



Committee Input No. 19-NFPA 652-2019 [Global Input]

See attached Word file for changes to be considered at the Second Draft meeting, after NFPA 499 has had their Second Draft meeting.

Supplemental Information

File Name	Description Approved
652_CI19_global_499_changes.docx	

Submitter Information Verification

Committee:

Submittal Date: Fri Aug 09 16:44:38 EDT 2019

Committee Statement

Committee Statement: There are two main reasons for these revisions, first to clearly include ignitable fibers/flyings to draw the connection to the NFPA 70 application and second to remove any prescriptive limitation or prohibition for use of the Zone system for classification. A number of paragraphs in the main body and annex specifically call out Division system criteria, and these are updated to either remove the specific Division reference or add the equivalent Zone reference. Lastly the term "electrically classified area(s)" has been replaced with "hazardous(classified) location(s)" to more clearly align with NFPA70 terminology.

We have not yet and do not expect to completely agree on a definition for combustible dust because of the need to include process-specific atmospheres in NFPA652 and the commodity standards. This proposal makes the functional usage of the term combustible dust equivalent between NFPA70 and the various dust standards.

These changes are due to Standards Council input to expeditiously correlate the dust standards to NFPA 70. Terminology or language might change slightly, but the intent is to match NFPA 499 definitions for ignitable fibers/flyings and combustible fibers/flyings as acceptable to the NEC panels. The definition for combustible dust in this document will be inclusive of combustible dust as defined in NFPA 499 and combustible fibers/flyings.

Response Message: CI-19-NFPA 652-2019

- 1) Add a definition of Ignitable Fibers/Flyings and modify the definition of combustible dust in NFPA 652-2019 to include ignitable fibers/flyings. The addition of ignitable fibers/flyings is to clarify the relationship with the electrical definitions, such that material forms presenting a flash-fire or explosion hazard will be evaluated as hazardous (classified) locations regardless of particle size. Other dust standards will adopt the NFPA652 definition through correlating committee. Note that the dust standards reference the same ASTM E1226-2012a, *Standard Test Method for Explosibility of Dust Clouds*, or ISO 6184-1, *Explosion protection systems — Part 1: Determination of explosion indices of combustible dusts in air, for procedures for determining the explosibility of dusts*.

3.3.x* Combustible Fibers/Flyings. Solid particles, where one dimension is greater than 500 μm in nominal size, which may form an explosible mixture with air at standard atmospheric pressure and temperature [this is the IEC definition with spelling change and replacement of “explosive” with “explosible”]

A.3.3.x Combustible Flyings. As used in this recommended practice, flyings refers to a particle with a small cross sectional area and a length greater than 500 microns. Flyings is a general term encompassing any particle that can be suspended and that has one or more dimensions greater than 500 microns. Examples of flyings include flat platelet-shaped particulate, such as metal flake, and fibrous particulate, such as particle board core material. To be covered by this recommended practice, the particle must present a flash-fire hazard or explosion hazard when suspended in air. If the smallest dimension of a combustible solid is greater than 500 μm , it is unlikely that the material would be combustible dust or combustible flyings, as determined by test. Finely divided solids with lengths that are large compared to their diameter or thickness usually do not pass through a 500 μm sieve, yet could still pose a deflagration hazard.

Combustible flyings that present a flash-fire hazard or explosion hazard when dispersed in air must first be capable of being suspended in air under typical test conditions. The typical test methods for evaluating a flash-fire or explosion hazard are ASTM E1226-2012a, *Standard Test Method for Explosibility of Dust Clouds*, or ISO 6184-1, *Explosion protection systems — Part 1: Determination of explosion indices of combustible dusts in air, for procedures for determining the explosibility of dusts*.

3.3.y Ignitable Fibers/Flyings. A finely divided combustible particulate solid with at least one dimension larger than 500 microns (i.e., material that will not pass through a U.S. No. 35 Standard Sieve as defined in ASTM E11-2015, *Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves*) that is not likely to be in suspension and that presents a fire hazard.

A.3.3.y Ignitable Fibers/Flyings. NFPA 70, section 500.5, defines a Class III location as one where ignitable fibers/flyings are present, but not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures. This description addresses fibers/flyings which do not present a flash-fire hazard or explosion hazard by test. This could be because those fibers/flyings are too large or too agglomerated to be suspended in air in sufficient concentration, or at all, under typical test conditions.

Alternately, this could be because they burn so slowly that, when suspended in air, they do not propagate combustion at any concentration.

3.3.6* Combustible Dust. A finely divided combustible particulate solid, including combustible fibers/flyings, that presents a flash-fire hazard or explosion hazard when suspended in air or the process-specific oxidizing medium over a range of concentrations.

