Chapter 7 – Process Hazards Analysis

7.1 General Requirements

7.1.1 Responsibility
The owner/operator of a facility where combustible particulate solids are present in either a process or a facility compartment shall be responsible to ensure a process hazards analysis is completed in accordance with the requirements of this chapter.

7.1.2 The requirements of Chapter 7 shall be applied retroactively.

7.2 Criteria

7.2.1 Overview
The process hazards analysis shall consider the fire, deflagration, and explosion hazards and provide recommendations to ensure that the objectives in Section 4.2 are met.

7.2.1.1 The process hazards analysis shall determine where a fire, deflagration, and explosion hazard exists.

7.2.2 Qualifications
The process hazards analysis shall be performed or led by a qualified person.

7.2.3 Minimum Interval
A revalidation of the process hazards analysis shall be performed a minimum of every 5 years.

7.2.4 Documentation
The results of the process hazards analysis review shall be documented, including any necessary action items requiring change to the process materials, physical process, process operations, or facilities associated with the process.

7.3 Methodology

7.3.1 General
The process hazards analysis shall include the following:

1. Identify the portions of the process or facility areas where a fire, deflagration, and explosion hazard exists
2. Identify specific fire and deflagration scenarios and determine their consequences, including fires, deflagrations, and explosions
3. Identify the means and develop a plan by which fire, deflagration, and explosion events can be prevented or mitigated
4. Identify operating ranges

7.3.2 Material Evaluation

7.3.2.1 The process hazards analysis shall be based on data used in Chapter 5 of material that is representative of the dust present.

7.3.3 Process Systems
7.3.3.1 * - - 
Each part of the process system where combustible dust is present shall be evaluated.

7.3.3.2 * - - 
The potential for a dust fire, deflagration, or explosion in a process system component shall be based on whether the dust fire, deflagration, or explosion hazard exists.

7.3.3.3 - 
Where a dust fire, deflagration, or explosion hazard exists within a process system, the hazards shall be managed in accordance with this standard.

7.3.4 - Facility Compartments:

7.3.4.1 * - - 
Each facility compartment where combustible dust is present shall be evaluated.

7.3.4.2 * - - 
The potential for a dust fire, deflagration, or explosion in a facility compartment shall be based upon whether a dust fire, deflagration, or explosion hazard exists.

7.3.4.2.1 * - - 
The evaluation of dust deflagration hazard in a facility compartment shall include a comparison of actual or intended dust accumulation to the threshold housekeeping dust accumulation that would present a potential for flash-fire exposure to personnel or compartment failure due to explosive overpressure.

7.3.4.2.2 - 
Threshold housekeeping dust accumulation levels and non-routine dust accumulation levels (i.e., from a process upset) shall be in accordance with relevant industry or commodity-specific NFPA standards. (See 7.3.4.2.2.) -

7.3.4.3 - 
Where a dust fire, deflagration, or explosion hazard exists within a facility compartment, the effects of the fire, deflagration, or explosion shall be managed in accordance with this standard.

Statement of Problem and Substantiation for Public Comment

Delete the entire chapter. While I am in favor of the concept of hazard analysis, the application of PHA as directed by this chapter for many facilities handling combustible dust will be onerous, expensive and unnecessary. Many operations are covered very well by existing NFPA industry or commodity specific standards and the prescriptive requirements in those standards are easy to understand. Chapter 5 on hazard identification addresses the point of a PHA in identifying the presence of a hazard, Chapters 8 & 9 address the 'analysis' component of a PHA with requirements to eliminate, control or mitigate the hazard and where not covered by these chapters, Chapter 6 provides an option for a Performance Based analysis where a qualified practitioner could use a PHA of a level suitable to the Risk. Although A.7.1 claims not to be requiring application of a "PSM-type PHA" it is almost guaranteed that some AHJs will default to a PSM type product.

Submitter Information Verification
Submitter Full Name: Henry Febo
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Submittal Date: Wed Nov 13 09:42:37 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee believes that throughout the draft standard a logical case for Chapter 7 has been established, and with the changes incorporated as a result of the Second Draft, the inclusion of the hazard analysis chapter is further substantiated. Chapter 7 is intended to guide the process to identify where hazards exist and the DHA (now that this change is included) provides information learned about the process (es) so that corrective measures can be defined. The Committee does not support the recommendation to delete this chapter.
7.1.1 Responsibility.
The owner/operator of a facility where combustible particulate solids dust fire or deflagration hazards are present in either a process or a facility compartment shall be responsible to ensure a process hazards analysis is completed in accordance with the requirements of this chapter.

Statement of Problem and Substantiation for Public Comment

Section 7.1.1:
a. This section requires the completion of a process hazard analysis for all processes/facility compartments where combustible particulate solids are present. The mere presence of a combustible particulate solid should not trigger this requirement. Doing so would unnecessary obligate thousands of facilities without combustible dust deflagration or fire hazards to conduct process hazard analyses. The requirement to conduct a hazard analysis should be triggered by the presences of a fire or deflagration hazard, determinations that are already required by the Standard. Proposed language changes:

b. The owner/operator of a facility where combustible dust fire or deflagration hazards are present in either a process or a facility compartment shall be responsible to ensure a process hazards analysis is completed in accordance with the requirements of this chapter.

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Submittal Date: Wed Oct 09 13:16:52 EDT 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-40-NFPA 652-2014
Statement: Section 7.1.1:

a. This section requires the completion of a process hazard analysis for all processes/facility compartments where combustible particulate solids are present. The mere presence of a combustible particulate solid should not trigger this requirement. Doing so would unnecessary obligate thousands of facilities without combustible dust deflagration or fire hazards to conduct process hazard analyses. The requirement to conduct a hazard analysis should be triggered by the presence of a fire or deflagration hazard, determinations that are already required by the Standard.

The Committee agrees with the submitter of PC No. 21 and approves the changes shown in this SR. The Committee also modified this to be consistent with the use of the defined term compartment per work of a Committee task group that reviewed this issue and made recommendations to the full committee.
Public Comment No. 40-NFPA 652-2013 [Section No. 7.1.1]

7.1.1 Responsibility.
The owner/operator of a facility where combustible particulate solids are present in either a process or a facility compartment shall be responsible to ensure a process hazards analysis is completed when changes are made to a process, in accordance with the requirements of this chapter.

Statement of Problem and Substantiation for Public Comment

It is not necessary to perform a process hazard analysis on every dust producing process in existence today. Most of these processes have been around for a very long time and the hazards are well known. It is a waste of resources to perform PHAs on existing processes. As this currently reads, every farmer in America would have to do a PHA on their private grain elevators or barn where they store feed for the cows. However, there is value to performing a PHA as part of a management of change process.

Submitter Information Verification

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Submittal Date: Fri Oct 25 10:32:02 EDT 2013

Committee Statement

Committee Action: Rejected
Resolution: The recommended changes in this public comment are currently addressed in Section 9.9 of this draft standard on management of change (MOC), so the Committee does not support the proposed revision in this requirement.
7.1.1 Responsibility.
The owner/operator of a facility having more than 50 employees regularly on site and where combustible particulate solids are present in either a process or a facility compartment shall be responsible to ensure a process hazards analysis is completed in accordance with the requirements of this chapter except where an industry or commodity-specific NFPA standard does not have a similar requirement.

Statement of Problem and Substantiation for Public Comment
Chapter 7, Hazard Assessment: This provision is unnecessary, very costly, and unjustifiably onerous in the great majority of establishments subject to the standard. Whether to require such assessments requires a close familiarity with the practical costs and benefits conferred by PHA’s in particular industries. Not every bakery (baking presumably being a “process”), grain transfer station (presumably, the “process” of merely handling), wood working shop and similar small facilities requires a process hazards analysis (PHA) — yet, chapter 7 would require them all to have one, without distinction. As the former chairman of the NFPA 61 committee wrote, this chapter “would require every farmer in America to do a PHA on their dust producing farm equipment and their storage silos or barns.” That does not make sense.

Chapter 7 provides a good example of why NFPA 652 should not effectively displace the commodity- and industry-specific dust standards. Chapter 7 is not appropriate for many industries in which the characteristics of the substance and the technology are well understood, such as agricultural dusts. Process hazard analysis was developed in the chemical industry, which has novel chemicals, or varied and complex chemical processes, the behavior of which together can be dynamic and often difficult to predict. Fires and non-dust ignitions are much more common in chemical plants than dust explosions; they require the coincidence of only three elements, whereas combustible dust explosions require the coincidence of five elements.

By contrast, the ignition behavior of agricultural dusts and their handling processes have long been known, have remained essentially unchanged for decades, and are not complex. As a result, the NFPA 61 committee has rejected proposals for mandatory PHA’s. It concluded that, with regard to agricultural dusts, the benefits of mandating such analyses cannot be justified by their very substantial costs.

Furthermore, so long as a facility is designed by a qualified person, a PHA in many industries is not justifiable and will impose large costs on many small entities to hire expensive consultants to review processes that are already well understood by their managers. The small number (if any) of injuries and deaths, and the small amount of property damage, that might be prevented by this provision cannot possibly be justified by the large costs it will impose.

We made similar comments during the public input stage. With respect, the Committee’s reasons for rejecting them are either incorrect or do not come to grips with them. The Committee responded as follows: “The intent of this chapter section is to require the process of assessing the risk in any operation, regardless of size. A second intent of this chapter is to provide a step by step [method for analysis (?)], as well as examples on how to accomplish this at minimal cost to the operation. The process hazard analysis methodology is not the same as the OSHA PSM methodology and not intended to trigger the same level of work. Modified the definition of process hazard analysis to make this clear. Additionally, the Committee added language to annex, A.6.1, to help user with hazard analysis.”

The Committee’s statement that, “The intent of this chapter section is to require the process of assessing the risk in any operation, regardless of size,” does not explain why the standard should apply regardless of size. What about a family bakery or farm with only five employees? And with respect, the Committee’s assertion that it “[m]odified the definition of process hazard analysis to make [it] clear” that the required PHA “methodology is not the same as the OSHA PSM methodology and not intended to trigger the same level of work,” is not correct. The definition in 3.3.27 of a PHA as a “systematic review” of potential hazards imposes precisely the same duty as that imposed by paragraph (e) of the PSM Standard—systematic review of every possible hazard scenario. It is the requirement for a systematic review that makes PHA’s so expensive, so onerous and, in many industries, so unjustifiable, especially in industries, such as the agriculture industry, where dust behavior has been well understood for many, many years.

Submitter Information Verification
Committee Statement

Committee Action: Rejected

Resolution: It is not the Committee’s intent with this standard to establish a threshold based on personnel or employees below which the consequences do not apply. Such a threshold determination does not account for contractors or responders who might be on site or situations such as high school wood shops where there are students present who would not be considered employees. So, the Committee does not support the recommended revision proposed in this public comment.
Public Comment No. 138-NFPA 652-2013 [Section No. 7.1.2]

7.1.2 –
The requirements of Chapter 7 shall be applied retroactively.

Statement of Problem and Substantiation for Public Comment

Applying Chapter 7 retroactively introduces several major issues for Owners:
- Completing PHA’s on all existing processes with combustible dusts is a monumental task which will take years to complete. In reality, Owners would identify high hazard processes to complete a hazard analysis, not every process.
- To perform a PHA, the material properties will need to be known which then causes Chapter 5 to be retroactive.
- Performing a PHA on all processes can lead to extensive changes to existing facilities by implementing mitigations in Chapter 8 which are not intended to be retroactive.
- Requiring Owners to meet objectives of section 4.2 may require impractical or impossible physical changes to existing processes and buildings. Existing facilities may not be located or constructed to achieve the requirements of 4.2.1.2 or 4.2.4.

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Submittal Date: Mon Nov 11 17:12:48 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: These comments all recommend that the DHA not be implemented with a retroactive application. The Committee believes that it is essential for these hazard identification steps be implemented as soon as possible and that through the retroactivity concept that is included with SR No. 41 a workable approach can be achieved. The Committee is not in support of removing the retroactivity requirement from the standard.
Public Comment No. 22-NFPA 652-2013 [Section No. 7.1.2]

**7.1.2**

**Option 1:** The requirements of Chapter 7 shall be applied retroactively apply to new processes and to existing processes that are undergoing material modification. Material modification shall include modifications or maintenance/repair that exceeds 25% of the original process cost.

**Option 2:** The owner/operator of a facility shall prepare a schedule for completing process hazard analyses of affected process/facility compartments within a 5-year period of effective date of the Standard. The schedule shall demonstrate reasonable progress in each of the five years (all process hazard analyses cannot be completed in the 5th year).

Statement of Problem and Substantiation for Public Comment

Section 7.1.2 Process Hazard Analysis, Retroactivity:

a. This section indicates that the requirements of Chapter 7 shall be applied retroactively. This would require a facility owner to 1) have completed process hazard analyses on all existing combustible dust processes on the effective date of the Standard, and 2) according to Sections 7.3.3.3 and 7.3.4.3 “manage hazards in accordance with the Standard”. These two sections oblige a facility owner to have completed upgrades of all existing processes to NFPA 652 requirements by the effective date of the Standard. This is not only unachievable, but inconsistent with other NFPA Standards.

b. As a point of reference, when OSHA promulgated the Process Safety Standard (which appears to be the model for many of the concepts in NFPA 652), officials recognized the challenges associated with completing the initial PHA’s and did not require immediate completion.

c. A reasonable approach (and one used extensively by the EPA when it promulgates new regulations) is to require conformance for new processes and when existing processes undergo material modifications. As an alternative, a 5-year period for completion of initial PHA’s (approach taken by OSHA) could be followed. Recommended options for changes to section 7.1.2 are provided below.

d. **Option 1:** The requirements of Chapter 7 shall apply to new processes and to existing processes that are undergoing material modification. Material modification shall include modifications or maintenance/repair that exceeds 25% of the original process cost.

e. **Option 2:** The owner/operator of a facility shall prepare a schedule for completing process hazard analyses of affected process/facility compartments within a 5-year period of effective date of the Standard. The schedule shall demonstrate reasonable progress in each of the five years (all process hazard analyses cannot be completed in the 5th year).

