



September 8, 2023

Ultium Cells LLC
Tom Gallagher (VP of Operations)
7400 Tod Avenue Southwest
Warren, OH 44481

Re: Inspection #1658181 (combustible dust)

Mr. Gallagher,

An inspection of your workplace at 7400 Tod Avenue Southwest in Warren, OH beginning on March 20th, 2023, disclosed potential hazards associated with your company's various dust collection systems handling combustible aluminum scrap fines and combustible aluminum fume.

Event Overview

Our inspection was opened in response to a March 11th / 12th, 2023 duct flash fire/explosion event involving the 2nd floor ducting for the NND Line 1-1 Cathode process. Your company identified that on or about midnight of March 11, 2023 (early March 12, 2023) an aluminum dust flash fire and explosion occurred in the NND fume collector ducts #1 and #2 in the 2 Floor NND Cathode ceiling. The source of ignition for the event was identified as the NND 2-1 laser (laser notching operation within a booth). The event was noted to have resulted in structural damage to the NND's DHU supply duct and NND fume exhaust duct.

Our inspection activities included 1) review of relevant equipment, 2) review of requested documents (incident reports, engineering drawings, equipment manuals, safety data sheets, purchase orders, videos, system design specifications, etc.), 3) photographs, 4) private employee interviews, and 5) interviews with management.

Potential Hazards, Industry Consensus, and Abatement Solutions

National Fire Protection Association (NFPA) Standard 484 *Standard for Combustible Metals* is the commodity specific NFPA industry consensus standard applicable to your industry*. The 2022 edition of NFPA 484 is referenced in this letter, as it is the current version at the time of this correspondence.

*The Ohio State Fire Code (Ohio Fire Code 1301: 7-72 Combustible Dust-Producing Operations) authorizes fire code officials to enforce applicable provisions of NFPA combustible dust standards, including NFPA 484 (2015). This means that your company likely has obligations under Ohio State Law to comply with certain requirements of this standard.

Insufficient Duct Velocities

The accumulation and ignition of combustible particulates inside of the fume collector ducts indicates that an effective duct velocity was likely not being achieved in the system. Insufficient duct velocities present combustible dust fire, deflagration, and explosion hazards due to the concentration of fuel inside the ducting. There also appeared to be no preventative maintenance activities in place (i.e., duct inspections and performance checks) to ensure that duct velocities were effective and internal combustible dust accumulation was not occurring.

NFPA 484 (2022) – Section 13.2.3.4 (Dust Collection, General Requirements, Duct Velocity) states that dust collection systems shall be designed and maintained to ensure that the air/gas velocity used meets or exceeds the minimum required to keep the interior surfaces of all ducting free of accumulations under all normal operating modes.

NFPA 484 (2022) – Section A.13.2.3.4 (Explanatory Material) outlines that metal dusts or particulates, due to their density, deflagration hazard, or both, require higher-than-normal conveying velocities to ensure adequate conveying velocities, with most applications using 4,500 ft/min (1,372 m/min) or higher to maintain conveying velocities. Higher velocities are recommended to account for complex systems, longer duct runs, multiple duct runs, and to overcome the effects of abrasive wear.

Lack of Documentation for existing Explosion Venting Systems – Outdoor Dust Collectors

The outdoor filter media-type aluminum scrap dust collectors and the outdoor aluminum fume filter media-type dust collectors were noted to be protected with deflagration/explosion vents as a means of explosion protection. Your company was unable, however, to provide the necessary documentation to demonstrate the suitability and effectiveness of these systems in providing effective explosion protection. The specific concern is that there was no documentation (i.e., data sheets, installation details, design calculations, etc.) available to demonstrate that the outdoor explosion venting systems were selected, designed, sized, and installed to be capable of preventing internal deflagration pressures from exceeding the strengths of the enclosures. In addition, your company had not engaged in third-party explosibility parameter testing (i.e., ASTM E1226 testing) for the combustible dust(s) contained within the collectors. This indicates that the design of the protective systems was not derived from the specific hazardous properties of the dusts within the processes, but rather assumed or derived from published data which can be under protective.

NFPA 484 (2022) – Section 9.7.3.2 (Equipment Protection, General, System Design) states that deflagration venting, when used, shall be in accordance with NFPA 68 *Standard on Explosion Protection by Deflagration Venting*.

NFPA 68 (2023) – Section 11.2 (Design Parameters and Documentation) states that data sheets, installation details, and design calculations shall be developed and maintained for each vent closure application, suitable for review by an authority having jurisdiction that verifies the vent area is sufficient to prevent deflagration pressure from exceeding the enclosure strength and identifies areas exposed to potential overpressure, event propagation, and fireball effects during venting.

Orientation of Explosion Venting Systems – Outdoor Dust Collectors

The outdoor filter media-type aluminum scrap dust collectors had explosion vents oriented parallel to the side of the building. In the event of an explosion, the path of the resulting fireball

may therefore impact means of egress (i.e., exit doors) and/or outdoor work activities on the dust collectors (i.e., checking dust collector gauges, performing filter changes, etc.).

