ATTACHMENT A

LPCS AIR CASTING EMISSIONS MEMO

MEMORANDUM

To: Kenzie Billings

Date: December 14, 2021

From: Brian Eagle

Project No.: 8006.58.01

RE: PCC Structurals LPC Steel Air Casting Emissions

PCC Structurals, Inc. (PCC) received a letter dated October 19, 2021 from the Oregon Department of Environmental Quality (DEQ) relating to the Cleaner Air Oregon (CAO) Emissions Inventory that PCC submitted on October 10, 2020. The DEQ requested PCC provide support for the claim that 60 percent of air casting emissions at the Large Parts Campus Steel plant (LPCS) are routed to Baghouse 9256 (the baghouse) "based on operator observation and engineering judgement based on exhaust configuration." To further support this claim, Maul Foster & Alongi, Inc. (MFA) visited LPCS on November 11, 2021 to visually observe and characterize the behavior of emissions generated during air casting activities.

AIR CASTING – PROCESS DESCRIPTION

Air casting operations at LPCS are conducted in batches. Prior to initiating casting operations, the baghouse is configured so that air is drawn through two area vents on the west side of the building, which are shown in the attached figure. MFA personnel observed significant surface rippling of standing water inside of the casting building as air was pulled into the negatively pressurized building through the open bay door adjacent to the casting furnaces. This rippling was a clear indication of air being drawn into the building. The bay door is closed before casting activities are initiated, as required by PCC's safety protocols to limit access to the area during casting.

Steel alloy is heated in an electric induction furnace, then transferred to an insulated ladle. A bridge crane is used to move the ladle across the casting floor and position it above the pre-heated casting molds. The molds are set near the western wall next to the melt furnaces and below the vents to the baghouse, as noted in the figure. Air casting personnel release the molten metal from the ladle to fill the mold. The pre-heated mold is covered by a glass wool blanket at all times. Portions of the glass wool blanket are moved to allow filling of the mold, and application of molten metal insulation (i.e., hot top) to the open portions of the mold. The mold is immediately re-covered by the glass wool blanket after each step. It's important to note that emissions from the application of hot top are not assumed to be collected by the baghouse in the emissions inventory; however, a significant portion of emissions from this process were observed by MFA personnel as being collected by the baghouse vents.

The portion of the building where air casting operations occur has an elevated roof level. The exhaust vents that are connected to the baghouse are positioned along the western wall of this elevated portion. Vents on the eastern wall of the elevated portion are intended to provide general ventilation of the casting area for personnel comfort. The location of the two eastern vents closest to the air casting process are also noted in the figure.

AIR CASTING EMISSIONS – VISUAL OBSERVATIONS

To avoid interference with operations and comply with PCC's safety protocols, MFA personnel observed the air casting process from an elevated platform. The vantage provided a view of the casting operations, the emissions generated, and the vents. The view of the exhaust vents was partially obscured at times due to operation of the overhead bridge crane. During casting operations, MFA personnel used a FLIR® thermal camera (thermal camera) to capture images of the casting process. The images (thermograms) created by the thermal camera show variations in temperature. The temperature displayed in the top left-hand corner of the thermogram represents the recorded temperature (in degrees Fahrenheit) at the point in the center of the image. The color scale on the right-hand side of the image represents the range of temperatures in the thermogram. The thermal camera also captured contemporaneous photographs. Both thermograms and photographs captured during air casting operations have been included in the attached photograph log.

Visible emissions generated by the air casting activities rose rapidly to roof level, due to the thermal buoyancy of the emissions. Once at roof level, the visible emissions dispersed in the upper portion of the building but remained concentrated on the western side of building near the vents to the baghouse. In contrast, the eastern side of the building remained visibly clear of smoke. The observed behavior of the visible emissions was expected given the size of the baghouse, which is rated at 80,000 cubic feet per minute. Images 1 and 2 in the photograph log, which were captured only seconds apart, show the visible emissions generated from casting activities and the concentration of the emissions in the western portion of the building.