A.3.3.6 Combustible Dust. The term *combustible dust* when used in this standard includes powders, fines, fibers, flyings, etc. This definition also includes consideration of a process-specific oxidizing medium other than air. A larger particle size material might not present a hazard in air, yet could present a hazard in an atmosphere with increased oxygen concentration. Similarly, a combustible metal might still present a hazard in an atmosphere typically considered inert, such as CO₂ or nitrogen.

Dusts traditionally were defined as material 420 µm or smaller (i.e., capable of passing through a U.S. No. 40 standard sieve). For consistency with other standards, 500 µm (i.e., capable of passing through a U.S. No. 35 standard sieve) is now considered an appropriate size criterion. Particle surface area-to-volume ratio is a key factor in determining the rate of combustion. Combustible particulate solids with the smallest a minimum dimension more than 500 µm generally have a surface-to-volume ratio that is too small to pose a deflagration hazard. Flat platelet-shaped particles, flakes, or fibers Fibers/flyings with lengths that are large compared to their diameter or thickness usually do not pass through a 500 µm sieve, yet could still pose a deflagration hazard. Many particulates accumulate electrostatic charge in handling, causing them to attract each other, forming agglomerates. Often agglomerates behave as if they were larger particles, yet when they are dispersed they present a significant hazard. Therefore, it can be inferred that any particulate that has the smallest a minimum dimension less than or equal to 500 µm could behave as a combustible dust if suspended in air or the process specific oxidizer. If the smallest minimum dimension of the particulate is greater than 500 µm, it is unlikely that the material would be a combustible dust, as determined by test. The determination of whether a sample of combustible material presents a flash-fire or explosion hazard could be based on a screening test methodology such as provided in the ASTM E1226, *Standard Test Method for Explosibility of Dust Clouds*. Alternatively, and a standardized test method such as ASTM E1515, *Standard Test Method for Minimum Explosible Concentration of Combustible Dusts*, could be used to determine dust explosibility. Chapter 5 has additional information on testing requirements.....(annex continues)

2) Update section 8.4.2.2 to add equivalent Zone

8.4.2.2 Vacuum Cleaning Method.

.....

8.4.2.2.1.7* Portable vacuum cleaners that meet the following

minimum requirements shall be permitted to be used to collect combustible particulate solids in unclassified (nonhazardous)

areas/locations:

- (1) Materials of construction shall comply with 9.4.7.1.
- (2) Hoses shall be conductive or static dissipative.
- (3) All conductive components, including wands and attachments, shall be bonded and grounded.
- (4) The fan or blower shall be on the clean side of the primary filtration media or wet separation chamber.
- (5) Electrical motors shall not be located on the dirty side of the primary filtration media or wet separation chamber unless listed for Class II, Division 1, Zone 20 or Zone 21 locations.
- (6)*Where liquids or wet materials are picked up by the vacuum cleaner, paper filter elements shall not be used
- (7) Vacuum cleaners used for metal dusts shall meet the requirements of NFPA 484.

3) Update section 8.4.2.6.2 to add equivalent Zone

8.4.2.6.2* Where blowdown using compressed air is used, the following precautions shall be followed:

- (1) Prior to using compressed air, vacuum cleaning, sweeping, or water washdown methods are used to clean surfaces that can be safely accessed.
- (2) Dust accumulations in the area after vacuum cleaning, sweeping, or water washdown do not exceed the threshold housekeeping dust accumulation.
- (3) Compressed air hoses are equipped with pressure relief nozzles limiting the discharge pressure to 30 psi (207 kPa) in accordance with OSHA requirements in 29 CFR 1910.242(b).
- (4) All electrical equipment, including lighting, potentially exposed to airborne dust in the area during cleaning is suitable for use in a Class II, Division 2, or Zone 22, hazardous (classified) location in accordance with *NFPA 70*.
- (5) All ignition sources and hot surfaces capable of igniting a dust cloud or dust layer are shut down or removed from the area.
- (6) After blowdown is complete, residual dust on lower surfaces is cleaned prior to re-introduction of potential ignition sources.
- (7) Where metal or metal-containing dust or powder under the scope of NFPA 484 is present, the requirements of NFPA 484 apply.

4) Update section 9.4.6 to remove NFPA 652 statement that prohibits electrical classification according to article 506.

9.4.6 Hazardous (Classified) Locations for Electrical Installations.

9.4.6.1* The identification of the possible presence and extent

of ~~hazardous (classified) locations Class II and Class III locations~~ shall be made based on the criteria in ~~500.5(C) and (D)~~ Article 500 and 506 of *NFPA 70*.