Submitter Information Verification
Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-41-NFPA 652-2014
Statement: Section 7.1.2 Process Hazard Analysis, Retroactivity:

a. This section indicates that the requirements of Chapter 7 shall be applied retroactively. This would require a facility owner to 1) have completed process hazard analyses on all existing combustible dust processes on the effective date of the Standard, and 2) according to Sections 7.3.3.3 and 7.3.4.3 “manage hazards in accordance with the Standard”. These two sections obligate a facility owner to have completed upgrades of all existing processes to NFPA 652 requirements by the effective date of the Standard. This is not only unachievable, but inconsistent with other NFPA Standards.

b. As a point of reference, when OSHA promulgated the Process Safety Standard (which appears to be the model for many of the concepts in NFPA 652), officials recognized the challenges associated with completing the initial PHA’s and did not require immediate completion.

c. A reasonable approach (and one used extensively by the EPA when it promulgates new regulations) is to require conformance for new processes and when existing processes undergo material modifications. As an alternative, a 5-year period for completion of initial PHA’s (approach taken by OSHA) could be followed. Recommended options for changes to section 7.1.2 are provided below.

d. Option 1: The requirements of Chapter 7 shall apply to new processes and to existing processes that are undergoing material modification. Material modification shall include modifications or maintenance/repair that exceeds 25% of the original process cost.

e. Option 2: The owner/operator of a facility shall prepare a schedule for completing process hazard analyses of affected process/facility compartments within a 5-year period of effective date of the Standard. The schedule shall demonstrate reasonable progress in each of the five years (all process hazard analyses cannot be completed in the 5th year).

The Committee agreed with the principle outlined in Public Comment No. 22 and used it as the basis for developing this SR.
7.1.2 –

The requirements of Chapter 7 shall be applied retroactively.

Where a process or operation is covered by another NFPA commodity or industry specific code, it shall be permitted to be evaluated by that code without implementation of a PHA

Statement of Problem and Substantiation for Public Comment

The requirement that PHA be applied retroactively is onerous, expensive and unnecessary. Many operations are covered very well by existing NFPA industry or commodity specific standards and the prescriptive requirements in those standards are easy to understand. The addition of using existing code requirements as an alternative to a PHA is a reasonable alternative to the full PHA process.

This is submitted as a possible alternative should PC-245 be rejected by the committee

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Submittal Date: Wed Nov 13 10:17:49 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: These comments all recommend that the DHA not be implemented with a retroactive application. The Committee believes that it is essential for these hazard identification steps be implemented as soon as possible and that through the retroactivity concept that is included with SR No. 41 a workable approach can be achieved. The Committee is not in support of removing the retroactivity requirement from the standard.
7.1.2
The requirements of Chapter 7 shall not be applied retroactively.

Statement of Problem and Substantiation for Public Comment

This section provides that the process hazard requirements are retroactive. It is simply not feasible that a full process hazard evaluation will have been done as of the day of enactment of NFPA 652 in the thousands of facilities that have not done them previously. There should be a five year phase-in period for the requirements of this chapter. We made comments to this effect in January 2013, and the Correlating Committee made a similar recommendation. However, the requested changes in the Chapter have not been made. Finally, process hazard analysis should not be required every five years if there have been no changes in the facility necessitating such a re-evaluation.

Submitter Information Verification

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Committee Statement

Committee Action: Rejected
Resolution: These comments all recommend that the DHA not be implemented with a retroactive application. The Committee believes that it is essential for these hazard identification steps be implemented as soon as possible and that through the retroactivity concept that is included with SR No. 41 a workable approach can be achieved. The Committee is not in support of removing the retroactivity requirement from the standard.
7.1.2
The requirements of Chapter 7 shall not be applied retroactively. They shall be phased in over a five year period by owner/operators.

Statement of Problem and Substantiation for Public Comment

It is simply not feasible that a full process hazard evaluation will have been done as of the day of enactment of NFPA 652 in the thousands of facilities that have not done them previously. There should be a five year phase-in period for the requirements of this Chapter. We made comments to this effect in January 2013, and the Correlating Committee made a similar recommendation. However, the requested changes in this Chapter have not been made. Finally, process hazard analysis should not be required every five years if there have been no changes in the facility necessitating such a re-evaluation.

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Submitter Full Name: MARC FLEISCHAKER
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Submittal Date: Wed Nov 13 14:36:03 EST 2013

Committee Statement
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<td>Resolution:</td>
<td>SR-41-NFPA 652-2014</td>
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<td>Statement:</td>
<td>Section 7.1.2 Process Hazard Analysis, Retroactivity:</td>
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  a. This section indicates that the requirements of Chapter 7 shall be applied retroactively. This would require a facility owner to 1) have completed process hazard analyses on all existing combustible dust processes on the effective date of the Standard, and 2) according to Sections 7.3.3.3 and 7.3.4.3 “manage hazards in accordance with the Standard”. These two sections obligate a facility owner to have completed upgrades of all existing processes to NFPA 652 requirements by the effective date of the Standard. This is not only unachievable, but inconsistent with other NFPA Standards.

  b. As a point of reference, when OSHA promulgated the Process Safety Standard (which appears to be the model for many of the concepts in NFPA 652), officials recognized the challenges associated with completing the initial PHA’s and did not require immediate completion.

  c. A reasonable approach (and one used extensively by the EPA when it promulgates new regulations) is to require conformance for new processes and when existing processes undergo material modifications. As an alternative, a 5-year period for completion of initial PHA’s (approach taken by OSHA) could be followed. Recommended options for changes to section 7.1.2 are provided below.

  d. Option 1: The requirements of Chapter 7 shall apply to new processes and to existing processes that are undergoing material modification. Material modification shall include modifications or maintenance/repair that exceeds 25% of the original process cost.

  e. Option 2: The owner/operator of a facility shall prepare a schedule for completing process hazard analyses of affected process/facility compartments within a 5-year period of effective date of the Standard. The schedule shall demonstrate reasonable progress in each of the five years (all process hazard analyses cannot be completed in the 5th year).

The Committee agreed with the principle outlined in Public Comment No. 22 and used it as the basis for developing this SR.
7.1.2  
The requirements of Chapter 7 shall be applied retroactively.

Statement of Problem and Substantiation for Public Comment

A PHA should not have to be done for every dust producing process that is in existence since the beginning of the world. Again, these processes and hazards are well known and it is a waste of resources to retroactively perform PHAs on everything that produces dust. This is too far reaching and should not be made retroactive regardless of the time frame allowed to complete. This is not a fundamental concept and exceeds the scope of this document.

Submitter Information Verification

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Submittal Date: Fri Oct 25 10:36:40 EDT 2013

Committee Statement

Committee Action: Rejected  
Resolution: These comments all recommend that the DHA not be implemented with a retroactive application. The Committee believes that it is essential for these hazard identification steps be implemented as soon as possible and that through the retroactivity concept that is included with SR No. 41 a workable approach can be achieved. The Committee is not in support of removing the retroactivity requirement from the standard.
Public Comment No. 495-NFPA 652-2013 [Section No. 7.1.2]

7.1.2
The requirements of Chapter 7 shall be applied retroactively.

Statement of Problem and Substantiation for Public Comment

The Rubber Manufacturers Association recommends that NFPA 652 should not apply to facilities retroactively upon enactment of the standard. Section 7.1.2 specifies that, "The requirements of Chapter 7 shall be applied retroactively." A retroactivity provision also appears in the following sections of 652: 1.6.2, 1.6.3, 1.6.4, 7.1.2, 8.4.1, 8.5.1, 8.5.4.1, 8.5.5.1, 9.1. RMA interprets this retroactivity provision to mean that the standard is effective when enacted.

The inclusion of these retroactivity provisions means that most of NFPA 652 will be effective immediately upon enactment. Requiring facilities to be in compliance with NFPA 652 upon the date of enactment is not practical because it will cost facilities millions of dollars and years to achieve and in some circumstances may weaken actions facilities are currently doing to manage combustible dust. RMA recommends that NFPA 652 include additional time for compliance. Specifically we recommend that NFPA 652 specify that facilities shall use best faith efforts to come into compliance in a reasonable amount of time which at a minimum should provide facilities several years for implementation.

Submitter Information Verification

Submitter Full Name: SARAH AMICK
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Submittal Date: Fri Nov 15 14:58:26 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: These comments all recommend that the DHA not be implemented with a retroactive application. The Committee believes that it is essential for these hazard identification steps be implemented as soon as possible and that through the retroactivity concept that is included with SR No. 41 a workable approach can be achieved. The Committee is not in support of removing the retroactivity requirement from the standard.
7.1.2 –

The requirements of:
Requirements in Chapter 7 to consider or evaluate hazards shall be applied retroactively. Requirements in Chapter 7 to recommend changes to, or change, a facility or equipment shall not be applied retroactively.

Statement of Problem and Substantiation for Public Comment

If Chapter 7 merely required a PHA, then this provision might make sense as written. But other provisions can be read to require that changes to equipment and facilities be made in response to PHA findings. It thus can be read to completely undo the grandfather clause. The Committee stated in response to a previous similar comment that, “The chapter does not require to implement the changes retroactively, but to have a plan in place based upon a process hazard analysis…. Implementation can be done in stages, and the implementation period will be addressed in chapter 8 (hazard management).” With respect, reliance on chapter 8 does not solve the problem posed by section 7.2.1 as written. As written, it arguably means that a recommendation to implement a capital change must be implemented despite section 1.6.2 and despite the careful wording of chapter 8. The commentary cannot undo this problem. For the sake of clarity, and to ensure that facility owners are enmeshed in controversy with AHJ’s, the provision should either be struck or amended as follows: Requirements in Chapter 7 to consider or evaluate hazards shall be applied retroactively. Requirements in Chapter 7 to recommend changes to, or change, a facility or equipment shall not be applied retroactively. Furthermore, a phase-in period is needed to be stated expressly in the standard.

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Submittal Date: Mon Nov 18 09:27:07 EST 2013

Committee Statement
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<tr>
<th><strong>Committee Action:</strong></th>
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<tr>
<td><strong>Resolution:</strong></td>
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</table>
7.1.2
The requirements of Chapter 7 shall be applied retroactively.

Statement of Problem and Substantiation for Public Comment

CC NOTE: The following CC Note appeared in the First Draft Report.

The Correlating Committee requests that the TC consider establishing some time frame for phasing in the development of an implementation plan for the PHA requirement on a retroactive basis.

Submitter Information Verification

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Submittal Date: Thu Sep 19 08:52:45 EDT 2013

Committee Statement
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a. This section indicates that the requirements of Chapter 7 shall be applied retroactively. This would require a facility owner to 1) have completed process hazard analyses on all existing combustible dust processes on the effective date of the Standard, and 2) according to Sections 7.3.3.3 and 7.3.4.3 “manage hazards in accordance with the Standard”. These two sections obligate a facility owner to have completed upgrades of all existing processes to NFPA 652 requirements by the effective date of the Standard. This is not only unachievable, but inconsistent with other NFPA Standards.

b. As a point of reference, when OSHA promulgated the Process Safety Standard (which appears to be the model for many of the concepts in NFPA 652), officials recognized the challenges associated with completing the initial PHA’s and did not require immediate completion.

c. A reasonable approach (and one used extensively by the EPA when it promulgates new regulations) is to require conformance for new processes and when existing processes undergo material modifications. As an alternative, a 5-year period for completion of initial PHA’s (approach taken by OSHA) could be followed. Recommended options for changes to section 7.1.2 are provided below.

d. Option 1: The requirements of Chapter 7 shall apply to new processes and to existing processes that are undergoing material modification. Material modification shall include modifications or maintenance/repair that exceeds 25% of the original process cost.

e. Option 2: The owner/operator of a facility shall prepare a schedule for completing process hazard analyses of affected process/facility compartments within a 5-year period of effective date of the Standard. The schedule shall demonstrate reasonable progress in each of the five years (all process hazard analyses cannot be completed in the 5th year).

The Committee agreed with the principle outlined in Public Comment No. 22 and used it as the basis for developing this SR.
7.2.1 * Overview.
The process hazards analysis **shall consider**, **shall identify**, the fire, deflagration, and explosion hazards **and**, **assess the risks, and** provide recommendations to **ensure that the objectives in Section 4.2 are met**.

7.2.1.1
The process hazards analysis **shall determine where a fire, deflagration, and explosion hazard exists** and **mitigate the hazards when the User deems the risk to be intolerable**.

**Statement of Problem and Substantiation for Public Comment**

These requirements for PHA not only requires identification of hazards, but also recommendations, which implies completing a risk evaluation. The definition of Process Hazard Analysis should be updated accordingly.

**Related Public Comments for This Document**

<table>
<thead>
<tr>
<th>Related Comment</th>
<th>Relationship</th>
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<tr>
<td>Public Comment No. 137-NFPA 652-2013 [Section No. 5.4.3.5]</td>
<td></td>
</tr>
</tbody>
</table>

**Submitter Information Verification**

**Submitter Full Name:** Craig Froehling  
**Organization:** Cargill, Inc.  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Mon Nov 11 17:23:50 EST 2013

**Committee Statement**

**Committee Action:** Rejected but see related SR  
**Resolution:** SR-42-NFPA 652-2014  
**Statement:** These requirements for PHA not only requires identification of hazards, but also recommendations, which implies completing a risk evaluation. The definition of Process Hazard Analysis should be updated accordingly.
Public Comment No. 585-NFPA 652-2013 [ Section No. 7.2.1 ]

7.2.1 * Overview.
The process hazards analysis shall consider the fire, deflagration, and explosion hazards and (except as excluded by the grandfather clause in section 1.6.2) provide recommendations to ensure that the objectives in Section 4.2 are met.

7.2.1.1
The process hazards analysis shall determine where a fire, deflagration, and explosion hazard exists.

Statement of Problem and Substantiation for Public Comment

This provision would apply retroactively. Yet, because the phrase "and provide recommendations to ensure that the objectives in Section 4.2 are met" is so broad, it can be read to require recommendations for capital changes to equipment and facilities that the grandfather provision is designed to avoid. It thus can be read to completely undo the grandfather clause.

