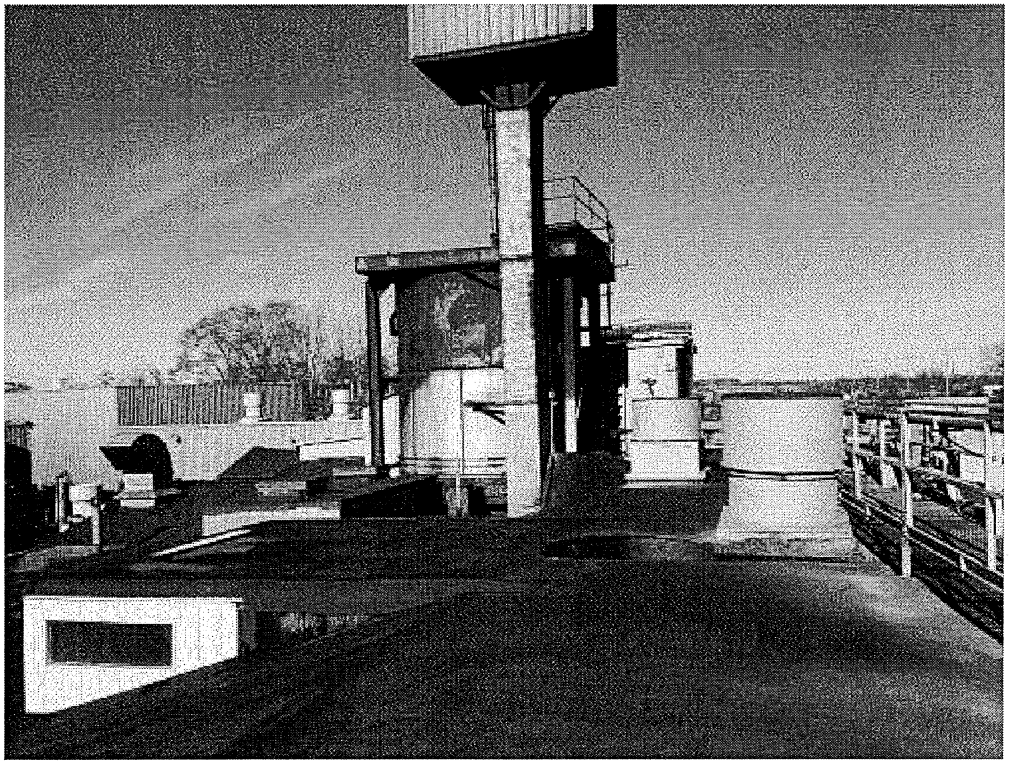

**Image 2(Roof 1) :** Roof 1

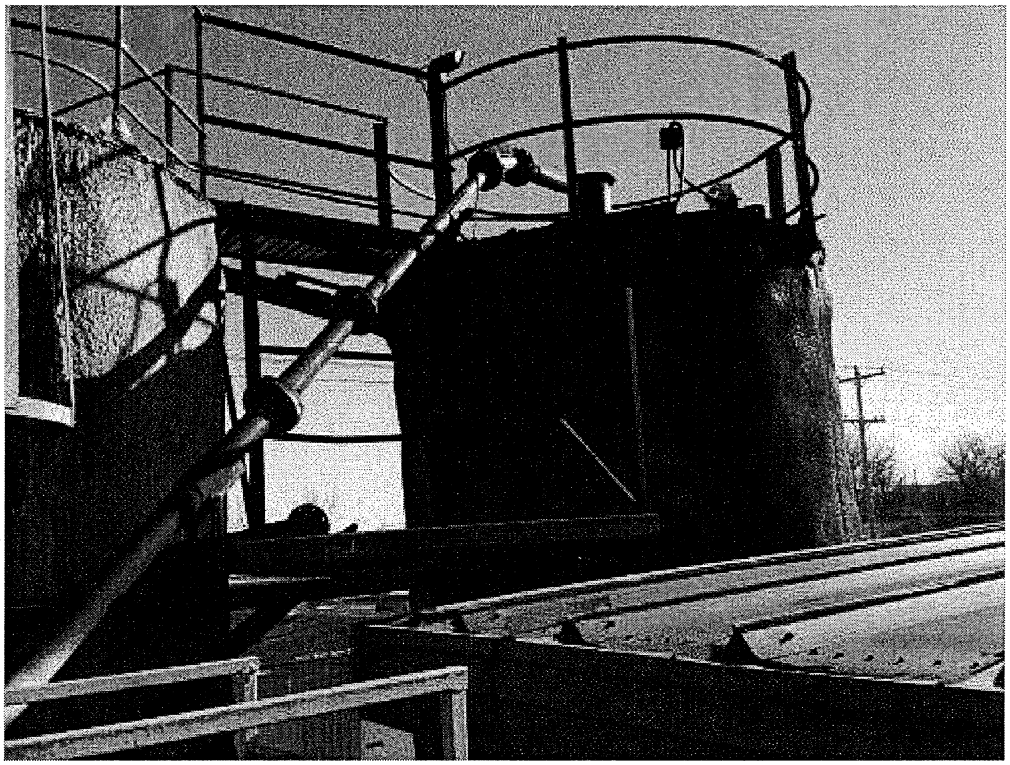

**Image 3(Roof 2) :** Roof 2

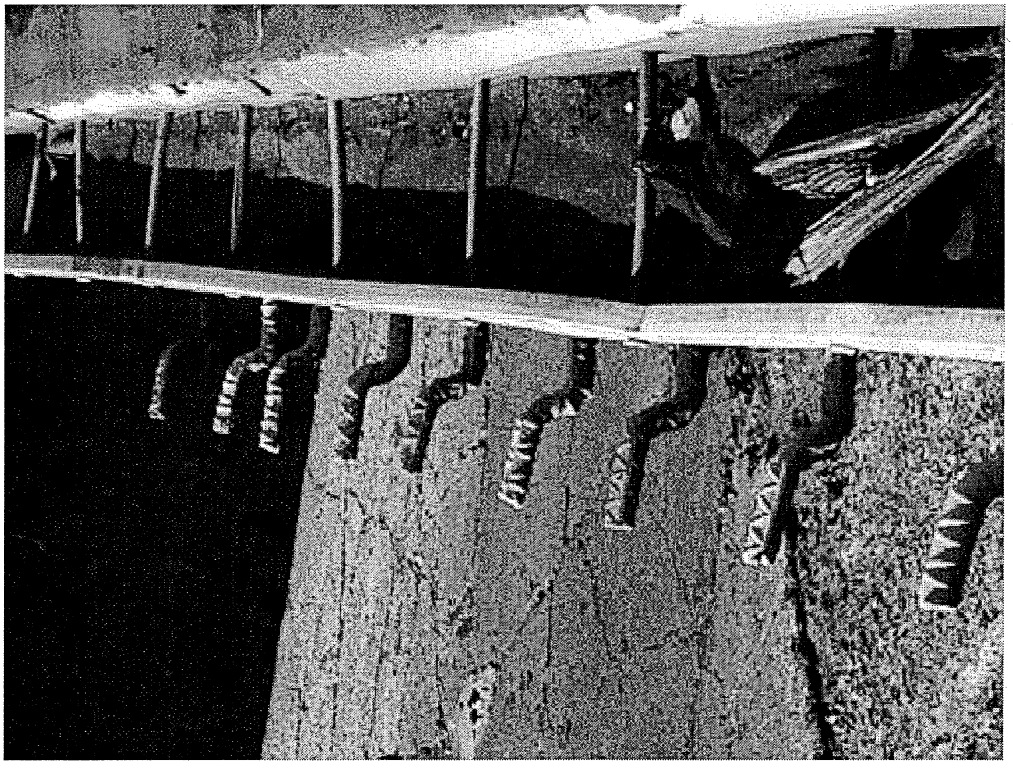

