ALLEGHENY COUNTY HEALTH DEPARTMENT
AIR QUALITY PROGRAM

January 28, 2015

SUBJECT: Review of Application
Operating Permit
McConway and Torley LLC
109 48th Street
Pittsburgh, PA 15201-2755

RE: Operating Permit File No. 0275

TO: Sandra L. Etzel
Air Pollution Control Manager

FROM: David D. Good
Air Pollution Control Engineer

FACILITY DESCRIPTION:

The McConway and Torley LLC (McConway and Torley) facility is a steel foundry that manufactures steel rail and mining castings. The types of processes conducted at the facility include raw materials handling, steel melting, casting, mold and core making, heat-treating and finishing operations. The facility is a synthetic minor source of particulate matter less than 10 microns in diameter (PM10), particulate matter less than 2.5 microns in diameter (PM2.5), volatile organic compounds (VOCs), and carbon monoxide (CO), as defined in §2101.20 of Article XXI. The facility is a minor source of particulate matter (PM), nitrogen oxides (NOX), sulfur dioxide (SO2), and hazardous air pollutants (HAPs) emissions, as defined in §2101.20 of Article XXI.

PROCESS SUMMARY:

Scrap metal that is stored in an open building (separate from main building) is loaded onto a rail car by a large magnet. The scrap metal is transported to the main building by a railcar and loaded into one of the two (2) electric arc furnaces (EAF). The metal is melted for approximately two to three hours and tapped into a ladle. An overhead crane transfers the molten steel to the pouring area to be poured into individual molds. The sand molds are shaped internally by cores and are both produced in a separate area of the facility. The molten steel cools to a desired hardness and the molds are then sent to shakeout process to break apart the molds and recover the sand. The steel castings proceed onto finishing operations and the sand is sent to a reclaiming process. The facility is limited to melting 21,250 tons/year of steel and using 167,700 tons/year of sand. The entire list of operations is contained in Table 1 below.

Table 1: Facility Process Summary

I.D.	SOURCE DESCRIPTION	CONTROL DEVICE(S)	MAXIMUM CAPACITY	FUEL/RAW MATERIAL	STACK I.D.
P001 - Steel Making	-	-	-	-	-
P001-1	Charge Handling	None	20 tons/heat	Scrap Metal	N/A
P001-2A	Ladle Pre-Heater 1	None	0.6 MMBtu/hr	Natural Gas	N/A
P001-2B	Ladle Pre-Heater 2	None	0.6 MMBtu/hr	Natural Gas	N/A
P001-3A	Stopper Rod Table 1	None	0.1 MMBtu/hr	Natural Gas	N/A
P001-3B	Stopper Rod Table 2	None	0.1 MMBtu/hr	Natural Gas	N/A
P001-4	Lance Table	None	0.2 MMBtu/hr	Natural Gas	N/A
P001-5	EAF 1 Fugitive	None	20 tons/heat	Scrap metal, internal recycle, alloys, other additives	N/A
P001-5	EAF 1 BH "NEW"	Baghouse No. 11	20 tons/heat	Scrap metal, internal recycle, alloys, other additives	
P001-6	EAF 2 Fugitive	None	20 tons/heat	Scrap metal, internal recycle, alloys, other additives	N/A
P001-6	EAF 2 BHs	Baghouse Nos. 9 & 10	20 tons/heat	Scrap metal, internal recycle, alloys, other additives	
P002 - Core Making	-	-	-	-	-
P002-1	Core Room Sand Handling and Silos	Bin Vent	27,000 tons/yr of sand	Sand	
P002-2	OB2 Core Room Sand Handling and Silo	Baghouse	5.76 tons/hr of sand	Sand	
P002-3	Harrison Core Machine	None	5.76 tons/hr of sand	Sand, Resin	N/A
P002-4	H-80 Core Machines	None	5.76 tons/hr of sand	Sand, Resin	N/A
P002-5	A-12 Core Machines	None	5.76 tons/hr of sand	Sand, Resin	N/A
P002-6	OB2 Core Machine	None	5.76 tons/hr of sand	Sand, Resin	N/A
P002-7	Alcohol Wash Operations	None	9,537 lb/yr core wash	Isopropanol	N/A
P002-8A	Existing Wisconsin Core Oven	None	1.6 MMBtu/hr 11,000 tons/yr sand	Natural Gas	N/A
P002-8B	IP # 9 Wisconsin Core Oven	None	1.8 MMBtu/hr 11,000 tons/yr sand	Natural Gas	N/A