A.9.4.6.1 The best method to eliminate the need for hazardous (classified) locations electrically-classified areas is to prevent the release of dust from equipment. The next best method to eliminate the need for hazardous (classified) locations electrically-classified areas is to remove the dust by developing proper housekeeping procedures. If the release of dust from equipment, cannot be prevented or the dust cannot be cleaned up, then that area might be a hazardous (classified) location an electrically classified area. NFPA 499 can be used for guidance to supplement the criteria in ~~Article 500.5 of NFPA 70~~. This guidance depends on a determination of the combustibility of dust in a particular area, the ignitibility properties of the dust, and the nature of possible dust cloud formation and dust layer accumulations within and outside the electrical equipment near the dusts. NFPA 499 is a good source for guidance on identifying hazardous (classified) locations Class III areas.

The user of this document should be aware that the dust layer accumulation criteria in Articles 500 ~~and 506-505~~ of *NFPA 70* and NFPA 499 ~~are is~~ intended to address electrical ignition hazards due to overheating or shorting of electrical equipment. However, the threshold housekeeping dust accumulation criteria in this standard are based on a dust flash-fire or dust deflagration hazard. These differing criteria can lead to different layer depth requirements. It is possible that even where electrically classified equipment is installed the area can still be considered a flash-fire or deflagration hazard.

9.4.6.1.1* The locations and extent of ~~Class II and Class III hazardous (classified) locations areas~~ shall be documented, and such documentation shall be preserved for access at the facility.

A.9.4.6.1.1 Local signage or floor indications should be considered. Having local floor signage provides the every-day operators and anyone else who would be in the facility with the awareness of the ~~electrically-classified areas~~ hazardous (classified) locations. Knowledge of ~~electrically-classified areas~~ hazardous (classified) locations gives anyone over the lifetime of the facility the awareness of immediate hazards within the facility.

9.4.6.2 Electrical equipment and wiring within ~~Class II~~ hazardous (classified) locations shall comply with ~~Article 502 of NFPA 70~~.

~~**9.4.6.3** Electrical equipment and wiring within Class III locations shall comply with Article 503 of NFPA 70.~~

9.4.6.34* Preventive maintenance programs for electrical

equipment and wiring in ~~Class II and Class III~~ hazardous (classified) locations shall include provisions to verify that dusttight electrical enclosures are not experiencing visible dust accumulation.

A.9.4.6.34 NFPA 70B contains recommendations on the development of an effective electrical equipment maintenance program.

NFPA 70 Article 502.15 contains descriptions of seals for electrical enclosures and fittings. The description includes a requirement that sealing fittings be accessible. This requirement is intended to include cabinets and other enclosures such as MCCs, control panels, and main switch gear, but not conduit, raceways, junction boxes, or other similar equipment.

NFPA 70 Article 506.16 also addresses seals.

~~9.4.6.5* Zone classification for dusts in accordance with Article 506 of NFPA 70 shall not be permitted.~~

~~A.9.4.6.5 Article 502 of NFPA 70 permits the use of Zone 20 equipment installation in a Class II, Division 1, location for the same dust. If the dust is a metal dust and not a combustible metal dust according to the test methods for Group IIIC, based on a conductivity criterion, this would potentially have equipment identified for Group IIIB (suitable for nonconductive dusts) installed in a Class II, Division 1, Group E, location. This would definitely not be appropriate. Contrary to the general statement in 506.6(A) of NFPA 70, a metal dust could be in Division Group E but not be conductive enough to be in Zone Group IIIC.~~

~~Another discrepancy in the requirements for zone classification versus division classification is that Article 506 of NFPA 70 provides no limitation on the designation of Zone 22 locations for combustible metal dusts. Under the division system in Article 500.5(C)(1)(3), where there is Group E metal dust in hazardous quantities, the location would be classified as Division 1 and would not be permitted to be classified as Division 2. Under the zone system, the less protective Zone 22 could be chosen.~~

~~Both of these discrepancies are nonconservative in comparison to the division classification system. While the NEC has established a framework for the use of zone classification for dusts, these nonconservative discrepancies in the boundaries between dust groups and area classification zones/divisions must be resolved before applying these concepts to industrial situations. The NFPA EECA committee had previously coordinated the boundaries between zone and division for gases but has not yet addressed this significant issue for dusts. Until these discrepancies can be addressed, NFPA 652 should not permit the application of zone classification for combustible~~

~~dusts in industrial occupancies.~~

- 5) Update the annex to 9.4.7.4.6 to address the labeling of Table A.9.4.7.4.6.

A.9.4.7.4.6 Table A.9.4.7.4.6 and Figure A.9.4.7.4.6 provide guides for the selection and use of FIBCs based on the MIE of product contained in the FIBC and the nature of the atmosphere surrounding it. While Table A.9.4.7.4.6 indicates Division locations, equivalent Zone locations are also included. Class I Division Group C/D is equivalent to Zone Group IIA/IIB. Class II Division 1 and 2 is equivalent to Zone 20/21/22. Inner liners for FIBCs are separated into three types. Note that the selection of the type of liner is critical to maintaining classification of the FIBC. Appropriate inner liner selection, where applicable, is addressed in IEC 61340-4-4.