Thermograms taken of the western vents connected to the baghouse show elevated temperature on the inside walls of the vents compared to the nearby temperatures (see Images 5b and 6b in the photograph log). This is consistent with the high temperature emissions being exhausted to the baghouse. Conversely, only one of the vents on the eastern wall appears to have elevated temperatures on the exterior walls of the vent (see Image 7b in the photograph log). This vent is close to the high temperature exhaust stacks of the burnout ovens, which could account for the elevated temperature on the exterior surface of the vent. The eastern vent in Image 8b of the photograph log shows no signs of elevated temperature relative to nearby surfaces. These observations are consistent with heated air exhausting through the baghouse vents only, and not the general building vents. To corroborate this assumption, PCC personnel performed a qualitative assessment of the eastern vents using thin plastic strips attached to a pole. The strips were placed in front of each eastern vent face from the inside of the building. The strips were either not impacted by the vents (i.e., the strips did not move), or an inward airflow through the vent was observed (i.e., the strips moved away from the vent). At the time of this assessment, the axial fans in the eastern vents were configured to move air

from inside the building to the outdoors. Even with these fans operating, the negative pressure within the building prevented the flow of air through these vents to the outdoors.

CONCLUSIONS

Visual observations of air movement in the LPCS air casting building indicate that operation of the baghouse during casting activities pulls emissions primarily towards the western exhaust vents connected to the baghouse. The location of casting operations and the rapid rise of the emissions effectively place the emission near the exhaust vents connected to the baghouse, and air is not being exhausted through the vents nearest the air casting operations on the eastern wall. These observations suggest that the air casting emissions are primarily collected by the western vents connected to the baghouse, and the assumption that 60 percent capture of air casting emissions by the baghouse is a reasonably conservative estimate.

NEW MASTER CASTER

OBSERVATION LOCATION

APPROXIMATE BOUNDARY OF ELEVATED ROOF TIER.

GENERAL LOCATION OF POURING ACTIVITIES

BUILDING VENTS

EXHAUST VENTS TO BH 9256

AIRCAST FURNACE

BURNOUT OVENS

DOORWAY TYPICALLY CLOSED

BH 9256

BAY DOOR CLOSED DURING AIR CASTING OPERATIONS

BAY DOOR TYPICALLY CLOSED

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This figure prepared as supplemental visual information only and should not be used for construction purposes. Only plan sheets approved, stamped and signed by a registered professional engineer in the state of governing jurisdiction shall be used for construction. Additionally, only plans approved by the applicable governing jurisdiction(s) shall be used for final construction unless otherwise expressly noted in writing by the engineer of record.

LEGEND:

- OBSERVATION LOCATION
- LOCATION OF POURING
- EXHAUST FAN ROUTED TO BH 9256
- BUILDING VENT
- BAGHOUSE
- BH BAGHOUSE

Figure
LPCS Air Casting - Emissions Observations
PCC Structurals - Large Parts Campus
Milwaukie, Oregon

Filename: PCC_LPCS_AIR CASTING_2021-1111.dwg
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PHOTOGRAPH LOG

Project Name: PCC Structurals, Large Parts Campus
Project Number: 8006.58.01
Location: Steel Foundry – Air Casting

Image 1: Smoke rising, southwestern-facing view.

Image 2: Southeastern-facing view.

PHOTOGRAPH LOG

Project Name: PCC Structurals, Large Parts Campus
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Location: Steel Foundry – Air Casting

Image 3: Smoke rising, southwestern-facing view. (a) photograph and (b) thermogram.