I.D.	SOURCE DESCRIPTION	CONTROL DEVICE(S)	MAXIMUM CAPACITY	FUEL/RAW MATERIAL	STACK I.D.
P003- Sand Handling Operations	-	-	-	-	-
P003-1	Sand Handling and Preparation	Baghouse No. 5	105 tons/hr sand	Sand	P003-S001
P003-2	Casting Shakeout	Baghouse No. 5	105 tons/hr sand	Sand	P003-S001
P003-3	Sand Reclamation	Baghouse No. 8	105 tons/hr sand	Sand	P003-S002
P003-4	Mold Making Units	None	105 tons/hr sand	Sand	N/A
P003-5	Sand Silos	Bin Vent	85 tons/hr	Sand	N/A
P004 - Casting Operations	-	-	-	-	-
P004-1	Mold Pouring	None	20 tons/heat	Molten Steel	N/A
P004-2	Casting Cooling	None	20 tons/heat	Molten Steel	N/A
P005 – Pre-finishing Operations	-	-	-	-	-
P005-1	Gas Torch Burning	None	0.5 MMBtu/hr	Natural Gas	N/A
P005-2	Air Arc Welding Tables	Baghouse No. 2	14,875 tons/yr	Steel, Welding Rod	N/A
P005-3	Shot Blast Units	Baghouse No. 2	9,917 tons/yr	Steel	
P005-4	Spinner Hanger Blast Units	Dust Collector	4,958 tons/yr	Steel	
P006 - Finishing Operations	-	-	-	-	-
P006-1	Robotic Knuckle Machines	Dust Collector	14,875 tons/yr	Steel	
P006-2	Hand Grinding Stations	None	14,875 tons/yr	Steel	
P007 - Heat Treating Operations	-	-	-	-	-
P007-1	Heat Treating Furnaces	None	10 Units at 7.8 MMBtu/hr (each)	Natural Gas	N/A
Miscellaneous	-	-	-	-	-
B001	Space Heaters and Furnaces	None	0.1 MMBtu/hr	Natural Gas	N/A
D001	On-Site Diesel Fuel Tank	None	66,000 Gallons/yr	Diesel Fuel	N/A
F001	On-Site Vehicles	None	35 Vehicles/yr	N/A	N/A

CHANGES TO SYNTHETIC MINOR SOURCE THROUGHPUT LIMITS:

McConway and Torley has historically been considered either a natural minor or synthetic minor source of PM-10 emissions. During the last 6 years, the following events and submissions have occurred:

1. Operating Permit Application was submitted to Department listing maximum production potential of 116,800 tons/year of steel (2008). An installation permit issued in 2007 stated the maximum production potential was 65,700 tons/year of steel.
2. Installation Permit Application (IP7) to reactivate an old EAF was received in 2008 with a maximum production potential of 116,800 tons/year of steel.
3. Coupled with the above installation, the potential production was reduced to 92,500 tons/yr of steel to remain a synthetic minor of PM10.
4. IP7 was issued on 1/21/2011. The facility was now permitted for two (2) EAFs with a combined production limit of 92,500 ton/yr steel.
5. A stack test on EAF 2 (IP7) was performed in July 2012. The facility exceeded numerous parameters including, but not limited to, PM10 (filterable + condensable), baghouse performance efficiency, CO & VOC.
6. The facility performed diagnostic testing and re-tested the baghouse on 2/1/2013. There were again test results that were higher than expected, but the results showed improvement from the previous stack test. New emission limits were proposed for PM10, CO & VOC that would keep the facility below major source levels at the 92,500 ton/yr production limit.
7. Installation Permit Application (IP8) was submitted to update EAF 1 with new capture hoods and a baghouse similar in function to IP7. IP8 was issued on 8/22/2013.
8. IP 9 application was received on 3/7/2013 for new core-making units. The overall core-making production was to remain the same. IP 9 was issued on 11/26/2013.

Since the meeting with McConway & Torley on November 7, 2013, the Department has performed a review of the above information along with a review of other air permits for steel foundries across the country. Additionally, the Department no longer accepts unsubstantiated claims of particulate control from buildings (the Department does not consider building structures to be a control device). These changes, discussed in detail below, result in maximum potential emission estimates at McConway & Torley that exceed major source thresholds for particulate matter less than 10 microns (PM10), particulate matter less than 2.5 microns (PM2.5) and carbon monoxide (CO) emissions at the throughput levels of McConway & Torley's Operating Permit Application.

Pouring and Cooling Emissions Estimate Changes

AP-42 Table 12.13-2 (Emission factors for steel foundries) lists "Filterable PM-10" emission factors for pouring and cooling of 2.8 and 1.4 lb/ton of metal processed, respectively. McConway and Torley reduced this emission factor by 60% in their 2008 Operating Permit Application claiming "Reduction based on observations of operations in comparison with large steel foundries". The Department questioned this claim and McConway & Torley produced a stack test of an Iron Foundry that had substantially less filterable emissions than the emission factors in AP-42. However, the test sent to the Department only measured filterable particulate matter and it was never determined what percentage of particulate matter was filterable or condensable. Additionally, the Department has located stack tests of similar Steel Foundries and found emissions that were comparable to those of AP-42 for pouring and cooling operations. The Department has also located air permits of steel foundries that all use AP-42 emission factors for pouring and cooling when no facility stack test data is available. Therefore, the Department will defer to AP-42 emission factors for processes such as pouring and cooling where no facility stack test data is available, which is consistent with emissions estimate methodologies of other permitted facilities in Allegheny County and steel foundry permits issued by other air agencies.

Fugitive Emissions Control Estimate Changes

The Department has historically allowed fugitive emissions released inside of a building to have a certain level of control ascribed to them for purposes of emissions inventory and permitting. Upon review of this procedure, it was found to have no technical basis to reference and was incongruent with policies and procedures of other air agencies, including, but not limited to, the PADEP, Ohio EPA and Oregon DEQ. The Department no longer allows for the use of buildings as a control device for particulate matter in Allegheny County unless the reduction is physically measurable.

Carbon Monoxide Emissions Estimate Changes

McConway & Torley did not include emissions estimates for carbon monoxide from the pouring, cooling and shakeout processes. A paper from the Casting Emissions Reduction Program (CERP) titled “Carbon Monoxide and Carbon Dioxide Emissions in Metalcasting Pouring, Cooling and Shakeout Operations” shows high levels of carbon monoxide in metalcasting operations. Steel foundry operations have a high variability in their carbon monoxide emissions based upon which additives are added to the mold sands. McConway and Torley claims that their CO production is very low since there are no additives such as seacoal, oil or chemical binderin their molds. No quantifiable estimate of CO has been produced.