Substantiation – Terminology or language might change slightly, but the intent is to match NFPA 499 definitions for ignitable fibers/flyings and combustible fibers/flyings as acceptable to the NEC panels. The definition for combustible dust in this document will be inclusive of combustible dust as defined in NFPA 499 and combustible fibers/flyings.

There are two main reasons for these revisions, first to clearly include ignitable fibers/flyings to draw the connection to the NFPA 70 application and second to remove any prescriptive limitation or prohibition for use of the Zone system for classification. A number of paragraphs in the main body and annex specifically call out Division system criteria, and these are updated to either remove the specific Division reference or add the equivalent Zone reference. Lastly the term “electrically classified area(s)” has been replaced with “hazardous(classified) location(s)” to more clearly align with NFPA70 terminology.

We have not yet and do not expect to completely agree on a definition for combustible dust because of the need to include process-specific atmospheres in NFPA652 and the commodity standards. This proposal makes the functional usage of the term combustible dust equivalent between NFPA70 and the various dust standards.

These changes are due to Standards Council input to expeditiously correlate the dust standards to NFPA 70.

TIA's will be submitted to each dust committee from the Dust Correlating committee with the issuance to follow the Standards Council approval of the changes and the 2nd revision meeting of NEC. In progress Dust documents will create committee inputs to address these changes and will also issue TIAs to the current editions in order to expeditiously correlate all of the documents, unless the document will issue prior to NEC.



Committee Input No. 2-NFPA 652-2019 [Section No. 2.4]

2.4 References for Extracts in Mandatory Sections.

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, 2014 [edition](#).

NFPA 68, *Standard on Explosion Protection by Deflagration Venting*, 2018 [edition](#).

NFPA 69, *Standard on Explosion Prevention Systems*, 2014 [edition](#).

NFPA 77, *Recommended Practice on Electricity*, 2019 [edition](#).

NFPA 221, *Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls*, 2018 _ 2021 [edition](#).

NFPA 484, *Standard for Combustible Metals*, 2019 _ 2022 [edition](#).

NFPA 921, *Guide for Fire and Explosion Investigations*, 2017 _ 2021 [edition](#).

NFPA 1250, *Recommended Practice in Fire and Emergency Service Organization Risk Management*, 2015 [edition](#).

NFPA 1451, *Standard for a Fire and Emergency Service Vehicle Operations Training Program*, 2018 [edition](#).

NFPA 5000[®], *Building Construction and Safety Code*[®], 2018 _ 2021 [edition](#).

Submitter Information Verification

Committee: CMD-FUN

Submittal Date: Mon Jul 29 18:44:45 EDT 2019

Committee Statement

Committee Statement: These documents are currently under revision and the extracts will be updated at the Second Draft stage.

Response Message: CI-2-NFPA 652-2019



Committee Input No. 16-NFPA 652-2019 [New Section after 3.3.36]

3.3.X Portable AMS (Dust Collector).

A portable machine designed to collect airborne dust produced from a dust generating operation.

Submitter Information Verification

Committee: CMD-FUN

Submittal Date: Fri Aug 09 15:36:42 EDT 2019

Committee Statement

Committee Statement: The current document does not include guidance for moveable devices intended for dust collection, and this intends to fill in that gap similar to the approach taken in NFPA 484. See Committee Input on section 9.3.4.1.2 for requirements related to the definition.

Response Message: CI-16-NFPA 652-2019



Committee Input No. 18-NFPA 652-2019 [Section No. 3.3.39]

3.3.39—*_ _ Qualified Person.

A person who, by possession of a recognized degree, certificate, professional standing, or skill, and who, by knowledge, training, and experience, has demonstrated the ability to deal with problems related to the subject matter, the work, or the project. [1451, 2018]

A.3.3.39 Qualified Person.

This standard uses a definition for a qualified person that is sufficiently broad to ensure that it does not exclude someone who is truly qualified but might have arrived at the attained expertise via an unconventional route. However, professional licensure or other recognition does not necessarily mean that such a person is qualified to perform or lead a DHA.

The technical committee is not aware of there being specific degrees or certifications one can obtain to demonstrate their knowledge in assessing and managing various combustible dust hazards. An advanced degree, license and/or certification (e.g. PE, CIH, CSP, CFPS, etc.) alone does not automatically qualify an individual to assess and manage these hazards. The complexities associated with analyzing the potential combustible dust hazards in processes, equipment and building compartments demand specialized expertise. The skills, knowledge, and other factors that comprise this expertise cannot be easily learned in a short duration through a training course, or by merely observing a DHA.

The person who is qualified to perform a DHA should have a sound understanding of the principles of fire protection engineering, detailed understanding of the processes where combustible dusts are encountered, of the hazards of combustible dusts and the means by which those hazards can be managed.