**Image 4(Roof Gutter) :** Roof gutter containing fall-out

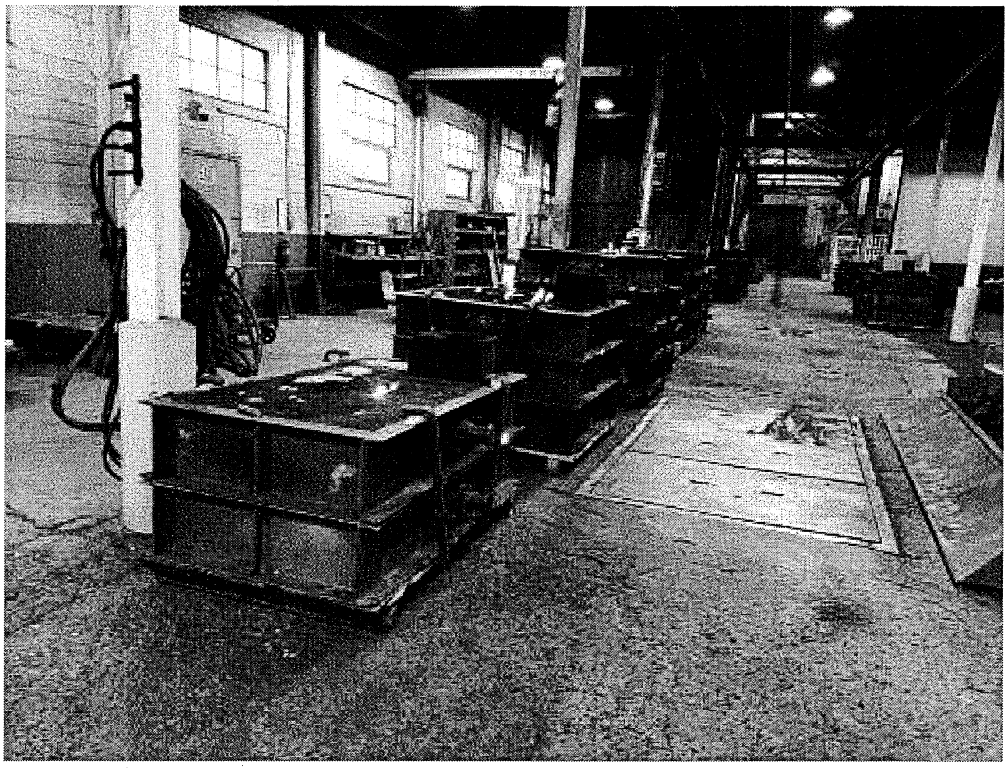

**Image 5(Molds) :** Molds where pouring occurred a few