McConway & Torley Emissions Estimates and ACHD Emissions Estimates of PM10

McConway & Torley submitted a revised facility-wide potential emissions estimate to the Department on 12/18/2014. McConway & Torley calculated their PM10 potential to emit as being 93.89 ton/year for melting 92,500 ton of steel and using 730,000 tons/year of sand. This estimate used a 50% building control throughout the facility for fugitive PM10, a 60% reduction on the AP-42 emission factors for pouring and cooling PM10 emissions, incorrect emission factors for EAF #1 and EAF #2, and did not use the emission factors derived from the 2008 and 2009 stack test for bagshouse nos. 5 and 8 to estimate those potential emissions. The Department revised the McConway & Torley submittal to reflect those changes and calculated a potential that exceeds 100 tons/year of PM10 (see attached spreadsheet). McConway & Torley’s usage of buildings as a control device, the 60% reduction in AP-42 emission factors for pouring and cooling, exclusion of permitted emission limits for EAF #1 and EAF #2, and their exclusion of emission factors derived from stack tests for baghouses nos. 5 and 8 (requested multiple times by ACHD) eliminates an additional 262 tons/year of potential PM10 emissions from their estimate. To remain a synthetic minor source of PM10, McConway & Torley will have to restrict throughput to less than 21,250 tons/year of steel and 167,700 tons/year of sand.

PROCESS DESCRIPTIONS & EMISSION CALCULATIONS:

Raw Materials Handling:

Raw material handling operations include receiving, unloading, storing, and conveying all raw materials for the foundry. Some of the raw materials used by McConway and Torley are iron and steel scrap, foundry returns, metal turnings, alloys, carbon additives, fluxes, sand, sand additives, and binders. These raw materials are received, placed into storage (containers, silos, bins, etc.) and are then transferred storage to the subsequent processes. The charge handling emissions are presented below. See the attached emissions spreadsheet for detailed calculations for each process.

PM10 = (0.36 lbs/ton of metal) x (13.33 tons/hr) x (1.15 uncertainty) = **5.52 lb/hr**
PM10 = (0.36 lbs/ton of metal) x (21,250 tons/yr) x (1.15 uncertainty) ÷ (2000 lb/ton) = **4.40 tons/yr**

Emission Factor Source: AP-42 Table 12.13-2

EAF Steelmaking:

Operations which generate emissions during the EAF steelmaking process are melting and refining, charging scrap, tapping steel and dumping slag. Iron oxide is the predominant constituent of the particulate emitted during melting. During refining, the primary particulate compound emitted is calcium oxide from the slag. Emissions from charging scrap are difficult to quantify, because they depend on the grade of scrap utilized. Scrap emissions usually contain iron and other metallic oxides from alloys in the scrap metal. Iron oxides and oxides from the fluxes are the primary constituents of the slag emissions. During tapping, iron oxide is the major particulate compound emitted. The emissions capture systems for the EAFs each consist of a side draft hood, canopy hood, and furnace enclosures that are estimated to capture 99.5% of the EAF emissions based on the volume of airflow and the geometric and spatial design parameters. The emission control devices are one (1) baghouse for EAF #1 and two (2) baghouses for EAF #2 that serve as the process unit for gas cleaning of filterable particulate emissions. See the attached emissions spreadsheet for detailed calculations for each process.

Particulate Emissions

The BACT filterable PM (FPM) limit of 0.0022 gr/dscf was used to calculate potential PM, which is more restrictive than the PM limits found in §63.10895(c). Results from July 2012 and February 2013 stack tests on EAF #2 were used in conjunction with the BACT FPM limit to derive the potential filterable and condensable PM10 and PM2.5 and also Metal HAPs. The PM10 and PM2.5 emission limits take into account the uncertainty in the condensable emissions which varied between the two tests by 300% (see attached). The fugitive emissions were calculated from a July, 2012 stack test that measured the FPM inlet to the baghouses on EAF #2 and the design of the new capture hood(s). The fugitive metal HAPs were derived from the FPM fugitive emissions and a 2004 baghouse dust study. The fugitive emissions and Metal HAP stack emissions were scaled up by 15% to account for uncertainty.

Gaseous Emissions

Please refer to the attached spreadsheet for detailed emissions calculations. Results from July 2012 and February 2013 stack tests on EAF #2 were used to derive the limits for CO, SO_X, NO_X and VOC. The CO, NO_X and VOC emission limits were taken to be 125% of the February 2013 stack test results and take into account the uncertainty which varied between the two tests by 274% and 235% for the CO and NO_X emissions, respectively (see attached).