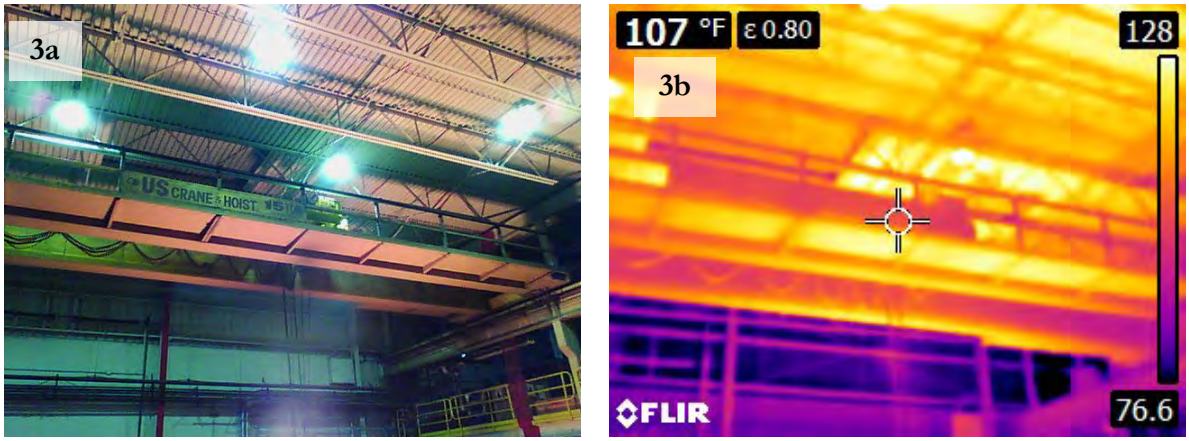
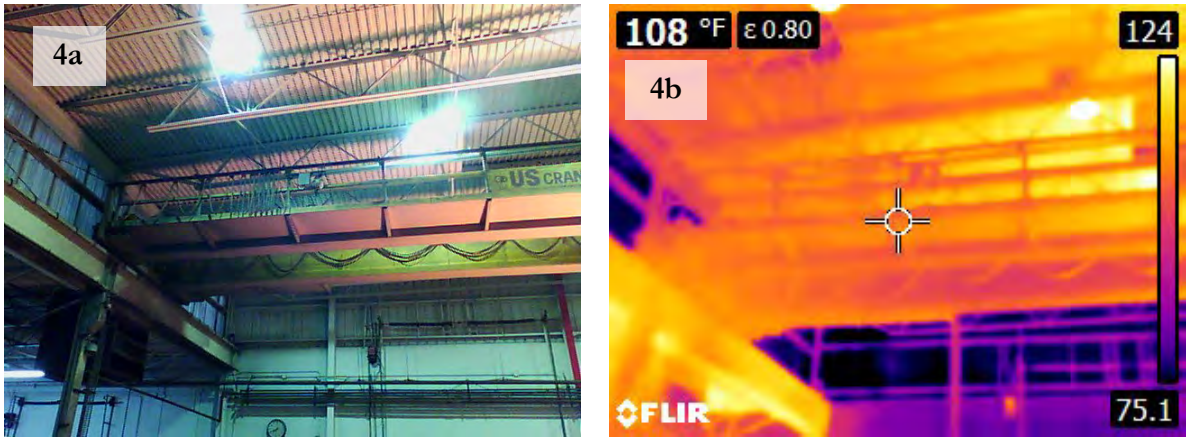


Image 4: Southeastern-facing view. (a) photograph and (b) thermogram.



PHOTOGRAPH LOG

Project Name: PCC Structurals, Large Parts Campus
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Image 5: Northwestern vent. Routed to Baghouse 9256. (a) photograph and (b) thermogram.

Image 6: Southwestern vents. Routed to Baghouse 9256. (a) photograph and (b) thermogram.

PHOTOGRAPH LOG

Project Name: PCC Structurals, Large Parts Campus
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Image 7: Southeastern exhaust vent. (a) photograph and (b) thermogram.

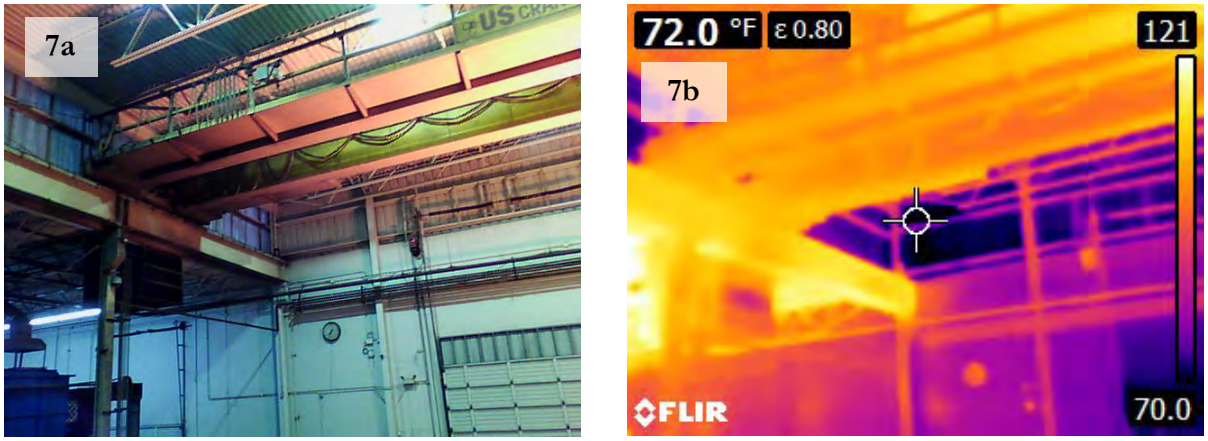

Image 8: Northeastern exhaust vents. Burnout oven exhaust stacks in background. (a) photograph and (b) thermogram.