Inexperienced and unqualified individuals who perform DHAs might not adequately identify and address all the potential combustible dust hazards associated with process equipment and building compartments.

Submitter Information Verification

Committee: CMD-FUN

Submittal Date: Fri Aug 09 16:03:58 EDT 2019

Committee Statement

Committee Statement: Besides this definition, NFPA 652 provides little insight into what qualifications are truly required to perform or lead a DHA. At the Second Draft meeting, the committee will review whether Annex material should be added to begin to clarify what qualifications an individual needs to possess to perform or lead a DHA.

Response Message: CI-18-NFPA 652-2019



Committee Input No. 15-NFPA 652-2019 [Section No. 5.2.1]

5.2.1— _ *

The determination of combustibility or explosibility shall be permitted to be based upon either of the following:

- (1) Historical facility data or published data that are deemed to be representative of current materials and process conditions
- (2) Analysis of representative samples in accordance with the requirements of 5.4.1 and 5.4.3

A.5.2.1 GHS Reference and DUST-EX (<http://staubex.ifa.dguv.de/?lang=e>) Placeholder

Submitter Information Verification

Committee: CMD-FUN

Submittal Date: Tue Jul 30 17:38:42 EDT 2019

Committee Statement

Committee Statement: GHS Annex 11 on Unclassified Hazards will address combustible dusts, and should be referenced in NFPA 652.

Response Message: CI-15-NFPA 652-2019



Committee Input No. 13-NFPA 652-2019 [Sections 7.1.1.1, 7.1.1.2, 7.1.1.3]

Sections 7.1.1.1, 7.1.1.2, 7.1.1.3

7.1.1.1*

A DHA shall be completed for all new processes and facility compartments.

A.7.1.1.1

A DHA is a careful review of the fire and explosion hazards to determine the consequences of what could go wrong and to determine what safeguards could be implemented to prevent or mitigate those consequences. DHA should be completed as soon as possible. For existing facilities, those processes with the greatest perceived risk should be evaluated first.

7.1.1.2*

For existing processes and facility compartments, a DHA shall be completed by September 7, 2020.

A.7.1.1.2

The deadline for completing initial DHAs is 5 years after the effective date of the first edition of this standard.

This edition extends the first edition's period of 3 years for completion of all DHAs to 5 years. It is not the intent of this requirement to permit a delay in the completion of all DHA until the fifth year.

7.1.1.3

The owner/operator shall demonstrate reasonable progress each year in completing DHAs prior to the deadline set in 7.1.1.2.

Submitter Information Verification

Committee: CMD-FUN

Submittal Date: Tue Jul 30 17:13:46 EDT 2019

Committee Statement

Committee Statement: The Committee will be revisiting this section at the Second Draft meeting, as the September 2020 deadline will have passed by the time the next edition of NFPA 652 is published. All existing facility DHAs should be completed by that time.

Response Message: CI-13-NFPA 652-2019



Committee Input No. 17-NFPA 652-2019 [New Section after 9.3.4.1.1]

9.3.4.1.2* Portable Indoor Dry-Type Air-Material Separators (AMS) (Dust Collectors).

A.9.3.4.1.2

See Figure A.9.3.4.1.2.

Figure A.9.3.4.1.2 An Example of a Portable Media-Type Dust Collector. [See attachment]

9.3.4.1.2.1

Portable indoor dry-type AMS shall be used only for grinding, buffing, or sanding operations.

9.3.4.1.2.2

Individual machines with portable dry dust-collection capabilities shall be permitted to be used indoors when the object being processed or finished is incapable of being moved to a properly arranged fixed hood or enclosure and shall incorporate the safeguards in 11.2.4.4.16.

9.3.4.1.2.3

Portable indoor dry-type dust collectors shall not be connected to a permanent fixed piping system.

9.3.4.1.2.4

The operation of portable dry dust-collection devices shall be subject to a DHA to ensure that the risk to personnel and operations from flash fire and shrapnel is minimized.

(A)*

The portable dust collector shall not be used in an identified deflagration hazard area until appropriate housekeeping methods in Chapter 9 have been used to remove hazardous quantities of dust.

(B)

Portable dry AMS with a dirty side volume greater than 0.2 m³ (8 ft³) shall be protected against explosion in accordance with NFPA 69.

A.9.3.4.1.2.4(A)

The concern is that if a deflagration did occur in the portable dust collector, flames propagating from the collector could disperse and ignite fugitive dust accumulations in the area, causing a flash fire or explosion. The intent of portable dust collection is to prevent the accumulation of hazardous quantities of fugitive dust. Hazardous levels of dust should be cleaned prior to using the portable dust collector. Portable dust collectors that are rated for Class II areas are typically certified to not serve as ignition sources for existing hazards. However, the collection chamber in a dry collector can still be subject to a deflagration due to other ignition sources, including, but not limited to, hot embers, open flames, and sparks. A deflagration inside the dry collector can propagate outside of the collector or rupture the collector and ignite fugitive dust in the area.