Table 2: EAF Point Source Emissions Summary

POLLUTANT	Process	Emission Factor	Units	Reference
PM	EAFs	0.0022	Gr./DSCF	BACT
PM	EAF #1	0.120	Lbs/ton-metal charged	BACT
PM	EAF #2	0.10	Lbs/ton-metal charged	§63.10895(c)(2)
PM-10	EAFs	0.305	Lbs/ton-metal charged	ACHD, Stack Test (7/12, 2/13)
PM-2.5	EAFs	0.283	Lbs/ton-metal charged	ACHD, Stack Test (7/12, 2/13)
NOx	EAFs	0.650	Lbs/ton-metal	ACHD, Stack Test (2/13 + 25%)
SO_2	EAFs	0.430	Lbs/ton-metal	ACHD, IP7 & IP8
CO	EAFs	1.313	Lbs/ton-metal	ACHD, Stack Test (2/13 +25%)
VOC	EAFs	0.238	Lbs/ton-metal	ACHD, Stack Test (2/13 + 25%)
Metal HAPs(*)	EAFs	0.0035	Lbs/ton-metal charged	ACHD, Stack Test (7/12, MHAP/PM ratio +15%)

(*) Metal HAPs such as Arsenic, Cadmium, Chromium, Cobalt, Lead, Manganese & Nickel

Mold Pouring:

Molten steel is transferred from the EAF to the pouring area by a ladle containing approximately 20 tons of steel that is attached to an overhead crane. The steel is poured into individual sand molds across the line. The emissions of particulate matter from the mold pouring process are not controlled by a dedicated baghouse or any other type of control device. The emission factors for pouring operations are contained in US EPA's AP-42 Chapter 12, Section 13 (Steel Foundries). Table 12.13-2 lists "Filterable PM-10" emissions of 2.8 lbs/ton of metal processed. This is consistent with steel foundry PM-10 emission factors used by other regulatory agencies (Ohio, Michigan, West Virginia, Oregon, etc.). 15% was added to the "E-rated" emission factor to account for uncertainty. See the attached emissions spreadsheet for detailed calculations for each process.

PM10 = (2.8 lbs/ton of metal) x (13.33 tons/hr) x (1.15 uncertainty) = **42.93 lb/hr**
PM10 = (2.8 lbs/ton of metal) x (21,250 tons/yr) x (1.15 uncertainty) ÷ (2000 lb/ton) = **34.21 tons/yr**

Casting Cooling:

After the molten steel is poured into the sand molds, the casting is then allowed to cool until the casting is solidified. The emissions of particulate matter from the casting cooling process are not controlled by a dedicated baghouse or any other type of control device. The emission factors for casting cooling operations are contained in US EPA's AP-42 Chapter 12, Section 13 (Steel Foundries). Table 12.13-2 lists "Filterable PM-10" emissions of 1.4 lbs/ton of metal processed. This is consistent with steel foundry PM-10 emission factors used by other regulatory agencies (Ohio, Michigan, West Virginia, Oregon, etc.). 15% was added to the "E-rated" emission factor to account for uncertainty. See the attached emissions spreadsheet for detailed calculations for each process.

PM10 = (1.4 lbs/ton of metal) x (13.33 tons/hr) x (1.15 uncertainty) = **21.47 lb/hr**
PM10 = (1.4 lbs/ton of metal) x (21,250 tons/yr) x (1.15 uncertainty) ÷ (2000 lb/ton) =**17.11 tons/yr**

The following table summarizes the PM-10 emissions limitations for the mold pouring and casting cooling operations and the basis for their calculation:

Table 3: Mold Pouring and Casting Cooling Emissions Limitations

EMISSION POINT	POLLUTANT	LBS/HR	TPY[1]	METHODOLOGY
Fugitive	PM-10	64.4	51.32	AP-42, 5th Edition, Table 12.13-2 (Steel Foundries) (+15%)

[1] A year is defined as any consecutive 12-month period

Sand and Bentonite Operations:

Storage

Sand is stored in two (2) 200 ton sand silos that are each controlled by a bin vent dust collector for particulate emissions. Four (4) 25 ton sand silo surge bins are also each controlled by a bin vent dust collector. There is one (1) 200 ton bentonite storage and feed system also controlled by a bin vent dust collector. See the attached emissions spreadsheet for detailed calculations for each process.

Table 4: Sand Storage Emission Factors

	Process	Emission Factor	Units	Building Control	Reference
PM, PM_{10}, $PM_{2.5}$	Sand Storage Bin Vent	0.02	gr/ACFM	None	BACT

PM, PM10, PM2.5 = [(2 x 0.02 gr/ACFM) x 190 ACFM x 60 min/hr x 8760 hr/yr x / 7000 gr/lb] = 1,129 lb/yr = **0.565 ton/yr** = **0.13 lb/hr**

Sand surge silos:

Table 5: Sand Surge Emission Factors

	Process	Emission Factor	Units	Building Control	Reference
PM, PM_{10}, $PM_{2.5}$	Sand Surge Bin Vent	0.02	gr/ACFM	None	BACT

PM, PM10, PM2.5 = [(7 x 0.02 gr/ACFM) x 376 ACFM x 60 min/hr x 8760 hr/yr x / 7000 gr/lb x (1-0.00)] = 1.997 lb/yr = **0.999 ton/yr** = **0.23 lb/hr**

Bentonite Storage silo:

Table 6: Bentonite Storage Emission Factors

	Process	Emission Factor	Units	Building Control	Reference
PM, PM_{10}, $PM_{2.5}$	Bentonite Storage Bin Vent	0.02	gr/ACFM	None	BACT

PM, PM10, PM2.5 = [(0.02 gr/ACFM) x 190 ACFM x 60 min/hr x 8760 hr/yr x / 7000 gr/lb] = 565 lb/yr = **0.28 ton/yr** = **0.06 lb/hr**

Sand Handling

To make the molds, the sand is loaded from a large hopper into a smaller hopper in order to be poured into the core boxes. As the sand is being poured, the resin mix ingredients are blended into the sand from two separate drums in the appropriate proportions. The sand handling particulate emissions are controlled by Baghouse #5, which also serves as the control device for casting shakeout (see emissions calculations in Baghouse #5 section below). See the attached emissions spreadsheet for detailed calculations for each process.