The Committee stated in response to a previous similar comment that, "The chapter does not require to implement the changes retroactively, but to have a plan in place based upon a process hazard analysis.... Implementation can be done in stages, and the implementation period will be addressed in chapter 8 (hazard management)." With respect, reliance on chapter 8 does not solve the problem posed by section 7.2.1 as written. As written, it arguably means that a recommendation to implement a capital change must be implemented despite 1.6.2 and despite the careful wording of chapter 8. The commentary cannot undo this problem.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 09:30:21 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee directs the submitter of PC No. 585 to the phase-in period established for the retroactivity provision in SR No. 41. It is not the intent to exclude blanket retroactivity to existing facilities.
### Public Comment No. 514-NFPA 652-2013 [Section No. 7.2.2]

<table>
<thead>
<tr>
<th>7.2.2*</th>
<th>Qualifications.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The process hazards analysis shall be performed or led by a qualified person.</td>
</tr>
</tbody>
</table>

#### Statement of Problem and Substantiation for Public Comment

This proposed language matches what is currently stated in section 6.1.1 and allows more flexibility to the owner/operator in whom they choose to perform this work.

#### Submitter Information Verification

- **Submitter Full Name:** J. Yount
- **Organization:** ConAgra Food Ingredients
- **Street Address:**
- **City:**
- **State:**
- **Zip:**
- **Submittal Date:** Fri Nov 15 15:48:25 EST 2013

#### Committee Statement

- **Committee Action:** Rejected
- **Resolution:** The submitter provided no special technical recommendation for changing the draft standard, so there is no action for the Committee to take on this comment other than to reject.
Public Comment No. 280-NFPA 652-2013 [Section No. 7.2.3]

7.2.3 * - Minimum Interval -
A revalidation of the process hazards analysis shall be performed a minimum of every 5 years.
- Also delete the related Annex material

Statement of Problem and Substantiation for Public Comment

The requirement for periodic revalidation will certainly be interpreted as PSM driven whether intended by the committee or not. While I agree that managing change is important in any hazardous operation, requiring the PHA be repeated on any size operation and even if prescriptive solutions from other codes are completed is unnecessary. I suggest the current requirements in paragraph 9.9 are perfectly sufficient in achieving what is intended by this section without the cost, documentation, etc. The related Annex material should also be removed.
This is submitted as a possible alternative should PC-245 be rejected by the committee

Submitter Information Verification

Submitter Full Name: Henry Febo
Organization: FM Global
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Nov 13 11:36:24 EST 2013

Committee Statement

Committee Action: Accepted
Resolution: SR-43-NFPA 652-2014
Statement: The requirement for periodic revalidation will certainly be interpreted as PSM driven whether intended by the committee or not. While I agree that managing change is important in any hazardous operation, requiring the PHA be repeated on any size operation and even if prescriptive solutions from other codes are completed is unnecessary. I suggest the current requirements in paragraph 9.9 are perfectly sufficient in achieving what is intended by this section without the cost, documentation, etc. The related Annex material should also be removed.
This is submitted as a possible alternative should PC-245 be rejected by the committee
7.2.3* Minimum Interval.
A revalidation of the process hazards analysis shall be performed a minimum of every 5 years. The owner-operator shall at least every 5 years determine whether and to what extent changes to the process require changes to the process hazard analysis. The process hazard analysis shall be updated accordingly.

Statement of Problem and Substantiation for Public Comment

The Committee amended this provision to make clear that it “does not imply a whole new process hazard analysis must be completed.” This is a helpful change. But because the key word “revalidation” is undefined, an AHJ could misunderstand it as imposing a requirement to re-do the PHA. The wording should more clearly reflect what the provision is trying to accomplish—to require that the PHA be examined to the extent that the process has been changed since the PHA or last updated.

The provision should therefore be amended to read: “The owner/operator shall at least every 5 years determine whether and to what extent changes to the process require changes to the process hazard analysis. The process hazard analysis shall be updated accordingly.”

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Nov 18 09:32:51 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee accepted an alternative Public Comment that recommended deleting the referenced paragraph, so now this comment is not relevant as the Committee supports removing the requirement rather than modifying it.
7.2.4 Documentation.
The results of the process hazards analysis review shall be documented, including (except as excluded by the grandfather clause in section 1.6.2) any necessary action items requiring change to the process materials, physical process, process operations, or facilities associated with the process.

Statement of Problem and Substantiation for Public Comment

This provision would apply retroactively. Yet, because it covers precisely the type of physical changes to equipment and facilities that the grandfather provision is designed to avoid, it can be read to completely undo the grandfather clause. Specifically, the phrase "any necessary action items requiring change to the process materials, physical process, process operations, or facilities associated with the process" could be read to require capital changes exempted by the grandfather clause.

The Committee stated in response to a previous similar comment that, "The chapter does not require to implement the changes retroactively, but to have a plan in place based upon a process hazard analysis…. Implementation can be done in stages, and the implementation period will be addressed in chapter 8 (hazard management)." With respect, reliance on chapter 8 does not solve the problem posed by section 7.2.1 as written. As written, it arguably means that a recommendation to implement a capital change must be implemented despite section 1.6.2 and despite the careful wording of chapter 8. The commentary cannot undo this problem.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 09:34:00 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee notes other changes in this chapter and also Chapter 1 that address the concerns outlined in the substantiation by this submitter for this comment.
7.3.1 General.
The process hazards analysis shall include the following:

1. Identify the portions of the process or facility areas where a fire, deflagration, and explosion hazard exists.

2. Identify specific fire and deflagration scenarios and determine their consequences, including fires, deflagrations, and explosions and likelihood of occurrence.

3. Identify the means and develop a plan safeguards which are in place by which fire, deflagration, and explosion events can be prevented or mitigated.

4. Identify operating ranges Evaluate the risk with existing safeguards and recommend additional safeguards if the User deems the risks are intolerable.

Statement of Problem and Substantiation for Public Comment

The proposed language change more accurately and clearly describes the PHA activities. The Process Hazard Analysis as described throughout the document should be reviewed for consistency throughout the standard. The risk assessment in Chapter 8 should be a part of PHA as described in 7.2.1 and not a separate analysis. The existing language in NFPA 652 for risk assessment and PHA is inconsistent and will be confusing to the user.

see PC139 on section 7.2.1

Related Public Comments for This Document

<table>
<thead>
<tr>
<th>Related Comment</th>
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<tbody>
<tr>
<td>Public Comment No. 182-NFPA 652-2013 [New Section after 8.3.1]</td>
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<tr>
<td>Public Comment No. 240-NFPA 652-2013 [Section No. 8.3.1]</td>
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Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 17:35:18 EST 2013

Committee Statement
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<tr>
<td>Resolution:</td>
<td><strong>SR-44-NFPA 652-2014</strong></td>
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<tr>
<td>Statement:</td>
<td>The proposed language change more accurately and clearly describes the PHA activities. The Process Hazard Analysis as described throughout the document should be reviewed for consistency throughout the standard. The risk assessment in Chapter 8 should be a part of PHA as described in 7.2.1 and not a separate analysis. The existing language in NFPA 652 for risk assessment and PHA is inconsistent and will be confusing to the user. See PC139 on section 7.2.1.</td>
</tr>
<tr>
<td></td>
<td>Annex: Added combustible dust to align with scope of this standard and remove the word minimum as this implies there are additional steps. There may be many types of activities but they all fall under the general hazard analysis steps described in the standard. See comment from Craig Froehling for 7.3.1 that suggest changes that better aligns the description for a hazard analysis with industry.</td>
</tr>
</tbody>
</table>
Public Comment No. 145-NFPA 652-2013 [ Section No. 7.3.1 ]

7.3.1 General.
The process hazards analysis shall include the following:

(1) Identify the portions of the process or facility areas where a fire, deflagration, and explosion hazard exists
(2) Identify specific fire and deflagration scenarios and determine their consequences, including fires, deflagrations, and explosions
(3) Identify the means and develop a plan by which fire, deflagration, and explosion events can be prevented or mitigated
(4) Identify safe operating ranges

Statement of Problem and Substantiation for Public Comment
The PHA should be focused on the identification of safe operating ranges.

Submitter Information Verification
Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address: City: State: Zip:
Submittal Date: Mon Nov 11 20:42:01 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-44-NFPA 652-2014
Statement:
The proposed language change more accurately and clearly describes the PHA activities. The Process Hazard Analysis as described throughout the document should be reviewed for consistency throughout the standard. The risk assessment in Chapter 8 should be a part of PHA as described in 7.2.1 and not a separate analysis. The existing language in NFPA 652 for risk assessment and PHA is inconsistent and will be confusing to the user.

see PC139 on section 7.2.1

Annex: Added combustible dust to align with scope of this standard and remove the word minimum as this implies there are additional steps. There may be many types of activities but they all fall under the general hazard analysis steps described in the standard. see comment from Craig Froehling for 7.3.1 that suggest changes that better aligns the description for a hazard analysis with industry
7.3.1 General.
The process hazards analysis shall include the following:

(1) Identify the portions of the process or facility areas where a fire, deflagration, and explosion hazard exists, based on a risk assessment performed pursuant to this standard of the representative conditions in those areas.

(2) Identify specific fire and deflagration scenarios and determine their consequences, including fires, deflagrations, and explosions.

(3) Identify the means and develop a plan by which fire, deflagration, and explosion events can be prevented or mitigated.

(4) Identify operating ranges.

Statement of Problem and Substantiation for Public Comment

The Rubber Manufacturers Association recommends that section 7.3.1 be changed to read: "The process hazards analysis shall include the following: (1) Identify the portions of the process or facility areas where combustible dust is located and where a fire, deflagration, and explosion hazard exists, based on a risk assessment performed pursuant to this standard of the representative conditions in those areas. (2) Identify specific fire and deflagration scenarios and determine their consequences, including fires, deflagrations, and explosions. (3) Identify the means and develop a plan by which fire, deflagration, and explosion events can be prevented or mitigated. (4) Identify operating ranges."

Submitter Information Verification

Submitter Full Name: SARAH AMICK
Organization: RUBBER MANUFACTURERS ASSN
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 15:00:08 EST 2013
Committee Action: Rejected but see related SR
Resolution: SR-44-NFPA 652-2014
Statement: The proposed language change more accurately and clearly describes the PHA activities. The Process Hazard Analysis as described throughout the document should be reviewed for consistency throughout the standard. The risk assessment in Chapter 8 should be a part of PHA as described in 7.2.1 and not a separate analysis. The existing language in NFPA 652 for risk assessment and PHA is inconsistent and will be confusing to the user.

see PC139 on section 7.2.1

Annex: Added combustible dust to align with scope of this standard and remove the word minimum as this implies there are additional steps. There may be many types of activities but they all fall under the general hazard analysis steps described in the standard. see comment from Craig Froehling for 7.3.1 that suggest changes that better aligns the description for a hazard analysis with industry.
7.3.1 General.
The process hazards analysis shall include the following:

(1) Identify the portions of the process or facility areas where a fire, deflagration, and explosion hazard exists

(2) Identify specific fire and deflagration scenarios and determine their consequences, including fires, deflagrations, and explosions

(3) Referring to the pertinent requirements in Chapter 8 and their applicability to specific process materials and equipment, identify the means and develop a plan by which fire, deflagration, and explosion events can be prevented or mitigated

(4) Identify operating ranges and limitations of the identified prevention and mitigation measures

Statement of Problem and Substantiation for Public Comment

The proposed insert is intended to provide an explicit link to the fire and explosion prevention requirements in Chapter 8, so that the process hazard analysis and resulting recommendations will be consistent with Chapter 8 provisions.

Submitter Information Verification

Submitter Full Name: Robert Zalosh
Organization: Firexplo
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 20:02:24 EST 2013

Committee Statement
<table>
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Annex: Added combustible dust to align with scope of this standard and remove the word minimum as this implies there are additional steps. There may be many types of activities but they all fall under the general hazard analysis steps described in the standard. see comment from Craig Froehling for 7.3.1 that suggest changes that better aligns the description for a hazard analysis with industry
Public Comment No. 536-NFPA 652-2013 [ Section No. 7.3.1 ]

7.3.1 General.
The process hazards analysis shall include the following:

(1) Identify the portions of the process or facility areas where a fire, deflagration, and explosion hazard exists

(2) Identify specific fire and deflagration scenarios and determine their consequences, including fires, deflagrations, and explosions, and the potential for fire and explosion propagation beyond the site of the initial fire or explosion

(3) Identify the means and develop a plan by which fire, deflagration, and explosion events can be prevented or mitigated

(4) Identify operating ranges

Statement of Problem and Substantiation for Public Comment

The additional wording is intended to require the process hazard analysis to identify the potential for dust explosion propagation so that the applicability of Chapter 8 explosion isolation requirements will be established.

Submitter Information Verification

Submitter Full Name: Robert Zalosh
Organization: Firexplp
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 20:15:02 EST 2013

Committee Statement
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<tr>
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<td>SR-44-NFPA 652-2014</td>
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| Statement:        | The proposed language change more accurately and clearly describes the PHA activities. The Process Hazard Analysis as described throughout the document should be reviewed for consistency throughout the standard. The risk assessment in Chapter 8 should be a part of PHA as described in 7.2.1 and not a separate analysis. The existing language in NFPA 652 for risk assessment and PHA is inconsistent and will be confusing to the user.  

see PC139 on section 7.2.1

Annex: Added combustible dust to align with scope of this standard and remove the word minimum as this implies there are additional steps. There may be many types of activities but they all fall under the general hazard analysis steps described in the standard. see comment from Craig Froehling for 7.3.1 that suggest changes that better aligns the description for a hazard analysis with industry
7.3.1 General.
The process hazards analysis shall include the following:

(1) Identify the portions of the process or facility areas where a fire, deflagration, and explosion hazard exists

(2) Identify specific fire and deflagration scenarios and determine their consequences, including fires, deflagrations, and explosions

(3) Identify the means and develop a plan by which fire, deflagration, and explosion events can be prevented or mitigated

(4) Identify operating ranges

Statement of Problem and Substantiation for Public Comment

This provision poses the same retroactivity problems as other provisions.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 09:37:39 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-44-NFPA 652-2014
Statement: The proposed language change more accurately and clearly describes the PHA activities. The Process Hazard Analysis as described throughout the document should be reviewed for consistency throughout the standard. The risk assessment in Chapter 8 should be a part of PHA as described in 7.2.1 and not a separate analysis. The existing language in NFPA 652 for risk assessment and PHA is inconsistent and will be confusing to the user. see PC139 on section 7.2.1

Annex: Added combustible dust to align with scope of this standard and remove the word minimum as this implies there are additional steps. There may be many types of activities but they all fall under the general hazard analysis steps described in the standard. see comment from Craig Froehling for 7.3.1 that suggest changes that better aligns the description for a hazard analysis with industry

http://submittals.nfpa.org/TerraViewWeb/ContentFetcher?commentParams=%28Comment...
7.3.2.1 *
The process hazards analysis shall be based on data used in Chapter 5.
accordance with Chapter 5. for material that is representative of the dust present.