9.3.4.1.2.5

Personal protective clothing shall comply with Section 4.6.

9.3.4.1.2.6

Prior to a change in the collected materials, the portable dry-type AMS and all associated components shall be thoroughly cleaned.

9.3.4.1.2.7

Grounding of personnel operating portable indoor dust collectors shall comply with 10.5.6.

9.3.4.1.2.8

The AMS and any associated components shall be bonded and grounded to an earth ground.

9.3.4.1.2.9

Hazards associated with static discharge shall be mitigated in accordance with Section 10.5.

9.3.4.1.2.10

Hoses shall be appropriate for use and be static dissipative or conductive.

9.3.4.1.2.11*

Hoses and nozzles shall be bonded and grounded, and a path to ground shall be verified prior to use after each movement, each new connection, or both.

A.9.3.4.1.2.11

It is recommended that each use without a new connection to ground is considered a single use.

9.3.4.1.2.12

The resistance of the path to ground shall be documented and maintained.

9.3.4.1.2.13*

The material collected shall be limited to 2.2 kg (5 lb) and, at a minimum, emptied daily.

A.9.3.4.1.2.13

The purpose is to limit the maximum amount of collected dusts to 2.2 kg (5 lb) at any time. It is good practice to empty this device daily, even if the 2.2 kg (5 lb) limit is not reached.

9.3.4.1.2.14

The collector shall not be used on processes generating hot embers or sparks.

Supplemental Information

File Name	Description	Approved
652_CI17_A.9.3.4.1.1.jpg	Figure A.9.3.4.1.2	

Submitter Information Verification

Committee: CMD-FUN

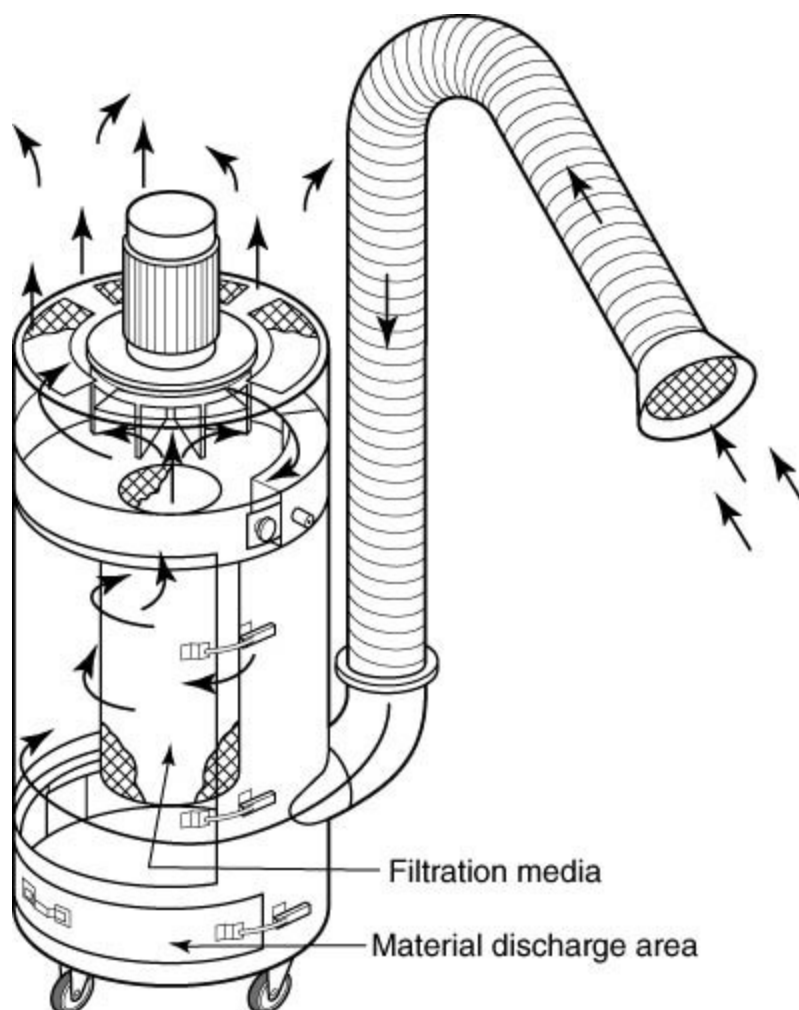
Submittal Date: Fri Aug 09 15:44:48 EDT 2019

Committee Statement

Committee Statement: The current document does not include guidance for moveable devices intended for dust collection, and this intends to fill in that gap similar to the approach taken in NFPA 484. See Committee Input on Chapter 3 which adds a definition for Portable AMS (Dust Collector).