Mold Making

Molds are forms used to shape the exterior of castings and are prepared from wet sand, clay and additives. Fugitive emissions from this process are an engineering estimate during operation of the automated equipment installed from Installation Permit No. 4. Sand usage is limited to 730,000 tons/yr. Particle size estimates are taken from AP-42 Table 12.10-8. See below for particulate emissions calculations and the attached emissions spreadsheet for detailed calculations for each process.

PM = (0.01 lb/ton of sand) x (85 tons sand/hr) x (1 heat/2hr) = **0.85 lb/hr**
PM = (0.01 lbs/ton of sand) x (167,700 tons/yr) = **0.84 tons/yr**
PM10 = 0.7 x PM = (0.7) x (0.85 lb/hr) = **0.60 lb/hr**
PM10 = 0.7 x PM = (0.7) x (0.84 ton/yr) = **0.59 tons/yr**
PM2.5 = 0.42 x PM = (0.42) x (0.85 lb/hr) = **0.36 lb/hr**
PM2.5 = 0.42 x PM = (0.42) x (0.84 ton/yr) = **0.35 tons/yr**
VOC = Mold Release Agent (wt.) = 9,465 lb/yr = **4.73 tons/yr**

Shakeout

Solidified metal components are removed from their mold by the shakeout process. During shakeout, high energy vibration of the molds is performed overtop of metal runners and gates to free the castings from the sand and collect the solids and aerosols formed by the process. The emissions are captured within the unit and controlled by baghouse #5. See emissions calculations in Baghouse #5 section below and the attached emissions spreadsheet.

Sand Reclaim

Used sand from the castings shakeout is recycled and reused in the sand reclaim process. The sand is screened and reused to make new molds. The emissions are captured and within the unit and controlled by baghouse #8. See emissions calculations in Baghouse #8 section below and detailed emissions calculations in the attached emissions spreadsheet.

Baghouse No. 5 (sand handling and shakeout)

Baghouse No. 5 was tested in April of 2008. Filterable and condensable PM was measured at the stack during the test. The sand usage rate was measured and recorded. Based upon the results of that testing, estimated capture efficiency and emissions factor estimates from AP-42 Section 12.10 on Gray Iron Foundries, the total PM, PM10, PM2.5 and VOC emissions were calculated. Control efficiency was estimated based on the stack test result compared to the AP-42 factor for sand handling at steel foundries, 0.54 lb/ton sand. The latter figure was converted to 5.29 lb/ton steel using the 2008 emissions inventory sand to steel ratio rather than the stack test ratio (steel production was not recorded in the stack test report). The percentage of Baghouse 5 emissions due to sand handling was then estimated by using the above factor compared to the factor for casting shakeout from AP-42 Sec. 12.10 for gray iron foundries, 3.2 lb/ton hot metal, to estimate that 62% of the dust captured by Baghouse 5 came from sand handling. This percent was multiplied by the stack test result for filterable PM, 0.062 lb/ton steel, to estimate 0.039 lb/ton steel from sand handling. This factor was then compared to the factor of 5.29 lb/ton steel (from AP-42) to estimate a control efficiency of 99.268%. Using this control efficiency along with an assumed capture efficiency of 97.5% for all the PM filterable results, estimated fugitive emission factors in lb/ton sand were created. Fugitive emission factors were calculated for PM condensable and VOC using the test results and the capture efficiency assuming zero control from the baghouse. A 15% adjustment factor was added to the stack emissions and a 50% adjustment factor was added to the fugitives to account for uncertainty. See the attached emissions spreadsheet for detailed calculations for each process.

Table 7: Shakeout Emission Factors

POLLUTANT	Source	Emission Factor	Units	Reference
PM	Stack	0.036	Lb/ton sand	Stack test (4/08) + 15%, AP-42 Section 12.10 + 50%
PM	Fugitive	0.070	Lb/ton sand	Stack test (4/08) + 15%, AP-42 Section 12.10 + 50%
PM-10	Stack	0.030	Lb/ton sand	Stack test (4/08) + 15%, AP-42 Section 12.10 + 50%
PM-10	Fugitive	0.049	Lb/ton sand	Stack test (4/08) + 15%, AP-42 Section 12.10 + 50%
PM-2.5	Stack	0.025	Lb/ton sand	Stack test (4/08) + 15%, AP-42 Section 12.10 + 50%
PM-2.5	Fugitive	0.030	Lb/ton sand	Stack test (4/08) + 15%, AP-42 Section 12.10 + 50%
VOC	Stack	0.046	Lb/ton sand	Stack test (4/08) + 15%, AP-42 Section 12.10 + 50%
VOC	Fugitive	0.001	Lb/ton sand	Stack test (4/08) + 15%, AP-42 Section 12.10 + 50%

Table 8: Shakeout Emissions

POLLUTANT	Source	Emission Factor	Tons per Year	Reference
PM	Stack	0.036	3.52	Stack test (4/08), AP-42 Section 12.10
PM	Fugitive	0.070	8.81	Stack test (4/08), AP-42 Section 12.10
PM	Total	0.106	12.32	Stack test (4/08), AP-42 Section 12.10
PM-10	Stack	0.030	2.94	Stack test (4/08), AP-42 Section 12.10
PM-10	Fugitive	0.049	6.18	Stack test (4/08), AP-42 Section 12.10
PM-10	Total	0.080	9.12	Stack test (4/08), AP-42 Section 12.10
PM-2.5	Stack	0.025	2.41	Stack test (4/08), AP-42 Section 12.10
PM-2.5	Fugitive	0.030	3.73	Stack test (4/08), AP-42 Section 12.10
PM-2.5	Total	0.055	6.13	Stack test (4/08), AP-42 Section 12.10
VOC	Stack	0.046	4.4	Stack test (4/08), AP-42 Section 12.10
VOC	Fugitive	0.001	0.11	Stack test (4/08), AP-42 Section 12.10
VOC	Total	0.047	4.51	Stack test (4/08), AP-42 Section 12.10