minutes before the time of the picture.

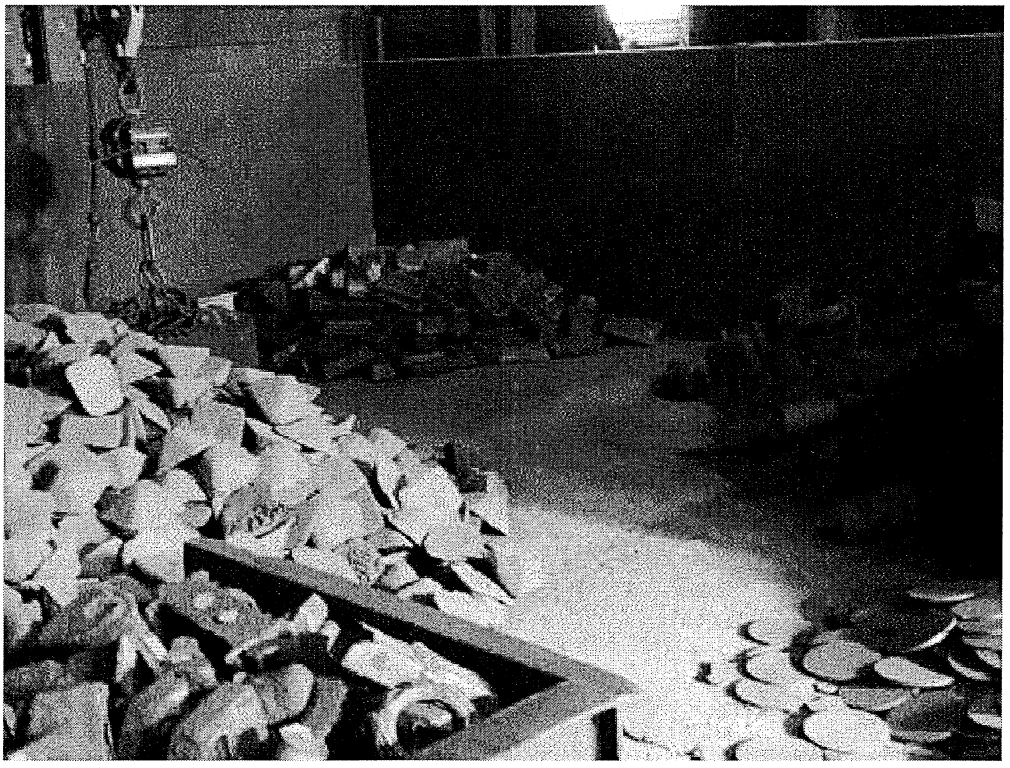

**Image 6(Scrap Metal) :** Scrap metal before being added to furnaces.

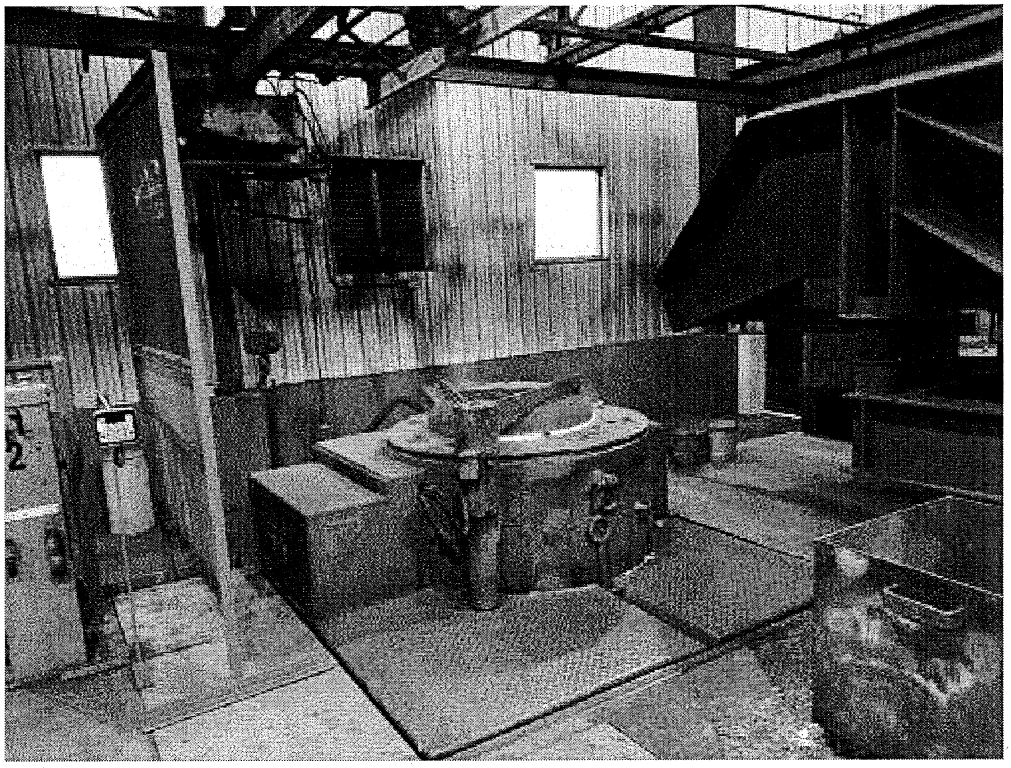

**Image 7(Furnace) :** One of 2 furnaces.


**Image 8(Pouring) :** Pouring from the furnace into a ladle.

NAME M. Kovalchick DATE 12/8/2016 SUPERVISOR