The language in this Committee Input comes directly from NFPA 484 11.2.4.4.16. Cross references will need to be updated.

Response Message: CI-17-NFPA 652-2019





Committee Input No. 7-NFPA 652-2019 [New Section after 9.3.18]

9.3.19 Additive Manufacturing Systems

9.3.19.1 General Provisions

9.3.19.1.1 The Dust Hazard Analysis described in Chapter 7 shall explicitly include a section on Additive Manufacturing written with contributions and a review by someone familiar with pertinent industrial-scale Additive Manufacturing fire and explosion scenarios and incidents.

9.3.19.1.2 Powders shall be stored in a separate cutoff room or building from the printing operations except that an amount of powder limited to one load for each printer may be stored in the same room as the printer and pre-printing equipment.

9.3.19.1.3 Metal powder printers shall be located in a separate room from the printers used for nonmetal powders, such as polymer and composite powders.

9.3.19.1.4 When nonmetallic containers or liners are used for powders with Minimum Ignition Energies less than 100 mJ, the containers or liners shall be conductive or static dissipative.

9.3.19.2 Pre-Printing Operations and Equipment

9.3.19.2.1 Metal powder pre-printing operations and equipment shall comply with the pertinent requirements in NFPA 484, Standard for Combustible Metals.

9.3.19.2.2 Pre-printing operations involving polymer powders with Minimum Ignition Energies less than 50 mJ shall comply with the requirements in 9.3.19.2.2.1 and 9.3.19.2.2.2.

9.3.19.2.2.1 Personnel involved in manually filling or emptying containers or vessels, sieving, handling open containers, or cleaning shall be grounded and bonded to equipment during such operations.

9.3.19.2.2.2 All pieces of pre-printing equipment, including weighing and sieving equipment, shall be grounded and bonded.

9.3.19.2.3 The following paragraphs 9.3.19.2.3.1 to 9.3.19.2.3.3 are applicable to the open transfer of combustible polymer powder to or from pre-printing equipment including scales, sieves, and blenders.

9.3.19.2.3.1 A dust collection hood or vacuum pickup shall be installed over all open equipment inlets and outlets for powder transfer operations.

9.3.19.2.3.2 The area directly under the paragraph 9.3.19.2.3.1 dust collection hood or vacuum pickup shall be designated a Class II Division 2 area and all electrical equipment and wiring in this area shall be in accord with Article 502 of NFPA 70, National Electrical Code, including required listings for Group G combustible dusts.

9.3.19.2.3.3 An automatic fire extinguishing system approved for use with the combustible powder shall be installed in the area of the open transfer pre-printing equipment.

9.3.19.3 Printing.

9.13.19.3.1 Powder Loading of the printer shall be through totally enclosed containers with seals to prevent powder leakage.

9.13.19.3.2* The printer shall have a local and a remote manual emergency shutdown device which shuts off the power supply to the printer heat source and all printing operations.

A.9.13.19.3.2 The local emergency shutdown should be at or near the control station for the printer. The remote emergency shutdown should be located a minimum of 7.6 m (25 ft) away from the printer and in the path of the means of egress for the area.

9.3.19.3.3 Printing with combustible metal powders shall be in accord with the pertinent provisions of NFPA 484, Standard for Combustible Metals.

9.3.19.3.4 Printers using combustible polymer or composite powders shall be in accord with the following requirements of paragraphs 9.3.19.3.4.1 to 9.3.19.3.4.4.

9.3.19.3.4.1 Powder shall be transported from the bed to the build platform without forming dust clouds.

9.3.19.3.4.2* The powder bed temperature shall be monitored during printing and the printing operation shall be automatically shutdown when the bed temperature is 75 oC or more above the polymer melt temperature.

A.9.3.19.3.4.2 Selective Laser Sintering, Selective Laser Melting, and Fusion Jet Melting processes for polymer additive manufacturing are designed to produce polymer temperatures slightly below or approximately equal to the polymer melt temperature. Excessive temperatures approaching the polymer

decomposition temperature (a precursor to the polymer pyrolysis or ignition temperature) are to be avoided. The measured decomposition temperatures for commonly used polymers are usually more than 75 oC above the corresponding melting temperature. For example, polyamide 6 has a melting point of about 225 oC, whereas it has a decomposition temperature of 435 oC, and polyether ether ketone (PEEK) has a melting point of 334 oC and a decomposition temperature of 570 oC (SFPE Handbook of Fire Protection Engineering, 5th Edition, Table 7.1).

9.3.19.3.4.3 Residual powder accumulations in the printer shall be minimized by dust collection and filters per 9.3.4.

9.3.19.3.4.4 Residual powder deposits on the built object shall be removed by sweeping and vacuuming before the object is removed from the printer and exposed to the print room atmosphere.