Baghouse No. 8 (sand handling and shakeout)

Baghouse No. 8 was tested in April of 2008 and again in February of 2009. Filterable and condensable PM was measured at the stack during the test. The sand usage rate was measured and recorded. Based upon the results of that testing, estimated capture efficiency and emissions factor estimates from AP-42 Section 12.10 on Gray Iron Foundries, the total PM, PM10 and PM2.5 emissions were calculated. Control efficiency was estimated based on the stack test results compared to the AP-42 factor at steel foundries, 0.216 lb/ton sand (40% of total emissions from AP-42 sand handling factor assigned to reclaim). This factor was then compared to the factor of the stack test results of to estimate a control efficiency of 94.61% (2008 test) and 95.76% (2009 test). Using this control efficiency along with an assumed capture efficiency of 97.5% for all the PM filterable results, estimated fugitive emission factors in lb/ton sand were created. Fugitive emission factors were calculated for PM condensable and the capture efficiency assuming zero control from the baghouse. A 15% adjustment factor was added to the stack emissions and a 50% adjustment factor was added to the fugitives to account for uncertainty. See the attached emissions spreadsheet for detailed calculations for each process.

Table 9: Baghouse No. 8 Emission Factors

POLLUTANT	Source	Emission Factor	Units	Reference
PM	Stack	0.045	Lb/ton sand	Stack test (4/08, 02/09) +15%, AP-42 Section 12.10 + 50%
PM	Fugitive	0.016	Lb/ton sand	Stack test (4/08, 02/09) +15%, AP-42 Section 12.10 + 50%
PM-10	Stack	0.035	Lb/ton sand	Stack test (4/08, 02/09) +15%, AP-42 Section 12.10 + 50%
PM-10	Fugitive	0.012	Lb/ton sand	Stack test (4/08, 02/09) +15%, AP-42 Section 12.10 + 50%
PM-2.5	Stack	0.027	Lb/ton sand	Stack test (4/08, 02/09) +15%, AP-42 Section 12.10 + 50%
PM-2.5	Fugitive	0.007	Lb/ton sand	Stack test (4/08, 02/09) +15%, AP-42 Section 12.10 + 50%

Table 10: Baghouse No. 8 Emissions

POLLUTANT	Source	Emission Factor	Tons per Year	Reference
PM	Stack	0.045	4.38	Stack test (4/08, 02/09), AP-42 Section 12.10
PM	Fugitive	0.016	1.99	Stack test (4/08, 02/09), AP-42 Section 12.10
PM	Total	0.061	6.37	Stack test (4/08, 02/09), AP-42 Section 12.10
PM-10	Stack	0.035	3.44	Stack test (4/08, 02/09), AP-42 Section 12.10
PM-10	Fugitive	0.012	1.41	Stack test (4/08, 02/09), AP-42 Section 12.10
PM-10	Total	0.048	4.84	Stack test (4/08, 02/09), AP-42 Section 12.10
PM-2.5	Stack	0.027	2.56	Stack test (4/08, 02/09), AP-42 Section 12.10
PM-2.5	Fugitive	0.007	0.86	Stack test (4/08, 02/09), AP-42 Section 12.10
PM-2.5	Total	0.035	3.42	Stack test (4/08, 02/09), AP-42 Section 12.10

Core Making:

Cores are pieces that are placed into casting molds to form internal cavities of the steel castings. The cores are made from chemically bonded sand by mixing sand with a two-part chemical binder system (ISOCURE Parts I and II). A third part, the catalyst (ISOCURE Catalyst), is introduced into the mixed sand to set or cure the core. The cores are baked in core oven. The production limit of the combined core-making units has been set at 27,000 tons/year. The resin and catalyst emission factors are from a 1994 OCMA study that was also used in the Iron and Steel Foundries MACT background document and a 2009 stack test of the existing Dekota Scrubber. The hourly limits were based on the specifications of the new Core-Making Units contained in the Installation Permit application, which were used to calculate the maximum amount of sand that each unit can process on an hourly basis. See the attached emissions spreadsheet for detailed calculations for each process.

1.0 cycle/10 sec x 3600 sec/hr x 32 lb core/cycle x 1.0 ton/2000 lbs = **5.76 tons/hr** of sand cores (each unit)

Table 11: Core-Making Particulate Emission Factors

	Process	Emission Factor	Units	Reference
PM	Core Making	1.1	Lbs/ton-sand handled	AP-42, Table 12.13-2, SCC30400706 and Table 12.10-8, SCC30400331 **[1]**
PM_{10}	Core Making	0.54	Lbs/ton-sand handled	AP-42, Table 12.13-2, SCC30400706
$PM_{2.5}$	Core Making	0.053	Lbs/ton-sand handled	AP-42-13.2.4, ACHD, 2007
VOC	Core Making	0.945	Lbs/ton-sand handled	2009 Stack Test on Dekota Scrubber + 15%
HAPs	Core Making	0.162	Lbs/ton-sand handled	OCMA Study & 2009 Stack Test on Dekota Scrubber + 15%