Statement of Problem and Substantiation for Public Comment

This seeks to clarify the intent of the requirement.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 20:43:54 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-45-NFPA 652-2014
Statement: This seeks to clarify the intent of the requirement.

http://submittals.nfpa.org/TerraViewWeb/ContentFetcher?commentParams= commentParams%3D%28Comment...
Public Comment No. 209-NFPA 652-2013 [Section No. 7.3.2.1]

7.3.2.1*
The process hazards analysis shall be based on data used in Chapter 5 of material that is representative of the dust present.

Comment: this section should be revised as follows:
The process hazard analysis shall be based on data used in Chapter 5 of material that is representative of the dust present and process and technology information collected in 9.10.1(5).

Statement of Problem and Substantiation for Public Comment

Substantiation: The proposed requirement does not take into account all of the data required for the process hazard analysis. Paragraph 9.10.1(5) requires the collection of essential process and technology information, and the suggested revision captures that data.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-45-NFPA 652-2014
Statement: This seek to clarify the intent of the requirement.
7.3.2.1 *
The process hazard analysis shall be based on data used in Chapter 5 of for material that is representative of the dust present and process and technology information collected in 9.10.1(5).

Statement of Problem and Substantiation for Public Comment

The proposed requirement does not take into account all of the data required for the process hazard analysis. Paragraph 9.10.1(5) requires the collection of essential process and technology information, and the suggested revision captures that data.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 14:04:21 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-45-NFPA 652-2014
Statement: This seeks to clarify the intent of the requirement.
Public Comment No. 84-NFPA 652-2013 [Section No. 7.3.2.1]

7.3.2.1 *  
The process hazards analysis shall be based on data used in Chapter 5 of material that is representative of the dust present.

The process hazard analysis shall be based on data used in Chapter 5 for of material that is representative of the dust present, and process and technology information collected in 9.10.1(5).

Statement of Problem and Substantiation for Public Comment

Substantiation: The proposed requirement does not take into account all of the data required for the process hazard analysis. Paragraph 9.10.1(5) requires the collection of essential process and technology information, and the suggested revision captures that data.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC ‘s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 08 16:19:06 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-45-NFPA 652-2014
Statement: This seeks to clarify the intent of the requirement.
7.3.3 Process Systems.

7.3.3.1 Each part of the process system where combustible dust is present shall be evaluated.

7.3.3.2 The potential for a dust fire, deflagration, or explosion in a process system component shall be based on whether the dust fire, deflagration, or explosion hazard exists.

7.3.3.3 Where a dust fire, deflagration, or explosion hazard exists within a process system, the hazards shall be managed. That hazard is identified during an initial hazard analysis on existing equipment, the owner/operator shall develop and execute a plan acceptable to the Authority Having Jurisdiction, to manage the hazards in accordance with this standard.

Statement of Problem and Substantiation for Public Comment

Proposed addition to Section 7.3.3.3: Where that hazard is identified during an initial hazard analysis on existing equipment, the owner/operator shall develop and execute a plan acceptable to the Authority Having Jurisdiction, to manage the hazards in accordance with this standard.

Submitter Information Verification

Submitter Full Name: Jennifer Gradnigo
Organization: CRA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Oct 09 13:23:11 EDT 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee has addressed issues outlined in this comment through action on SR No. 31 and SR No. 44.
Public Comment No. 445-NFPA 652-2013 [Section No. 7.3.3.1]

7.3.3.1*
Each part of the process system where combustible dust is present or where combustible particulate solids could cause combustible dust to be present shall be evaluated.

Statement of Problem and Substantiation for Public Comment

Section 7.1.1 states that a PHA is necessary where combustible particulate solids are present. This change is suggested here for consistency with 7.1.1 and other changes suggested in Ch. 1.

Submitter Information Verification

Submitter Full Name: Dale Hansen
Organization: Harrington Group, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 12:33:48 EST 2013

Committee Statement

Committee Action: Accepted
Resolution: SR-46-NFPA 652-2014
Statement: Section 7.1.1 states that a PHA is necessary where combustible particulate solids are present. This change is suggested here for consistency with 7.1.1 and other changes suggested in Ch. 1.
Public Comment No. 497-NFPA 652-2013 [ Section No. 7.3.3.1 ]

7.3.3.1* 
Each part of the The representative process system where combustible dust is present shall be evaluated.

Statement of Problem and Substantiation for Public Comment

The Rubber Manufacturers Association has concern that as drafted the word “each part” of the process system in section 7.3.3.1 may be burdensome. We recommend that the language in section 7.3.3.1 should be changed to read: “The representative process system where combustible dust is present shall be evaluated.” Annex A section A.7.3.4.1 states that “where multiple compartments present essentially the same hazard, a single evaluation might be appropriate.” RMA recommends that section 7.3.3.1 should include the clarifying language in A.7.3.4.1.

Submitter Information Verification

Submitter Full Name: SARAH AMICK
Organization: RUBBER MANUFACTURERS ASSN
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 15:02:34 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The situations addressed in this public comment are rarely identical and could be handled together if documented; each of the situations needs to be evaluated to determine the conditions based on evaluation of each hazard.
7.3.3.1 *
Each part of the process system where a significant amount of combustible dust is present shall be evaluated.

Statement of Problem and Substantiation for Public Comment

Each part of the process system where combustible dust is present shall be evaluated. As stated, even parts of a process system with insignificant amounts of dust must be evaluated. This is unjustifiable. Some threshold is needed.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Nov 18 09:39:24 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The proposed introduction of the word “significant” creates an unenforceable condition, so the Committee does not support the proposed revision.
Public Comment No. 590-NFPA 652-2013 [Section No. 7.3.3.1]

| 7.3.3.1 * | Each part of the process system where combustible dust is present at or above housekeeping threshold accumulation levels shall be evaluated. |

**Statement of Problem and Substantiation for Public Comment**

The draft states: "Each part of the process system where combustible dust is present shall be evaluated." This is unjustifiable. Some threshold is required.

**Submitter Information Verification**

- **Submitter Full Name:** ARTHUR SAPPER
- **Organization:** for United States Beet Sugar Association
- **Street Address:**
- **City:**
- **State:**
- **Zip:**
- **Submittal Date:** Mon Nov 18 09:40:38 EST 2013

**Committee Statement**

- **Committee Action:** Rejected
- **Resolution:** The proposed introduction of the word "significant" creates an unenforceable condition, so the Committee does not support the proposed revision.
Public Comment No. 141-NFPA 652-2013 [Section No. 7.3.3.2]

7.3.3.2 * - -
The potential for a dust fire, deflagration, or explosion in a process system component shall be based on whether the dust fire, deflagration, or explosion hazard exists.

Statement of Problem and Substantiation for Public Comment

The requirement should be deleted as it adds no value or information for the user. At an extreme, this statement could be misinterpreted to mean hazards are everywhere and equal and all need to be mitigated.

Related Public Comments for This Document

<table>
<thead>
<tr>
<th>Related Comment</th>
<th>Relationship</th>
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</thead>
<tbody>
<tr>
<td>Public Comment No. 142-NFPA 652-2013 [Section No. 7.3.4.2] [Excluding any Sub-Sections]</td>
<td></td>
</tr>
</tbody>
</table>

Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 17:46:18 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-47-NFPA 652-2014
Statement: The Committee incorporated changes into paragraph 7.3.3.2 and included a revised 7.3.3.3.
Public Comment No. 498-NFPA 652-2013 [ Section No. 7.3.3.2 ]

7.3.3.2*  
The potential for probability that a dust fire or deflagration or explosion in a process system component will occur shall be based on whether the representative conditions under which the dust fire, deflagration, or explosion hazard exists is present in the facility are sufficient for a fire or deflagration.

Statement of Problem and Substantiation for Public Comment

The Rubber Manufactures Association recommends that the word "potential" in section 7.3.3.2 be replaced with the word "probability." Specifically, RMA recommends that section 7.3.3.2 be revised to read: "The probability that a dust fire or deflagration in a process system component will occur shall be based on whether the representative conditions under which the dust is present in the facility are sufficient for a fire or deflagration.

Submitter Information Verification

Submitter Full Name: SARAH AMICK  
Organization: RUBBER MANUFACTURERS ASSN  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Fri Nov 15 15:03:45 EST 2013

Committee Statement

Committee Action: Rejected  
Resolution: The Committee accomplished a modification similar to that recommended by the submitter in SR No. 47 by adding the new 7.3.3.3. The Committee believes the changes in SR No. 47 address the changes intended by the submitter.
Public Comment No. 539-NFPA 652-2013 [Section No. 7.3.3.2]

7.3.3.2*
The potential for a dust fire, deflagration, or explosion in a process system component shall be based on whether the dust fire, deflagration, or explosion hazard exists.

7.3.3.2.1 The potential for a dust explosion in process equipment shall account for the potential of accumulated combustible dust being dispersed due to both normal and possible upset operating conditions.

Statement of Problem and Substantiation for Public Comment

The dust explosion hazard evaluation should account for all the combustible dust in the equipment providing there is a mechanism to disperse the accumulated dust not normally in suspension.

Submitter Information Verification

Submitter Full Name: Robert Zalosh
Organization: Firexplo
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 20:44:40 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee believes the standard already addresses the need to look at upset conditions in other places and that the standard does not limit its application to only normal operating conditions. In addition, the Committee believes the DHA operator should know enough to include normal and upset conditions, so no further changes are included.
Public Comment No. 591-NFPA 652-2013 [Section No. 7.3.3.2]

7.3.3.2

The potential for a dust fire, deflagration, or explosion in a process system component shall be based on whether the dust fire, deflagration, or explosion hazard exists.

Statement of Problem and Substantiation for Public Comment

The provision states an unnecessary truism. No one needs to be told that a conclusion that a hazard exists must be based "upon whether the conditions necessary and sufficient for a fire or deflagration exist."

We are aware that the Committee previously wrote in response to a previous comment that, "These sections are needed to clarify in the standard when for a dust fire, deflagration, and/or explosion exist and that they are based on when the conditions exist. So that during the process hazard analysis, when the user is evaluating a part of a process system or facility that does not have the conditions for a fire, deflagration and/or explosion, no further action is required." With respect, the provision should be re-examined for usefulness.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 09:42:07 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-47-NFPA 652-2014
Statement: The Committee incorporated changes into paragraph 7.3.3.2 and included a revised 7.3.3.3.
7.3.3.3 – Where a dust fire, deflagration, or explosion hazard exists within a process system, the hazards shall be managed in accordance with this standard.

Statement of Problem and Substantiation for Public Comment

The provision is redundant with Chapter 8 and unnecessary.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 09:43:51 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: This paragraph has been moved to Chapter 4 as part of SR No. 31.
Public Comment No. 322-NFPA 652-2013 [ Section No. 7.3.4 ]

7.3.4 - Facility Compartments  Buildings or Rooms  .  
7.3.4.1 *  .  
Each facility compartment where combustible dust. Each building or room where a combustible dust fire, deflagration or explosion hazard is present shall be evaluated.  
7.3.4.2 *  .  
The potential for a dust fire, deflagration, or explosion in a facility compartment shall be based upon whether a dust fire, deflagration, or explosion hazard exists. 
1.1 Where multiple building or rooms present essentially the same hazard it shall be permitted to conduct a single evaluation as representative of all similar buildings or rooms 

7.3.4.2.1 *  .  
The evaluation of dust deflagration hazard in a facility compartment shall a building or room shall include a comparison of actual or intended dust accumulation to the threshold housekeeping dust accumulation that would present a potential for flash-fire exposure to personnel or compartment failure due to explosive overpressure .  

7.3.4.2.2  .  
Threshold housekeeping dust accumulation levels and non-routine dust accumulation levels (i.e., from a process upset) shall be in accordance with relevant industry or commodity-specific NFPA standards. (See 1.3.1.)  
7.3.4.3  
Where a dust fire, deflagration, or explosion hazard exists within a facility compartment building or room , the effects of the fire, deflagration, or explosion shall be managed in accordance with this or any industry or commodity specific NFPA standard.

Statement of Problem and Substantiation for Public Comment

Why create unique terms (facility compartment) when common terms (building or room) will do as well. Putting the A.7.3.4.1 material in the main body of the code is more appropriate to insure the option is equally valid to the main requirement. Adding the additional text to the basic requirement and removal of 7.3.4.2 will simplify the understanding of the need. The text in 7.3.4.2 is nearly duplication of the main requirement. The deleted text in new 7.3.4.2 (existing 7.3.4.2.1) adds nothing to the understanding of the requirement. The added text to 7.3.4.3 makes it clear the hazard may be managed by other existing standards.

Submitter Information Verification
### Committee Statement

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<tbody>
<tr>
<td>Resolution:</td>
<td>SR-49-NFPA 652-2014</td>
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<td>Why create unique terms (facility compartment) when common terms (building or room) will do as well. Putting the A.7.3.4.1 material in the main body of the code is more appropriate to insure the option is equally valid to the main requirement. Adding the additional text to the basic requirement and removal of 7.3.4.2 will simplify the understanding of the need. The text in 7.3.4.2 is nearly duplication of the main requirement. The deleted text in new 7.3.4.2 (existing 7.3.4.2.1) adds nothing to the understanding of the requirement. The added text to 7.3.4.3 makes it clear the hazard may be managed by other existing standards.</td>
</tr>
</tbody>
</table>

Based on the recommendations in the various related item Public Comments, the Committee created this SR No. 49 to incorporate the changes to the standard.
7.3.4.1*
Each Representative facility compartment where combustible dust is present shall be evaluated.