9.3.19.3.4.5 Printing operations involving jet application of powder, binding agent, or detailing agent shall be in accord with the applicable provisions of NFPA 33, Standard for Spray Application Using Flammable or Combustible Materials.

9.3.19.4 Post-Printing Operations and Equipment

9.3.1.9.4.1 Printed Object Retrieval.

Printed object removal shall be performed without the formation of a dust cloud or the escape of residual powder or dust. Unless experience has demonstrated negligible residual powder and dust on the printed object, the object shall be enclosed in a container when removed from the printer.

9.3.1.9.4.2 Post-printing operations of metal objects shall be in accord with the applicable provisions of NFPA 484, Standard for Combustible Metals.

9.3.1.9.4.3 Post-processing equipment shall have dust control provisions per Section 9.6.

9.3.1.9.4.4 Abrasive blast cleaning equipment shall have dust explosion protection per Section 9.7.

9.3.1.9.4.5 Powder recovery equipment shall have dust explosion protection per Section 9.7.

9.3.1.9.4.6 Spray painting of the printed object shall be in accord with the applicable provisions of NFPA 33, Standard for Spray Application Using Flammable or Combustible Materials.

9.3.19.5 Equipment Cleaning and Maintenance

9.3.19.5.1 Portable Vacuums used for Additive Manufacturing equipment shall be listed for use in Class II Division 1 areas.

9.3.19.5.1.1 Portable vacuums used for cleaning residual metal dusts shall be listed for use with Group E combustible dusts.

9.3.19.5.1.1 Portable vacuums used for cleaning residual polymer and composite dusts shall be listed for use with Group G combustible dusts.

9.3.19.5.2 Cleaning and maintenance equipment shall be grounded and bonded.

9.3.19.5.3 Cleaning and maintenance operations shall not generate dust clouds within or outside the equipment.

9.3.19.5.4 Personal doing filter removal and replacement shall be grounded and shall wear flash fire resistant garments in accord with NFPA 2112.

9.3.19.5.5 Solvents used cleaning equipment shall be evaluated for potential reactivity hazards with the residual dust in the equipment per 5.3.2, and for potential flammable vapor generation in the equipment.

Submitter Information Verification

Committee: CMD-FUN

Submittal Date: Tue Jul 30 14:14:27 EDT 2019

Committee Statement

Committee Statement: Additive Manufacturing Systems using combustible powders are a new type of equipment with fire and explosion hazards and protection requirements that should be included in the next edition of NFPA 652. By the time the next edition becomes effective these systems, including systems using polymer powders, will be in widespread use. NFPA 484 covers systems using metal powders, but not systems using other types of combustible powders. A task group has been formed to review this text, and the committee invites Public Comments from manufacturers and users of this equipment and powder suppliers.

Response Message: CI-7-NFPA 652-2019

[Public Input No. 12-NFPA 652-2019 \[New Section after 9.3.18\]](#)



Committee Input No. 10-NFPA 652-2019 [New Section after 9.8.1.2]

9.8.1.3*

A documented self-heating fire response plan shall be developed and made available to all pertinent personnel responsible for monitoring the applicable bulk storage or transport. Equipment and instrumentation required to implement the fire response plan shall be made available near the site of the bulk storage. The plan and referenced equipment and instrumentation shall also be made available to responding firefighters.

A.9.8.1.3 Guidelines for extinguishment of smoldering fires in silos and bins are available in the Swedish Civil Contingencies Agency (MSB) 2013 report Silo Fires by Henry Persson and the VTT Reports (339, for example) on Extinguishing smoldering fires in silos.

Submitter Information Verification

Committee: CMD-FUN

Submittal Date: Tue Jul 30 16:02:57 EDT 2019

Committee Statement

Committee Statement: The proposed new section provides needed guidance on fire extinguishment of bulk storage smoldering fires. A task group has been formed to determine where this text or modified text should be located.

Response Message: CI-10-NFPA 652-2019

[Public Input No. 17-NFPA 652-2019 \[New Section after 9.8.2.4\]](#)



Committee Input No. 20-NFPA 652-2019 [Section No. D.3]

D.3 References for Extracts in Informational Sections.

NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities*, 2017 edition.

NFPA 68, *Standard on Explosion Protection by Deflagration Venting*, 2018 edition.

NFPA 484, *Standard for Combustible Metals*, 2019- 2022 edition.

NFPA 499, *Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas*, 2017- 2021 edition.

NFPA 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids*, 2017 edition.

Submitter Information Verification

Committee: CMD-FUN

Submittal Date: Fri Aug 09 16:58:26 EDT 2019

Committee Statement

Committee Statement: These documents are currently under revision and the extracts will be updated at the Second Draft stage.

Response Message: CI-20-NFPA 652-2019