1. Table 12.13-2, for Core Making, PM_{10} = 0.54 lbs/ton-sand handled.
   From Table 12.10-8, PM_{10} = 70% of PM. Assume PM_{10} = 50% of PM, therefore, PM = 0.54/0.5 = 1.1 lbs/ton-sand handled

All core-making units (23.04 ton/hr and 27,000 ton/yr core sand):

PM = [(1.1 lb/ton of sand) x 1.15 x (27,000 tons/yr of sand)] = 34,155 lb/yr = **17.08 tpy**
PM = [(1.1 lb/ton of sand) x 1.15 x (23.04 ton/hr of sand)] = **29.15 lbs/hr**
PM_{10} = [(0.54 lb/ton of sand) x 1.15 x (27,000 tons/yr of sand)] = 16,767 lb/yr = **8.38 tpy**
PM_{10} = [(0.54 lb/ton of sand) x 1.15 x (23.04 ton/hr of sand)] = **14.31 lbs/hr**
$PM_{2.5}$ = [(0.053 lb/ton of sand) x 1.15 x (27,000 tons/yr of sand)] = 1,646 lb/yr = **0.82 tpy**
$PM_{2.5}$ = (0.053 lbs/ton of sand) x 1.15 x (23.04 ton/hr of sand)] = **1.40 lb/hr**

VOC (23.04 ton/hr and 27,000 tons/yr core sand):

VOC = 27,000 ton/yr x 0.822 lb/ton (+15%) = 25,523 lb/yr = **12.76 ton/yr** = **0.9453 lb/ton**
VOC = 23.04 ton/hr x 0.822 lb/ton (+15%) = **21.80 lb/hr**

*Core Wash = 7,358 lb/yr x 25% = 1,839 lb/yr = 0.92 ton/yr
*Core Wash = 1,839 lb/yr /1,173 hr/yr = 1.56 lb/hr

Total = **1**3.68 ton/yr, 23.36 lb/hr

HAPs (23.04 ton/hr and 27,000 tons/yr core sand):

Phenol = 712,800 lb/yr x 0.0567% (+15%) = 464.45 lb/yr = 0.232 ton/yr
Phenol = 464.45 lb/yr / 1,173 hr/yr = 0.396 lb/hr

Naphthalene = 712,800 lb/yr x 0.0227% (+15%) = 185.78 lb/yr = 0.093 ton/yr
Naphthalene = 185.78 lb/yr x /1,173 hr/yr = 0.158 lb/hr

MDI = 712,800 lb/yr x 0.4533% (+15%) = 3,715.57 lb/yr = 1.858 ton/yr
MDI = 3,715.57 lb/yr / 1,173 hr/yr = 3.168 lb/hr

Total = **2.183 ton/yr** = **3.722 lb/hr, 0.1617 lb/ton**

(*) The core wash emissions are not routed to the Dekota Scrubber.

Pre-finishing and Finishing Operations:

Pre-finishing operations include gas torch burning, air arc welding tables, shot blast units and spinner hanger blast units. Finishing operations include robotic knuckle machines and hand grinding stations. See the attached emissions spreadsheet for detailed calculations for each process.

Fuel Burning Operations:

Fuel burning operations include heat treating furnaces, space heaters and furnaces. See the attached emissions spreadsheet for detailed calculations for each process.

Miscellaneous:

Miscellaneous operations include vehicle traffic, on-site diesel fuel tank, two (2) ladle pre-heaters, two (2) stopper rod tables and a lance table. See the attached emissions spreadsheet for detailed calculations for each process.

OPERATING PERMIT APPLICATION COMPONENTS:

1. Operating Permit Application received February 28, 2008.
2. Revised Operating Permit Application received August 6, 2010.
3. Revised Operating Permit Application Calculations received January 10, 2012.
4. Revised Operating Permit Application Calculations received April 16, 2013.
5. Proposed Revised Emission Limits Received June 6, 2013.
6. Meeting with McConway & Torley on November 7, 2013.
7. Information Request on November 7, 2013 (pouring/cooling/shakeout emissions, redo baghouse 5 & baghouse 8 calculations based on stack test data, etc.). Information was never received.

INSTALLATION PERMITS:

1. ACHD Installation Permit No. 0275-I003

This permit is for the installation of a new Artisand H-80 Core Making Unit for the manufacturing of sand cores.

2. ACHD Installation Permit No. 0275-I004

This installation permit is for the modification of the existing mold making and casting handling system through the replacement of molding equipment with automated equipment; the replacement of the casting shakeout machine with a shaker table; and the realignment of the existing mold/flask conveyor systems. This modification is expected to streamline the process, but will not result in an increase in production, since the existing ancillary equipment (sand preparation, storage silos, and sand reclaim system) and the heat duration of 2 hours are the limiting factors of the throughput.

3. ACHD Installation Permit No. 0275-I005

This permit is for the installation of an additional A-12 Core Making Unit for the manufacturing of sand cores. An existing wet scrubber will be used for the control of VOC and HAP emissions from the process.

4. ACHD Installation Permit No. 0275-I006

This permit is for the installation of an additional A-12 Core Making Unit and an H-80T Core Making Unit for the manufacturing of sand cores. An existing wet scrubber will be used for the control of odor, VOC and HAP emissions from the process.

5. ACHD Installation Permit No. 0275-I007

This permit is for the installation of a new Electric Arc Furnace (EAF) which is a new affected source to a large foundry as defined in §63.10880(b)(2). With the addition of this new unit, this facility will have a total of two (2) EAF's. Two new baghouses will be used for the control of Particulate Matter (PM) and metal HAP emissions from the process.