NFPA 484 (2022) – Section 9.2.7.5.2 (Explosion Mitigation/Deflagration Venting) states that, in accordance with NFPA 68, deflagration vents shall be directed toward a personnel-restricted area.

The outdoor filter media-type aluminum fume dust collectors had explosion vents oriented back at the building structure. The concern for this orientation is any potential for un-calculated resistance pressures during the event, caused by the proximity of the building's exterior walls to the vents, resulting in failure of the vents to properly function.

NFPA 68 (2023) – Section 6.5.1 (Vent Closure Operation) states that vent openings shall be free and clear.

NFPA 68 (2023) – Section A.6.5.1 (Explanatory Material) outlines that if a vent discharges into a congested area, the pressure inside the vented enclosure increases.

Lack of Explosion Protection & Deflagration Propagation Protection (Isolation) – Outdoor Cyclone Separators

The outdoor filter media-type aluminum scrap dust collectors and the outdoor filter-media-type aluminum fume dust collectors both incorporated pre-stage particulate separation technology via the use of cyclone separators just upstream of the filter media-type dust collectors. The outdoor cyclones lacked means of explosion protection and deflagration propagation protection (isolation).

NFPA 484 (2022) – Section 13.2.4.4.11.2 (Dust Collection, Specific Requirements, Dry-Type AMS, Explosion Protection) states that collectors (including cyclones) shall be protected by a means of explosion protection such as, but not limited to, deflagration venting to a safe outdoor location in accordance with NFPA 68, or deflagration detection and chemical suppression systems in accordance with NFPA 69 *Standard on Explosion Prevention Systems*.

NFPA 484 (2022) – Section 9.7.4.1 and 9.7.4.3 (Explosion Prevention/Protection, Equipment Isolation) state that, where a dust explosion hazard exists, isolation devices shall be provided in accordance with NFPA 69 to prevent deflagration propagation 1) from equipment through ductwork to the work areas and 2) between connected equipment.

Exhausted Air Returned Back into Facility – Outdoor Dust Collectors

The outdoor filter media-type aluminum scrap dust collectors returned exhausted air back inside of the occupied building. In the event of an internal dust collector fire, the hazardous byproducts from a fire (smoke, toxic gases, embers, etc.) would be returned back into the building. In addition, in the event of an internal dust collector deflagration, the resulting fireball could potentially enter the building through the exhaust air return ducting due to the lack of deflagration protection (isolation) for this specific building connection.

NFPA 484 (2022) – Section 13.2.4.4.13.1 (Dust Collection, Specific Requirements, Dry-Type AMS, Requirements for the Clean Air Exhaust) states that the recycling of exhaust air from fixed dry-type dust collectors into buildings shall not be permitted unless all of 10 individual requirements can be met. Included amongst these requirements are that 1) provisions are incorporated to prevent the transmission of smoke and flame from a fire in the collector back to

the facility and 2) provisions are incorporated to prevent the transmission of flame and pressure effects from a deflagration in a collector back into the facility.

NFPA 484 (2022) – Section 9.7.4.3 (Explosion Prevention/Protection, Equipment Isolation) states that, where a dust explosion hazard exists, isolation devices shall be provided in accordance with NFPA 69 to prevent deflagration propagation from equipment through ductwork to the work areas.

Lack of a Dust Hazards Analysis (DHA)

Prior to the event, your company had not engaged in a dust hazard analysis (DHA) to evaluate the fire, deflagration, reactivity, and explosion hazards associated with combustible aluminum dust in its various forms and to manage any discovered hazards. Such an evaluation, if properly performed, would have likely identified the concerns being relayed in this letter. It is recognized that your company did engage in a DHA after the event in order to better understand the process hazards associated with combustible dusts and develop controls.

NFPA 484 (2022) – Section 7.2.1 (Dust Hazard Analysis [DHA], Responsibility) requires the owner/operator of a facility where combustible dust is present to complete a DHA in accordance with Chapter 7 “Hazard Analysis” of NFPA 484 prior to operation of the process. DHAs are also required to be reviewed and updated at least every five years subsequent to the original DHA.

Conclusion

Since no OSHA standard directly applies to these potential standards and it is not considered appropriate at this time to invoke Section 5(a)(1), the General Duty Clause of the Occupational Safety and Health Act, no citation will be issued for the potential hazards identified above as a result of this inspection.

In the interest of workplace safety and health, we recommend that you voluntarily take the necessary steps to eliminate or materially reduce your employees’ exposures to the potential hazards described above.

OSHA welcomes any report of your efforts to reduce the above-mentioned exposures. If you have any questions concerning this matter, including further discussion on specific feasible means of abatement, please feel free to contact our office.

Sincerely,


Howard Eberts for
Area Director