Statement of Problem and Substantiation for Public Comment

As drafted, the use of the word “each” in section 7.3.4.1 is potentially burdensome. The Rubber Manufacturers Association recommends that the word “each” be removed from section 7.3.4.1. Specifically we recommend that section 7.3.4.1 should be revised to read: “Representative facility compartments where combustible dust is present shall be evaluated.” Annex section A.7.3.4.1 states “where multiple compartments present essentially the same hazard, a single evaluation might be appropriate.” RMA recommends that including the word “representative,” rather than “each” will reflect the purpose of section 7.3.4.1 as explained in Annex section A.7.3.4.1.

Submitter Information Verification

Submitter Full Name: SARAH AMICK
Organization: RUBBER MANUFACTURERS ASSN
Street Address: 
City: 
State: 
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Submittal Date: Fri Nov 15 15:10:32 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-49-NFPA 652-2014
Statement: Why create unique terms (facility compartment) when common terms (building or room) will do as well. Putting the A.7.3.4.1 material in the main body of the code is more appropriate to insure the option is equally valid to the main requirement. Adding the additional text to the basic requirement and removal of 7.3.4.2 will simplify the understanding of the need. The text in 7.3.4.2 is nearly duplication of the main requirement. The deleted text in new 7.3.4.2 (existing 7.3.4.2.1) adds nothing to the understanding of the requirement. The added text to 7.3.4.3 makes it clear the hazard may be managed by other existing standards.

Based on the recommendations in the various related item Public Comments, the Committee created this SR No. 49 to incorporate the changes to the standard.
7.3.4.2*
The potential for probability that a dust fire, or deflagration, or explosion, in a facility compartment will occur shall be based upon whether a dust fire, deflagration, or explosion hazard exists on whether the representative conditions under which the dust is present in the facility are sufficient for a fire or deflagration.

7.3.4.2.1*
The evaluation of dust deflagration hazard in a facility compartment shall include a comparison of actual or intended dust accumulation to the threshold housekeeping dust accumulation that would present a potential for flash-fire exposure to personnel or compartment failure due to explosive overpressure.

7.3.4.2.2
Threshold housekeeping dust accumulation levels and non-routine dust accumulation levels (i.e., from a process upset) shall be in accordance with relevant industry or commodity-specific NFPA standards. (See 1.3.1.)

Statement of Problem and Substantiation for Public Comment

The Rubber Manufactures Association believes that as drafted, section 7.3.4.2 no longer makes sense. We recommend that the words “the potential for” should be removed from section 7.3.4.2 and replaced with the word “probability”. Specifically, we recommend that section 7.3.4.2 be revised to read: “The probability that a dust fire or deflagration in a facility compartment will occur shall be based on whether the representative conditions under which the dust is present in the facility are sufficient for a fire or deflagration.” The focus of NFPA 652 should address combustible dust that is identified based on representative facility conditions. RMA recommends that NFPA 652 should not address the potential for a dust fire, deflagration, or explosion but actual hazards.

Submitter Information Verification

Submitter Full Name: SARAH AMICK
Organization: RUBBER MANUFACTURERS ASSN
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 15:12:32 EST 2013

Committee Statement
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<td>Statement:</td>
<td>Why create unique terms (facility compartment) when common terms (building or room) will do as well. Putting the A.7.3.4.1 material in the main body of the code is more appropriate to insure the option is equally valid to the main requirement. Adding the additional text to the basic requirement and removal of 7.3.4.2 will simplify the understanding of the need. The text in 7.3.4.2 is nearly duplication of the main requirement. The deleted text in new 7.3.4.2 (existing 7.3.4.2.1) adds nothing to the understanding of the requirement. The added text to 7.3.4.3 makes it clear the hazard may be managed by other existing standards.</td>
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</table>

Based on the recommendations in the various related item Public Comments, the Committee created this SR No. 49 to incorporate the changes to the standard.
7.3.4.2. The potential for a dust fire, deflagration, or explosion in a facility compartment shall be based upon whether a dust fire, deflagration, or explosion hazard exists.

7.3.4.2.1. The evaluation of dust deflagration hazard in a facility compartment shall include a comparison of actual or intended dust accumulation to the threshold housekeeping dust accumulation that would present a potential for flash-fire exposure to personnel or compartment failure due to explosive overpressure.

7.3.4.2.2. Threshold housekeeping dust accumulation levels and non-routine dust accumulation levels (i.e., from a process upset) shall be in accordance with relevant industry or commodity specific NFPA standards. (See 1.3.1.)

Statement of Problem and Substantiation for Public Comment

The provision states an unnecessary truism, and is unhelpful. No one needs to be told that a conclusion that a hazard exists must be based "upon whether a dust fire, deflagration, or explosion hazard exists." Comment A.7.3.4.2 suggests that the point of the provision is to require that evaluators look in compartments. If that is worth saying, it should be said more directly and clearly. Moreover, the word "compartment" is no longer defined, adding to the problems with the provision.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 09:44:53 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-49-NFPA 652-2014
Statement: Why create unique terms (facility compartment) when common terms (building or room) will do as well. Putting the A.7.3.4.1 material in the main body of the code is more appropriate to insure the option is equally valid to the main requirement. Adding the additional text to the basic requirement and removal of 7.3.4.2 will simplify the understanding of the need. The text in 7.3.4.2 is nearly duplication of the main requirement. The deleted text in new 7.3.4.2 (existing 7.3.4.2.1) adds nothing to the understanding of the requirement. The added text to 7.3.4.3 makes it clear the hazard may be managed by other existing standards.

Based on the recommendations in the various related item Public Comments, the Committee created this SR No. 49 to incorporate the changes to the standard.
Public Comment No. 142-NFPA 652-2013 [Section No. 7.3.4.2]

[Excluding any Sub-Sections]

The potential for a dust fire, deflagration, or explosion in a facility compartment shall be based upon whether a dust fire, deflagration, or explosion hazard exists.

Statement of Problem and Substantiation for Public Comment

The requirement should be deleted as it adds no value or information for the user. At an extreme, this statement could be misinterpreted to mean hazards are everywhere and equal and all need to be mitigated.

Related Public Comments for This Document

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<th>Related Comment</th>
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Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:
City: 
State: 
Zip: 
Submittal Date: Mon Nov 11 17:50:53 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-49-NFPA 652-2014
Statement: Why create unique terms (facility compartment) when common terms (building or room) will do as well. Putting the A.7.3.4.1 material in the main body of the code is more appropriate to insure the option is equally valid to the main requirement. Adding the additional text to the basic requirement and removal of 7.3.4.2 will simplify the understanding of the need. The text in 7.3.4.2 is nearly duplication of the main requirement. The deleted text in new 7.3.4.2 (existing 7.3.4.2.1) adds nothing to the understanding of the requirement. The added text to 7.3.4.3 makes it clear the hazard may be managed by other existing standards.

Based on the recommendations in the various related item Public Comments, the Committee created this SR No. 49 to incorporate the changes to the standard.
Public Comment No. 143-NFPA 652-2013 [ Section No. 7.3.4.2.1 ]

7.3.4.2.1 *

The evaluation of a dust deflagration hazard in a facility compartment shall include a comparison of actual or intended dust accumulation to the threshold housekeeping dust accumulation that the quantity of dust required to create an ignitable dust cloud, combined with a sufficient means to cause this quantity of dust to be in suspension and an ignition source of sufficient energy to ignite the dust cloud which would present a potential for flash-fire exposure to personnel or compartment failure due to explosive overpressure.

Statement of Problem and Substantiation for Public Comment

The originally worded requirement can be misinterpreted that a dust deflagration hazard exists in every compartment if there is dust. The evaluation of a deflagration hazard needs to include evaluation of ignition sources and sufficient quantity of dust in suspension, not just presence of dust.

Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 17:52:21 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-49-NFPA 652-2014
Statement: Why create unique terms (facility compartment) when common terms (building or room) will do as well. Putting the A.7.3.4.1 material in the main body of the code is more appropriate to insure the option is equally valid to the main requirement. Adding the additional text to the basic requirement and removal of 7.3.4.2 will simplify the understanding of the need. The text in 7.3.4.2 is nearly duplication of the main requirement. The deleted text in new 7.3.4.2 (existing 7.3.4.2.1) adds nothing to the understanding of the requirement. The added text to 7.3.4.3 makes it clear the hazard may be managed by other existing standards.

Based on the recommendations in the various related item Public Comments, the Committee created this SR No. 49 to incorporate the changes to the standard.
Public Comment No. 515-NFPA 652-2013 [ Section No. 7.3.4.2.2 ]

7.3.4.2.2
Threshold housekeeping dust accumulation levels and non-routine dust accumulation levels (i.e., from a process upset) shall be in accordance with relevant industry or commodity-specific NFPA standards. (See 1.3.1.)

Statement of Problem and Substantiation for Public Comment

There's nothing in 1.3.1 to reference.

Submitter Information Verification

Submitter Full Name: J. Yount
Organization: ConAgra Food Ingredients
Street Address: City: State: Zip: Submittal Date: Fri Nov 15 15:58:01 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-49-NFPA 652-2014
Statement: Why create unique terms (facility compartment) when common terms (building or room) will do as well. Putting the A.7.3.4.1 material in the main body of the code is more appropriate to insure the option is equally valid to the main requirement. Adding the additional text to the basic requirement and removal of 7.3.4.2 will simplify the understanding of the need. The text in 7.3.4.2 is nearly duplication of the main requirement. The deleted text in new 7.3.4.2 (existing 7.3.4.2.1) adds nothing to the understanding of the requirement. The added text to 7.3.4.3 makes it clear the hazard may be managed by other existing standards.

Based on the recommendations in the various related item Public Comments, the Committee created this SR No. 49 to incorporate the changes to the standard.
7.3.4.2.2
Threshold housekeeping dust accumulation levels and non-routine dust accumulation levels (i.e., from a process upset) shall be in accordance with relevant industry or commodity-specific NFPA standards. (See 1.3.1.)

Statement of Problem and Substantiation for Public Comment

This is a sound provision, and should not be altered.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organizations: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 09:45:49 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-49-NFPA 652-2014
Statement: Why create unique terms (facility compartment) when common terms (building or room) will do as well. Putting the A.7.3.4.1 material in the main body of the code is more appropriate to insure the option is equally valid to the main requirement. Adding the additional text to the basic requirement and removal of 7.3.4.2 will simplify the understanding of the need. The text in 7.3.4.2 is nearly duplication of the main requirement. The deleted text in new 7.3.4.2 (existing 7.3.4.2.1) adds nothing to the understanding of the requirement. The added text to 7.3.4.3 makes it clear the hazard may be managed by other existing standards.

Based on the recommendations in the various related item Public Comments, the Committee created this SR No. 49 to incorporate the changes to the standard.
Public Comment No. 24-NFPA 652-2013 [ Section No. 7.3.4.3 ]

7.3.4.3
Where a dust fire, deflagration, or explosion hazard exists within a facility compartment, the effects of the fire, deflagration, or explosion shall be managed that hazard is identified during an initial hazard analysis on facility compartments, the owner/operator shall develop and execute a plan acceptable to the Authority Having Jurisdiction, to manage the hazards in accordance with this standard.

Statement of Problem and Substantiation for Public Comment

Proposed addition to Section 7.3.4.3: Where that hazard is identified during an initial hazard analysis on facility compartments, the owner/operator shall develop and execute a plan acceptable to the Authority Having Jurisdiction, to manage the hazards in accordance with this standard.

Submitter Information Verification

Submitter Full Name: Jennifer Gradnigo
Organization: CRA
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Oct 09 13:24:55 EDT 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-49-NFPA 652-2014
Statement: Why create unique terms (facility compartment) when common terms (building or room) will do as well. Putting the A.7.3.4.1 material in the main body of the code is more appropriate to insure the option is equally valid to the main requirement. Adding the additional text to the basic requirement and removal of 7.3.4.2 will simplify the understanding of the need. The text in 7.3.4.2 is nearly duplication of the main requirement. The deleted text in new 7.3.4.2 (existing 7.3.4.2.1) adds nothing to the understanding of the requirement. The added text to 7.3.4.3 makes it clear the hazard may be managed by other existing standards.

Based on the recommendations in the various related item Public Comments, the Committee created this SR No. 49 to incorporate the changes to the standard.
7.3.4.3
Where a dust fire, deflagration, or explosion hazard exists is identified within a facility compartment, the effects of the fire, deflagration, or explosion shall be managed in accordance with this standard.

Statement of Problem and Substantiation for Public Comment

The Rubber Manufacturers Association recommends that dust should be evaluated under NFPA 652 to determine if the dust is combustible and explosive based on representative facility conditions. We recommend that section 7.3.4.3 should be revised to read: “Where a dust fire, deflagration, or explosion hazard is identified within a facility compartment, the effects of the fire, deflagration, or explosion shall be managed in accordance with this standard.” Dust that has been classified as explosive based on representative facility conditions should then be managed to control the effects of the combustible dust in accordance with this standard.

Submitter Information Verification

Submitter Full Name: SARAH AMICK
Organization: RUBBER MANUFACTURERS ASSN
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 15:18:16 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-49-NFPA 652-2014
Statement: Why create unique terms (facility compartment) when common terms (building or room) will do as well. Putting the A.7.3.4.1 material in the main body of the code is more appropriate to insure the option is equally valid to the main requirement. Adding the additional text to the basic requirement and removal of 7.3.4.2 will simplify the understanding of the need. The text in 7.3.4.2 is nearly duplication of the main requirement. The deleted text in new 7.3.4.2 (existing 7.3.4.2.1) adds nothing to the understanding of the requirement. The added text to 7.3.4.3 makes it clear the hazard may be managed by other existing standards.

Based on the recommendations in the various related item Public Comments, the Committee created this SR No. 49 to incorporate the changes to the standard.
Public Comment No. 595-NFPA 652-2013 [Section No. 7.3.4.3]

7.3.4.3
Where a dust fire, deflagration, or explosion hazard exists within a facility compartment, the effects of the fire, deflagration, or explosion shall be managed in accordance with this standard.