6. ACHD Installation Permit No. 0275-I008a

This permit is for the installation of new pollution control devices (baghouse and capture hoods) on an Electric Arc Furnace (EAF #1), which is an existing affected source of a large foundry, as defined in §63.10880(b)(1). One new baghouse and capture hood will be used for the control of filterable PM, PM-10, PM-2.5 and Metal HAP emissions from the process. The facility has a total of two (2) EAF's that share an annual production limit to remain a synthetic minor source of PM10 and CO.

7. **<u>ACHD Installation Permit No. 0275-I009</u>**

This installation permit is for the addition of an A-12 core-making unit and three (3) Lampe/Loramende core-making units. McConway and Torley currently operate three (3) A-12 core-making units, two (2) H-80 core making units two (2) Sand Silos, four (4) Sand Silo Surge Bins, one (1) Bentonite Storage and Feed System, two (2) Core Wash Dip Stations and one (1) Wisconsin Core Oven.. All of the core-making units are manufactured by Artisand Specialty, Inc. Cores are pieces that are placed into casting molds to form internal cavities of the steel castings. The cores are made from chemically bonded sand by mixing sand with a two-part chemical binder system (ISOCURE Parts I and II). A third part, the catalyst (ISOCURE Catalyst), is introduced into the mixed sand to set or cure the core. The production limit of the combined core-making units has been reduced from 35,000 tons/year to 27,000 tons/year.

REGULATORY APPLICABILITY:

1. **<u>Article XXI Requirements for Issuance:</u>**

See Permit Application No. 0275 Section 5. The requirements of Article XXI, Parts B and C for the issuance of major source operating permits have been met for this facility. Article XXI, Part D, Part E & Part H will have the necessary sections addressed individually.

2. **<u>Method(s) of Demonstrating Compliance:</u>**

Compliance with the emission standards set forth in this Operating Permit will be demonstrated by stack testing every five (5) years, recording the total amount of metal produced and sand used in tons, raw materials consumed, the tracking of the hours of operation of the processes, and the monitoring/recording of the operating parameters of the baghouses including the use of a bag leak detection system. In addition, all instances of non-compliance will be reported to the Department on a semi-annual basis. See Operating Permit No. 0275 for the specific conditions for determining compliance.

3. **<u>New Source Performance Standards (NSPS)</u>**

There are no applicable NSPS for this installation. The requirements of 40 CFR Part 60 Subpart A (Standards of Performance for New Stationary Sources) are not included in the permit because McConway & Torley are not an “affected facility”, as per their exemption for facilities classified as ‘Foundries’ (Letter from EPA to McConway & Torley dated 3/2/01).

The requirements of 40 CFR Part 60 Subpart AA (Standards of Performance for Steel Plants: Electric Arc Furnaces and Argon-Oxygen Decarburization Vessels Constructed After October 21, 1974 and on or before August 7, 1983) are not included in the permit because of the exemption for facilities classified as ‘Foundries’ (Letter from EPA to McConway & Torley dated 3/2/01).

The requirements of 40 CFR Part 60 Subpart AAa (Standards of Performance for Steel Plants: Electric Arc Furnaces and Argon-Oxygen Decarburization Vessels Constructed After August 7, 1983) are not included in the permit because of the exemption for facilities classified as ‘Foundries’ (Letter from EPA to McConway & Torley dated 3/2/01).

4. **<u>National Emission Standards for Hazardous Air Pollutants (NESHAP)</u>**
    a. National Emission Standards for Hazardous Air Pollutants for Iron and Steel Foundries Area Sources (40 CFR Part 63 Subpart ZZZZZ).
    b. National Emission Standards for Hazardous Air Pollutants Area Source Standards for Nine Metal Fabrications and Finishing Source Categories (40 CFR Part 63 Subpart XXXXXX).

5. **Risk Management Plan; CAA Section 112(r):**
The facility is not required to have a risk management plan at this time because none of the regulated chemicals exceed the thresholds in the regulation.

6. **Greenhouse Gas Reporting (40 CFR Part 98):**
Should the facility exceed 25,000 metric tons of actual CO2e emissions in any 12-month period, the facility will have to submit reports in accordance with 40 CFR Part 98. See §98.2(a)(3) for applicability.

7. **Ambient Air Monitoring:**

Ambient air monitoring at the McConway & Torley facility fence linebeing conducted using a PM10 reference method used to measure PM10 mass in ambient air. High purity quartz filters are used to capture the particles. The filter size is 8 inches by 10 inches. Each sample is collected for 24hours at a flow rate of 40 cfm. The filters are weighed before and after sampling. The weight difference represents total mass. The Department then factors in the total air volume sampled to calculate PM10 mass in micrograms per cubic meter. The PM10 will be analyzed for HAP metals (manganese, total chromium and lead).

EMISSIONS SUMMARY:

POLLUTANT	ANNUAL EMISSION LIMIT (tons/year)*
Particulate Matter	198.9
PM10	99.45
PM2.5	48.95
Nitrogen Oxides	28.78
Sulfur Oxides	9.69
Carbon Monoxide	27.13
Volatile Organic Compounds	34.04
Benzene	9.67
Manganese	0.74
Chromium	0.47
Nickel	0.59
Total HAPs	15.84

***** A year is defined as any consecutive 12-month period.

RECOMMENDATION:

The facility has no unresolved Notices of Violation issued within the last 18 months and it is recommended that Operating Permit No. 0275 be issued.