Statement of Problem and Substantiation for Public Comment

The provision has nothing to do with how to perform a PHA, is redundant with many other provisions (particularly chapter 8), and should be deleted. Chapter 8 is more specifically applicable and should not be clouded by this provision.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Nov 18 09:50:49 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-49-NFPA 652-2014
Statement: Why create unique terms (facility compartment) when common terms (building or room) will do as well. Putting the A.7.3.4.1 material in the main body of the code is more appropriate to insure the option is equally valid to the main requirement. Adding the additional text to the basic requirement and removal of 7.3.4.2 will simplify the understanding of the need. The text in 7.3.4.2 is nearly duplication of the main requirement. The deleted text in new 7.3.4.2 (existing 7.3.4.2.1) adds nothing to the understanding of the requirement. The added text to 7.3.4.3 makes it clear the hazard may be managed by other existing standards.

Based on the recommendations in the various related item Public Comments, the Committee created this SR No. 49 to incorporate the changes to the standard.
Public Comment No. 596-NFPA 652-2013 [ Section No. 8.1 ]

8.1 Inherently Safe Designs. (Reserved) - This chapter requires that owner/operators mitigate and prevent hazards to the extent feasible.

Statement of Problem and Substantiation for Public Comment

Numerous provisions in chapter 8 are worded so unequivocally that an AHJ might think that the Committee meant to impose duties even when their imposition is infeasible. Although this was not the Committee’s intent (e.g., A.8.2.4.1 and A.8.3.3.2), AHJ’s and users are frequently unaware of Committee commentary. In addition, the provisions require revision anyway because “Reserved” provisions are not proper at this stage.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 10:04:02 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: It is not the intent of the Committee that the "reserved" sections be used to develop any new requirements at this stage in the development of NFPA 652, and "reserved" sections have no mandatory element to them at this stage. The Committee is using the "reserved" sections (like other NFPA committees) to establish a draft structure at this initial document stage indicating through the use of the reserved sections where future content might be developed in subsequent revisions. So, the Committee does not intend to accept the proposed deletion of these sections where they exist and where Public Comments have proposed deletion as part of this Second Draft. In addition, the text that the submitter proposes for inclusion here does not relate to this particular section or application.
8.2 Building Design.

8.2.1 Risk Assessment. [Renumber subsequent sections]
A documented risk assessment acceptable to the authority having jurisdiction shall be permitted to be conducted to determine the level of building design and protection features to be provided, including, but not limited to, the measures addressed in Section 8.2.

8.2.1 * Construction.
The type of construction shall be in accordance with the building code adopted by authority having jurisdiction.

8.2.2 Building/Room Protection.
8.2.2.1* Each room, building, or other enclosure where a dust deflagration hazard exists shall be protected from the consequence of deflagration.

8.2.2.2 If a room or building contains a dust explosion hazard in a facility compartment and outside of equipment, such areas shall be provided with deflagration venting to a safe area in accordance with NFPA 68, Standard on Explosion Protection by Deflagration Venting.

8.2.2.2.1 Venting shall be located to relieve pressure through an outside wall or roof.

8.2.2.2.2 The fireball, blast hazards, and missile hazards that are created by deflagration venting shall not expose additional personnel or property assets.

8.2.3 Life Safety.
Building configuration and appurtenances shall comply with the life safety requirements of the building and fire prevention codes adopted by the authority having jurisdiction.

8.2.3.1 Where a dust deflagration hazard exists in a facility compartment and outside of equipment, building configuration and appurtenances shall comply with the life safety requirements of the building and fire prevention codes for a hazardous occupancy adopted by the authority having jurisdiction.

8.2.3.2* Where a dust explosion hazard exists in a facility compartment and outside of equipment, enclosed exit and egress paths shall be designed to withstand potential overpressures from a dust explosion.

8.2.4 Methods to Limit Accumulation.
8.2.4.1* Interior surfaces where dust accumulations can occur shall be designed and constructed so as to facilitate cleaning and to minimize combustible dust accumulations.

8.2.4.2 Enclosed building spaces inaccessible to routine housekeeping shall be sealed to prevent dust accumulation.

8.2.4.3* Enclosed building spaces that are difficult to access for routine housekeeping shall be designed to facilitate routine inspection for the purpose of determining the need for periodic cleaning.
8.2.5 Separation of Hazard Areas from Other Hazard Areas and from Other Occupancies.

8.2.5.1 Areas where a dust deflagration hazard exists in a facility compartment (excluding hazard within equipment) shall be segregated, separated, or detached from other occupancies to minimize damage from a fire or explosion.

8.2.5.2 Use of Segregation.

8.2.5.2.1 Physical barriers erected for the purpose of limiting fire spread shall be designed in accordance with NFPA 221, Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls.

8.2.5.2.2 Physical barriers erected to segregate fire hazard areas, including all penetrations and openings of floors, walls, ceilings, or partitions, shall have a minimum fire resistance rating based on the anticipated fire duration.

8.2.5.2.3 Physical barriers, including all penetrations and openings of floors, walls, ceilings, or partitions, that are erected to segregate dust explosion hazard areas shall be designed to preclude failure of those barriers during a dust explosion in accordance with NFPA 68, Standard on Explosion Protection by Deflagration Venting.

8.2.5.3 Use of Separation.

8.2.5.3.1* Separation shall be permitted to be used to limit the dust explosion hazard or deflagration hazard area within a building when it is supported by a documented engineering evaluation acceptable to the authority having jurisdiction.

8.2.5.3.2* The required separation distance between the dust explosion hazard or deflagration hazard area and surrounding exposures shall be determined by an engineering evaluation that addresses the following:

1. Properties of the materials
2. Type of operation
3. Amount of material likely to be present outside the process equipment
4. Building and equipment design
5. Nature of surrounding exposures

8.2.5.3.3 The separation area shall be free of dust, or where dust accumulations exist on any surface, the surface colors below shall be readily discernible.

8.2.5.3.4 When separation is used to limit the dust explosion or deflagration hazard area determined in Chapter 7, the minimum separation distance shall not be less than 35 ft (11 m).

8.2.5.3.5* When separation is used, housekeeping, fixed dust collection systems employed at points of release, and the use of physical barriers shall be permitted to be used to limit the extent of the dust explosion hazard or flash-fire hazard area.

8.2.5.4 Use of Detachment.

8.2.5.4.1 Detachment shall be permitted to be used to limit the dust hazard area to a physically separated adjacent building.
8.2.5.4.2
The required detachment distance between the dust explosion hazard or deflagration hazard area and surrounding exposures shall be determined by an engineering evaluation that addresses the following:

(1) Properties of the materials
(2) Type of operation
(3) Amount of material likely to be present outside the process equipment
(4) Building and equipment design
(5) Nature of surrounding exposures

Statement of Problem and Substantiation for Public Comment

Several of the provisions in this section are inappropriately stated in absolute terms without regard to feasibility, practicability, or the level of residual risk. The addition of the proposed Risk Assessment paragraph here will make this section consistent with the other sections of this Chapter.

Submitter Information Verification

Submitter Full Name: Dale Hansen
Organization: Harrington Group, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 12:59:20 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-65-NFPA 652-2014
Statement: Several of the provisions in this section are inappropriately stated in absolute terms without regard to feasibility, practicability, or the level of residual risk. The addition of the proposed Risk Assessment paragraph here will make this section consistent with the other sections of this Chapter.

Based on comments 214, 302 and 88, the requirement in 8.2.3.2 was deleted.

Annex: Since the Committee modified this requirement to apply to enclosed means of egress within buildings or building compartments and not applicable to facility compartments, the existing annex no longer applied and new annex has been provided.
**8.2.1 * Construction.**
The type of construction shall be in accordance with the building code adopted by authority having jurisdiction or the commodity-specific standard, whichever is more restrictive.

---

**Statement of Problem and Substantiation for Public Comment**

Some dust explosion standards have explicit requirements for building construction. If these are more restrictive than the building code requirements, the commodity-specific standards should prevail.

**Submitter Information Verification**

- **Submitter Full Name:** Walter Frank
- **Organization:** Frank Risk Solutions, Inc.
- **Street Address:**
- **City:**
- **State:**
- **Zip:**
- **Submittal Date:** Mon Nov 11 20:46:01 EST 2013

**Committee Statement**

- **Committee Action:** Rejected
- **Resolution:** The Committee notes that the proposed change in this comment is already covered by the changes to section 1.4 of the standard, so it is not necessary to include it here as well.
8.2.1 Construction.
The type of construction shall be in accordance with the building code adopted by authority having jurisdiction.

Statement of Problem and Substantiation for Public Comment

The provision is unnecessary and is one of many that adds to the bulk of the standard, makes it more difficult to use, and without any commensurate gain. The Committee is correct that "The requirement simply reminds the user that there may be applicable building code requirements in addition to the requirements of this standard." That, however, is not a sufficient reason to add to the already large size of this standard.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 10:05:29 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee notes the submitter’s rationale for recommending deletion of the subject paragraph; however, in this case, the Committee believes it is acceptable to restate this provision and therefore retains the paragraph as it appears in the First Draft.
8.2.2.1*

Each room, building, or other enclosure where a dust deflagration hazard exists shall be protected from the consequence of deflagration.

Statement of Problem and Substantiation for Public Comment

This section requires that every room, building or other enclosure containing a "combustible dust be protected from the consequence of deflagration." This is extraordinarily broad language, which would seem to inherently mean that there is a violation of this standard automatically whenever a deflagration actually occurs. This would appear to be the case regardless of any efforts and safety precautions taken prior to the event. This is not only unfair, but also constitutes virtually an unrebuttable presumption of guilt, or a "per se" or "res ipsa loquitur" conclusion of guilt in the case of any deflagration. It would also seem to require significant venting in every structure and room in which combustible dust might appear. This is classic over-regulation, and an impossible burden for industry. In the case of the grain industry, for example, it would seem to mean that every fire or explosion, even if well contained, would result in an inherent violation of NFPA 652, even if there were no violation of the OSHA grain handling standard, NFPA 61, or any other NFPA standard. This section should be deleted.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Wed Nov 13 14:41:22 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: As amended by SR No. 65, the Committee has modified the paragraph identified in this comment and the Committee believes the modification addresses questions raised by the submitter. So, this paragraph is not deleted as recommended.
Public Comment No. 598-NFPA 652-2013 [Section No. 8.2.2.1]

8.2.2.1 *

Each except as provided in section 8.2.2 as to deflagration venting or as provided in an industry or commodity-specific NFPA standard, each room, building, or other enclosure (other than a storage bin or silo) where a significant risk of a dust deflagration hazard exists shall be protected as specified in this standard and to the extent feasible, from the consequence of deflagration.

Statement of Problem and Substantiation for Public Comment

The United States Beet Sugar Association protests this provision most vigorously. A major problem with this provision is that the key terms "room" and "building" are not defined, and that "other enclosure" is so vague that an AHJ might think that it includes unoccupied enclosures, or storage silos or bins and thus that a storage silo or bin might require deflagration venting. Worse, the term "enclosure" is now expressly defined in section 3.3.15 so broadly as to arguably include storage silos or bins. And worse yet, A.3.3.15 states that, "Examples of enclosures include a room, building, vessel, silo, bin, pipe, or duct." (Emphasis added.)

These provisions in the text of the standard arguably nullify and override the advisory annex statement in A.8.2.2.1 that, "Section 8.2 is not intended to cover process equipment such as bins and silos" as well as the Committee response to public comments that, "This section is intended to address buildings and rooms, not storage bins or silos (equipment). The revised wording clarifies the intent." That the Committee did not intend to impair that exception is indicated by the absence of the term "other enclosure" in section 8.2.2.2, which more specifically covers explosion venting, and reads as follows: "If a room or building contains a dust explosion hazard in a facility compartment and outside of equipment, such areas shall be provided with deflagration venting to a safe area in accordance with NFPA 68, Standard on Explosion Protection by Deflagration Venting." As the standard’s words now stand, however, the Committee’s intent has been nullified.

The Committee’s actual intent must be reflected in the words of the statement, or the agricultural industry will be very adversely affected on a broad scale. The wording needs to make clear that storage bins and silos continue to be covered by the exception in section 6.2.1 of NFPA 61-2013, which reflects the frequent impracticality of explosion venting in bins and silos because of their geometry and building constraints. Again, this needs to be made clear in the standard itself, not merely in an annex or Committee commentary, which users may be unaware of, which AHJ’s may never see, and which enforcement officials may disregard.

Another major problem with this provision is that its wording literally requires perfect protection — that “each” room, building and enclosure be “protected” from the consequence of a deflagration, regardless of cost. The provision would impose a performance criterion so demanding in perfection that the slightest prospect of facility damage would violate the standard. It would also literally require venting in every room or structure with any amount of combustible dust that could be involved in a deflagration. The provision is thus infeasible as written.

Moreover, the provision is so broadly written that it defeats the purpose of this standard, which is to specify what the facility owner is to do. The provision does not refer to other provisions that specify how to achieve the desired goal.

Submitter Information Verification
**Submitter Full Name:** ARTHUR SAPPER  
**Organization:** for United States Beet Sugar Association  
**Committee Statement**

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<td>Statement:</td>
<td>Several of the provisions in this section are inappropriately stated in absolute terms without regard to feasibility, practicality, or the level of residual risk. The addition of the proposed Risk Assessment paragraph here will make this section consistent with the other sections of this Chapter.</td>
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Based on comments 214, 302 and 88, the requirement in 8.2.3.2 was deleted.

Annex: Since the Committee modified this requirement to apply to enclosed means of egress within buildings or building compartments and not applicable to facility compartments, the existing annex no longer applied and new annex has been provided.
8.2.2.2
If, except as provided in an industry or commodity-specific NFPA standard, if a room or building (other than storage bin or silo) contains a significant risk of a dust explosion hazard in a facility compartment and outside of equipment, such areas shall to the extent feasible be provided with deflagration venting to a safe area in accordance with NFPA 68, Standard on Explosion Protection by Deflagration Venting.

8.2.2.2.1
Venting shall be located to relieve pressure through an outside wall or roof.

8.2.2.2.2
The fireball, blast hazards, and missile hazards that are created by deflagration venting shall not expose additional personnel or property assets.

Statement of Problem and Substantiation for Public Comment

This provision is so worded that an AHJ might think that the terms “room” or “building” includes storage bins, and thus that a storage bin or silo might require deflagration venting. Storage bins and silos for agricultural products are covered by the exception in section 6.2.1 of NFPA 61-2013, which reflects the frequent impracticality of explosion venting in bins and silos because of their geometry, building constraints, or both. The NFPA 61 Committee has concluded that imposing a broad requirement for explosion venting of such bins and silos is unjustifiable — a decision upheld by the Standards Council. The provision as worded is infeasible for the agricultural sector, including the beet sugar industry. It would impose huge costs. We note in this respect the comment of the National Grain and Feed Association that, “A recent study conducted by the engineering firm VAA for the National Grain and Feed Association [David Olheiser (VAA), “Impact Study NFPA Standards on Grain Silo Explosion Venting Criteria” (July 31, 2013)] concluded that use of NFPA 68 would increase the average annual cost of U.S. grain storage construction by $413.6 million to over $1.09 billion. This would result in significantly less construction and, if retroactive, the abandonment of numerous facilities.” The study concluded the cost to manufacture a storage bin would increase between 250 to 400 percent. Similarly adverse results can be expected for the agricultural sector generally, including the beet sugar industry.

We are aware that a Committee explanation states that, “This section is intended to address buildings and rooms, not storage bins or silos (equipment). The revised wording clarifies the intent.” With respect, the actual wording of the standard does not reflect the Committee’s intent. AHJ’s and users will look to the words of the standard itself, and they are frequently unaware of Committee commentary. The provision needs to be revised to make the Committee’s intent expressly and unmistakably clear on this point, or AHJ’s and users will be confused by it.

Submitter Information Verification
Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-65-NFPA 652-2014
Statement: Several of the provisions in this section are inappropriately stated in absolute terms without regard to feasibility, practicality, or the level of residual risk. The addition of the proposed Risk Assessment paragraph here will make this section consistent with the other sections of this Chapter.

Based on comments 214, 302 and 88, the requirement in 8.2.3.2 was deleted.

Annex: Since the Committee modified this requirement to apply to enclosed means of egress within buildings or building compartments and not applicable to facility compartments, the existing annex no longer applied and new annex has been provided.
If a room or building contains a dust explosion hazard in a facility compartment and outside of equipment, such areas shall be provided with deflagration venting to a safe area in accordance with NFPA 68, *Standard on Explosion Protection by Deflagration Venting*.

**Statement of Problem and Substantiation for Public Comment**

This section requires deflagration venting in compliance with NFPA 68. A recent study conducted by the engineering firm VAA for the National Grain and Feed Association concluded that use of NFPA 68 would increase the average annual cost of U.S. grain storage construction by $413.6 million to over $1.09 billion. This would result in significantly less construction and, if retroactive, the abandonment of numerous facilities. The NFPA needs to analyze the costs of compliance before adopting rules with implications of this magnitude.

**Submitter Information Verification**

Submitter Full Name: MARC FLEISCHAKER  
Organization: ARENT FOX LLP  
Affiliation: NOPA, NGFA, IOMSA  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Wed Nov 13 14:47:02 EST 2013

**Committee Statement**

Committee Action: Rejected  
Resolution: This section applies to building or enclosure and the Committee has determined that silos are equipment, so they would not be included in this section of the standard. The Committee does not support deleting this requirement as it applies to buildings and enclosures.
Public Comment No. 67-NFPA 652-2013 [ Section No. 8.2.2.2.1 ]

8.2.2.2.1
Venting shall be located to relieve pressure through an outside wall or roof. Or via an AHJ approved flameless vent considering the room size being at least 16x the size of the device (reference Fike study).

Statement of Problem and Substantiation for Public Comment

Some applications do not allow through wall or roof venting. Example is in underground industrial park.

Submitter Information Verification

Submitter Full Name: GREG BUMB
Organization: GF PUHL
Street Address:
City: 
State: 
Zip: 
Submittal Date: Fri Nov 08 10:03:38 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee does not support the proposed change in this comment; this section does not apply to process equipment and the proposed change makes no sense for building or building compartment so it does not apply.
Public Comment No. 324-NFPA 652-2013 [Section No. 8.2.2.2.2]

8.2.2.2.2 –
The fireball, blast hazards, and missile hazards that are created by deflagration venting shall not expose additional personnel or property assets.

Statement of Problem and Substantiation for Public Comment

The venting required by this section is not feasible for agricultural storage concrete silos and steel tanks. This is well-documented by an NFPA study dated January 25, 2012, entitled "Impact Study -- NFPA Standards in Grain Silo Explosion Venting Criteria." This proposal was previously rejected by the NFPA 61 Committee, and that rejection was affirmed by the NFPA Standards Council. It should not resurface in NFPA 652, at least insofar as agricultural and food processing facilities are concerned.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 14:56:12 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The hazards of the fireball are well known and not consistent with the life safety goals and must be stated clearly, so it is the Committee's belief that these provisions must be retained. In addition, this section does not apply to silos as they are no longer covered here as they are equipment and this section does not apply to equipment.
Public Comment No. 181-NFPA 652-2013 [Section No. 8.2.3.1]

8.2.3.1
Where a dust deflagration hazard exists in a facility compartment and outside of equipment, building configuration and appurtenances shall comply with the life safety requirements of the building and fire prevention codes for a hazardous occupancy adopted, building occupancy shall comply with IBC or local building codes adopted by the authority having jurisdiction.

Statement of Problem and Substantiation for Public Comment

The original text implies that a facility compartment with a dust deflagration hazard is automatically considered a hazardous occupancy rating. This will cause confusion and misguide building officials. The IBC and local building code are documents that have been adopted to determine occupancy ratings.

Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Tue Nov 12 13:57:40 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee prefers to leave the reference to fire and building codes non-specific so that the appropriate citation depends on the jurisdiction involved.
8.2.3.2*
Where a dust explosion hazard exists in a facility compartment and outside of equipment, enclosed exit and egress paths shall be designed to withstand potential overpressures from a dust explosion.

8.2.3.2. Delete text

Comment: Section 8.2.3.2 should be deleted.

Statement of Problem and Substantiation for Public Comment

Substantiation: This requirement apparently assumes that all facility compartments have "enclosed exit and egress paths." While the standard does not define "enclosed exit or egress path," that assumption is incorrect. The vast majority of facility compartments have a simple door or hatch way, etc. for exit and egress.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Street Address:  
City:  
State:  
Zip:  
Submittal Date: Tue Nov 12 14:44:37 EST 2013

Committee Statement
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<tr>
<td>Statement:</td>
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</table>
Public Comment No. 302-NFPA 652-2013 [ Section No. 8.2.3.2 ]

8.2.3.2 *

Where a dust explosion hazard exists in a facility compartment and outside of equipment, enclosed exit and egress paths shall be designed to withstand potential overpressures from a dust explosion. Section 8.2.3.2 should be deleted.

Statement of Problem and Substantiation for Public Comment

This requirement apparently assumes that all facility compartments have "enclosed exit and egress paths". While the standard does not define "enclosed exit or egress path," that assumption is incorrect. The vast majority of facility compartments have a simple door or hatch way, etc. for exit and egress.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Wed Nov 13 14:12:34 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-65-NFPA 652-2014
Statement: Several of the provisions in this section are inappropriately stated in absolute terms without regard to feasibility, practicality, or the level of residual risk. The addition of the proposed Risk Assessment paragraph here will make this section consistent with the other sections of this Chapter.

Based on comments 214, 302 and 88, the requirement in 8.2.3.2 was deleted.

Annex: Since the Committee modified this requirement to apply to enclosed means of egress within buildings or building compartments and not applicable to facility compartments, the existing annex no longer applied and new annex has been provided.
8.2.3.2 *
Where a dust explosion hazard exists in a facility compartment and outside of equipment, enclosed exit and egress paths shall be designed to withstand potential overpressures from a dust explosion.

8.2.3.2, Delete text
Comment: Section 8.2.3.2 should be deleted.

Statement of Problem and Substantiation for Public Comment
Substantiation: This requirement apparently assumes that all facility compartments have "enclosed exit and egress paths". While the standard does not define "enclosed exit or egress path," that assumption is incorrect. The vast majority of facility compartments have a simple door or hatch way, etc. for exit and egress.

Submitter Information Verification
Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement
Committee Action:  Rejected but see related SR
Resolution:  SR-65-NFPA 652-2014
Statement:  Several of the provisions in this section are inappropriately stated in absolute terms without regard to feasibility, practicality, or the level of residual risk. The addition of the proposed Risk Assessment paragraph here will make this section consistent with the other sections of this Chapter.

Based on comments 214, 302 and 88, the requirement in 8.2.3.2 was deleted.

Annex: Since the Committee modified this requirement to apply to enclosed means of egress within buildings or building compartments and not applicable to facility compartments, the existing annex no longer applied and new annex has been provided.
8.2.4 Methods to Limit Accumulation.

8.2.4.1 Interior surfaces where dust accumulations can occur shall be designed and constructed so as to facilitate cleaning and to minimize combustible dust accumulations.

8.2.4.2 Enclosed building spaces inaccessible to routine housekeeping shall be sealed to prevent dust accumulation.

8.2.4.3 Enclosed building spaces that are difficult to access for routine housekeeping shall be designed to facilitate routine inspection for the purpose of determining the need for periodic cleaning.

Statement of Problem and Substantiation for Public Comment

It is proposed that this section be relocated to 8.4 in order to consolidate content related to control of fugitive dust accumulations.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 21:04:28 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee notes that if this section were deleted and moved it would become a retroactive requirement and that is not the intent as these are intended as design items and not intended to be applied retroactively, so the Committee does not support deleting as proposed by this comment.
Public Comment No. 210-NFPA 652-2013 [Section No. 8.2.4.1]

8.2.4.1*
Interior surfaces where dust accumulations can occur shall be designed and constructed so as to facilitate cleaning and to minimize combustible dust accumulations.

Comment: revise this section to read as follows:
To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, interior surfaces where dust accumulations can occur shall be designed and constructed so as to facilitate cleaning and to minimize combustible dust accumulations.

Statement of Problem and Substantiation for Public Comment

As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. The proposed annex language acknowledges that this absolute language is inappropriate and attempts to temper it. As a result, Sections 8.2.4.1 and A.8.2.4.1 are in conflict. Section 8.2.4.1 is written as an absolute design and construction requirement, although it was clearly recognized by the committee to be impractical if not unfeasible in many situations. To prevent imposition of an unfeasible requirement or a significant if not gross misallocation of resources, Section A.8.2.4.1 was apparently inserted to somehow undo the damage that would be inflicted if Section 8.2.4.1 was literally interpreted. It is not permissible to write a standard in this fashion. Annex material may be used to explain and clarify mandatory text; it may not be used to amend mandatory text. The word “minimize” means to prevent or reduce to risk to the lowest level possible, even if it would reduce the risk well below the acceptable risk level at completely unwarranted costs that would result in an inappropriate allocation of limited resources. The risk should be reduced to an acceptable level rather than to the lowest feasible level.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 14:39:41 EST 2013

Committee Statement
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<tr>
<td>Resolution:</td>
<td>As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style. In addition, the annex to this section already acknowledges that there is a feasibility aspect to this provision, so what the submitter is attempting to accomplish in the mandatory section would not be enforceable, but the annex addresses this the Committee believes without any further revision.</td>
</tr>
</tbody>
</table>
8.2.4.1 Interior

Comment 1: This section should be deleted. Comment 2: If this section is not deleted, it should be revised as follows:

To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, interior surfaces where dust accumulations can occur shall be designed and constructed so as to facilitate cleaning and to minimize combustible dust accumulations. Alternately, internal surfaces shall be regularly cleaned to keep dust accumulations from exceeding the thresholds identified in 7.3.4.2.

A.8.2.4.1

To the extent feasible and practical from a cost and sanitation standpoint, horizontal surfaces should be minimized to prevent accumulation of dust. Horizontal surfaces that can benefit from a sloped cover include girders, beams, ledges, and equipment tops. Overhead steel I-beams and similar structural shapes can be boxed with concrete or other noncombustible material to eliminate surfaces for dust accumulation. The additional weight of the box enclosures should be considered in the structural design. Surfaces should be as smooth as possible to minimize dust accumulations and to facilitate cleaning. One option based on clean design concepts is to construct the building walls so that the structural supports, electrical conduit, and so forth are on the exterior side of the building walls; therefore, the interior building compartment walls are smooth and less likely to collect fugitive dust.

Statement of Problem and Substantiation for Public Comment

#1, re: deletion - This concept sounds good, but the dust still accumulates on the surface. Stating this as a "shall" requirement is based on the erroneous premise that it is effective. Sloped covers sound like a good idea, but the angle of repose on the dusts is very high, so unless the slope is > 89 degrees, it is not an effective design technique.

#2 - As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. The proposed annex language acknowledges that this absolute language is inappropriate and attempts to temper it. As a result, Sections 8.2.4.1 and A.8.2.4.1 are in conflict. Section 8.2.4.1 is written as an absolute design and construction requirement, although it was clearly recognized by the committee to be impractical if not infeasible in many situations. To prevent imposition of an infeasible requirement or a significant if not gross misallocation of resources, Section A.8.2.4.1 was apparently inserted to somehow undo the damage that would be inflicted if Section 8.2.4.1 was literally interpreted. It is not permissible to write a standard in this fashion. Annex material may be used to explain and clarify mandatory text; it may not be used to amend mandatory text. The word "minimize" means to prevent or reduce to risk to the lowest level possible, even if it would reduce the risk well below the acceptable risk level at completely unwarranted costs that would result in an inappropriate allocation of limited resources. The risk should be reduced to an acceptable level rather than to the lowest feasible level.

Submitter Information Verification

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<th>MARIE MARTINKO</th>
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<td><strong>Submittal Date:</strong></td>
<td>Wed Nov 13 14:05:52 EST 2013</td>
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**Committee Statement**

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<tr>
<td><strong>Resolution:</strong></td>
<td>As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style. The annex already addresses the issue raised by the submitter.</td>
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Public Comment No. 327-NFPA 652-2013 [Section No. 8.2.4.1]

**8.2.4.1**

Interior surfaces where dust accumulations can occur shall be designed and constructed so as to facilitate cleaning and to minimize combustible dust accumulations. *This section is not retroactive.*

**Statement of Problem and Substantiation for Public Comment**

This section relates to the design of facilities, and is retroactive. Nothing related to design should be retroactive. It is simply not feasible to re-design facilities that have been fully built and operational for many years.

**Submitter Information Verification**

Submitter Full Name: MARC FLEISCHAKER  
Organization: ARENT FOX LLP  
Affiliation: NOPA, NGFA, IOMSA  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Wed Nov 13 15:02:33 EST 2013

**Committee Statement**

Committee Action: Rejected  
Resolution: The Committee is not accepting the recommended change as the submitter has incorrectly interpreted that this requirement is to be applied retroactive; this section is not retroactive, so there is no need to add a statement to that effect, otherwise, such a statement would be required throughout the standard.
8.2.4.1 *

Interior surfaces where dust accumulations can occur shall be designed and constructed so as to facilitate cleaning and to minimize combustible dust accumulations.

Comment 1: This section should be deleted

Comment 2: If this section is not deleted, it should be revised as follows:

To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, interior surfaces where dust accumulations can occur shall be designed and constructed so as to facilitate cleaning and to minimize combustible dust accumulations. Alternately, internal surfaces shall be regularly cleaned to keep dust accumulations from exceeding the thresholds identified in 7.3.4.2.

Statement of Problem and Substantiation for Public Comment

Substantiation 1: This concept sounds good, but the dust still accumulates on the surface. Stating this as a “shall” requirement is based on the erroneous premise that it is effective. Sloped covers sound like a good idea, but the angle of repose on the dusts is very high, so unless the slope is > 89 degrees, it is not an effective design technique.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement

Committee Action: Rejected
Resolution: As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style.
Public Comment No. 600-NFPA 652-2013 [Section No. 8.2.4.1]

8.2.4.1 *
Interior surfaces where dust accumulations can occur shall be, to the extent feasible, designed and constructed so as to facilitate cleaning and to minimize combustible dust accumulations. This provision is not retroactive.

Statement of Problem and Substantiation for Public Comment

The elimination of all flat surfaces in new construction, particularly from structural beams, could well be cost prohibitive. The provision should be amended by adding the phrase "to the extent feasible" after "shall." We are aware of the statement in A.8.2.4.1 that, "To the extent feasible and practical from a cost and sanitation standpoint, horizontal surfaces should be minimized to prevent accumulation of dust." Inasmuch as the italicized phrase appears to state the Committee's intent, there is no reason why it should not be clear in the text of the standard.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 10:20:21 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The submitter has incorrectly interpreted that this section is to be applied retroactive. This section is not retroactive, however, it is not necessary to add such a statement as the standard only requires statements for those sections that ARE retroactive and not for those that are NOT retroactive.
8.2.4.2
Enclosed. To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, enclosed building spaces inaccessible to routine housekeeping shall be sealed to prevent dust accumulation.

Statement of Problem and Substantiation for Public Comment

As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. It would impose this sealing obligation even if there is no significant risk to address (e.g., no significant dust in a particular area) or implementation would reduce the risk well below the acceptable risk level at completely unwarranted costs that would result in an inappropriate allocation of limited resources. The risk should be reduced to an acceptable level rather than to whatever level might be achieved by sealing every building space inaccessible to routine housekeeping. For some reason, there was no attempt to undo the misallocation of resources that would be wrought by this absolute provision through annex material.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 15:08:12 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style.
8.2.4.2 – Enclosed building spaces inaccessible to routine housekeeping shall be sealed to prevent dust accumulation.

Statement of Problem and Substantiation for Public Comment

This section provides that enclosed building spaces inaccessible to housekeeping shall be sealed to prevent dust accumulation. However, recent studies demonstrate that to adequately vent grain silos, it is necessary to have a "dead space" in the bin. Under this NFPA proposal, such a space would need to be sealed. This could, in fact, produce additional risk.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 14:59:59 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: For bins, cannot isolate the part of the bin that is not filled with the product. This section is just intended for buildings and would not apply to equipment, therefore it doesn't apply to silos or bins, so the proposed modification (deletion) is not applicable to this section of the standard.
Public Comment No. 601-NFPA 652-2013 [ Section No. 8.2.4.2 ]

8.2.4.2
Enclosed building spaces (other than storage bins and silos) inaccessible to routine housekeeping shall be sealed to prevent dust accumulation. This provision is not retroactive.

Statement of Problem and Substantiation for Public Comment

This provision is very unclear and should be deleted. At the very least, it requires, for the reasons stated with respect to section 8.2.4.1, the addition of the phrase “to the extent feasible”. Furthermore, it is infeasible with respect to storage bins and silos, which require a dead space to be adequately vented; sealing the dead space would interfere with venting. If the provision is not struck, it should read as shown above.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 10:22:47 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The subject sections are not currently intended to be applied retroactive; therefore, it is not appropriate nor necessary to add a statement indicating that it is not retroactive. The convention in this standard is to explicitly indicate those provisions that are applied retroactive, but no such statement is necessary when provisions are not applied retroactive.
Public Comment No. 86-NFPA 652-2013 [Section No. 8.2.4.2]

8.2.4.2
Enclosed building spaces inaccessible to routine housekeeping shall be sealed to prevent dust accumulation.

Comment: revise this section to read as follows:
To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, enclosed building spaces inaccessible to routine housekeeping shall be sealed to prevent dust accumulation.

Statement of Problem and Substantiation for Public Comment

Substantiation:

As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. It would impose this sealing obligation even if there is no significant risk to address (e.g., no significant dust in a particular area) or implementation would reduce the risk well below the acceptable risk level at completely unwarranted costs that would result in an inappropriate allocation of limited resources. The risk should be reduced to an acceptable level rather than to whatever level might be achieved by sealing every building space inaccessible to routine housekeeping. For some reason, there was no attempt to undo the misallocation of resources that would be wrought by this absolute provision through annex material.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC ’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 08 16:21:41 EST 2013

Committee Statement
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Public Comment No. 213-NFPA 652-2013 [Sections 8.2.4.2, 8.2.4.3]

Sections 8.2.4.2, 8.2.4.3

8.2.4.2
Enclosed building spaces inaccessible to routine housekeeping shall be sealed to prevent dust accumulation.

8.2.4.3*
Enclosed building spaces that are difficult to access for routine housekeeping shall be designed to facilitate routine inspection for the purpose of determining the need for periodic cleaning.

8.2.4.2, Revised text

Comment: revise this section to read as follows:
To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, enclosed building spaces inaccessible to routine housekeeping shall be sealed to prevent dust accumulation.

8.2.4.3, Revised text

Comment: revise this section to read as follows:
To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, enclosed building spaces that are difficult to access for routine housekeeping shall be designed to facilitate routine inspection for the purpose of determining the need for periodic cleaning.

Statement of Problem and Substantiation for Public Comment

Substantiation:

As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. It would impose this sealing obligation even if there is no significant risk to address (e.g., no significant dust in a particular area) or implementation would reduce the risk well below the acceptable risk level at completely unwarranted costs that would result in an inappropriate allocation of limited resources. The risk should be reduced to an acceptable level rather than to whatever level might be achieved by sealing every building space inaccessible to routine housekeeping. For some reason, there was no attempt to undo the misallocation of resources that would be wrought by this absolute provision through annex material.

Substantiation:

As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. It would impose this access obligation even if there is no significant risk to address (e.g., no significant dust in a particular area) or implementation would reduce the risk well below the acceptable risk level at completely unwarranted costs that would result in an inappropriate allocation of limited resources. The risk should be reduced to an acceptable level rather than to whatever level might be achieved by designing every building space difficult to access for routine housekeeping to facilitate routine inspection for the purpose of determining the need for periodic cleaning. For some reason, there was no attempt to undo the misallocation of resources that would be wrought by this absolute provision through annex material.
### Submitter Information Verification

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<tr>
<th>Submitter Full Name:</th>
<th>Richard Krock</th>
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<td>The Vinyl Institute</td>
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<td>These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.</td>
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### Committee Statement

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<td>Resolution:</td>
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Public Comment No. 301-NFPA 652-2013 [Section No. 8.2.4.3]

8.2.4.3 *
Enclosed. To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, enclosed building spaces that are difficult to access for routine housekeeping shall be designed to facilitate routine inspection for the purpose of determining the need for periodic cleaning.

Statement of Problem and Substantiation for Public Comment

As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. It would impose this access obligation even if there is no significant risk to address (e.g., no significant dust in a particular area) or implementation would reduce the risk well below the acceptable risk level at completely unwarranted costs that would result in an inappropriate allocation of limited resources. The risk should be reduced to an acceptable level rather than to whatever level might be achieved by designing every building space difficult to access for routine housekeeping to facilitate routine inspection for the purpose of determining the need for periodic cleaning. For some reason, there was no attempt to undo the misallocation of resources that would be wrought by this absolute provision through annex material.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 14:10:48 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style.
Public Comment No. 328-NFPA 652-2013 [Section No. 8.2.4.3]

8.2.4.3 *
Enclosed building spaces that are difficult to access for routine housekeeping shall be designed to facilitate routine inspection for the purpose of determining the need for periodic cleaning. This requirement is not retroactive.

Statement of Problem and Substantiation for Public Comment

This section is related to the design of facilities, and is retroactive. Nothing related to design should be retroactive. It is simply not feasible to re-design facilities that have been fully built and operational for many years.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Nov 13 15:04:31 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The subject sections are not currently intended to be applied retroactive; therefore, it is not appropriate nor necessary to add a statement indicating that it is not retroactive. The convention in this standard is to explicitly indicate those provisions that are applied retroactive, but no such statement is necessary when provisions are not applied retroactive.
8.2.4.3 *
Enclosed building spaces that are difficult to access for routine housekeeping shall be designed to facilitate routine inspection for the purpose of determining the need for periodic cleaning. This provision is not retroactive.

Statement of Problem and Substantiation for Public Comment

This provision should not be retroactive, and should be amended to so state.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 10:25:22 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The subject sections are not currently intended to be applied retroactive; therefore, it is not appropriate nor necessary to add a statement indicating that it is not retroactive. The convention in this standard is to explicitly indicate those provisions that are applied retroactive, but no such statement is necessary when provisions are not applied retroactive.
Public Comment No. 87-NFPA 652-2013 [ Section No. 8.2.4.3 ]

8.2.4.3 *
Enclosed building spaces that are difficult to access for routine housekeeping shall be designed to facilitate routine inspection for the purpose of determining the need for periodic cleaning.

Comment: revise this section to read as follows:

8.2.4.3. To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, enclosed building spaces that are difficult to access for routine housekeeping shall be designed to facilitate routine inspection for the purpose of determining the need for periodic cleaning.

Statement of Problem and Substantiation for Public Comment

Substantiation:

As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. It would impose this access obligation even if there is no significant risk to address (e.g., no significant dust in a particular area) or implementation would reduce the risk well below the acceptable risk level at completely unwarranted costs that would result in an inappropriate allocation of limited resources. The risk should be reduced to an acceptable level rather than to whatever level might be achieved by designing every building space difficult to access for routine housekeeping to facilitate routine inspection for the purpose of determining the need for periodic cleaning. For some reason, there was no attempt to undo the misallocation of resources that would be wrought by this absolute provision through annex material.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement
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Public Comment No. 605-NFPA 652-2013 [Section No. 8.2.5.3.1]

8.2.5.3.1 *
Separation shall be permitted to be used to limit the dust explosion hazard or deflagration hazard area within a building when it is supported by a documented engineering evaluation acceptable to the authority having jurisdiction.

Statement of Problem and Substantiation for Public Comment

This literally requires that, before separation may be used, even after an engineering evaluation approving it, an AHJ approve the conclusion. AHJ's cannot be expected to approve such engineering evaluations, and facility owners should not have to wait until they do. The phrase "acceptable to the authority having jurisdiction" should be deleted.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 10:29:18 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee does not agree with the interpretation of the submitter for this provision. The current language does not require the engineering evaluation to be submitted to the AHJ for approval; it merely states the evaluation should be acceptable to the AHJ and says nothing about submittal or approval.
Public Comment No. 303-NFPA 652-2013 [ Section No. 8.2.5.3.2 ]

8.2.5.3.2 *

The required separation distance between the dust explosion hazard or deflagration hazard area and surrounding exposures shall be determined by an engineering evaluation that addresses the following:

1) Properties of the materials
2) Type of operation
3) Amount of material likely to be present outside the process equipment
4) Building and equipment design
5) Nature of surrounding exposures
6) Predicted overpressure from the explosion

Statement of Problem and Substantiation for Public Comment

Predicted damage should be determined as described in resources such as NFPA 68: Standard on Explosion Protection by Deflagration Venting, or FM Global Data Sheet 1-44 (Damage-Limiting Construction). Otherwise, the results are subjective.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 14:14:42 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee did not accept the recommended addition which appears to be based on attenuation of pressure. The attenuation of pressure does not actually happen in the scale of building or building compartments and the addition of the proposed text would give the incorrect impression of the degree of protection provided through separation. A research paper published by R. Zalosh describes how pressure decay occurs outside away from the venting deflagration. Current annex text is specific to building separation rather than an exploding vessel. In addition, separation is not intended for managing an explosion but more so for managing the effects from the propagation of the flame front.
Public Comment No. 450-NFPA 652-2013 [Section No. 8.2.5.3.2]

8.2.5.3.2*
The required separation distance between the dust explosion hazard or deflagration hazard area and surrounding exposures shall be determined by an engineering evaluation that addresses the following:

1. Properties of the materials
2. Type of operation
3. Amount of material likely to be present outside the process equipment
4. Building and equipment design
5. Nature of surrounding exposures
6. Predicted explosion overpressure

Statement of Problem and Substantiation for Public Comment

The addition is a significant component that should be included in the engineering evaluation.

Submitter Information Verification

Submitter Full Name: Dale Hansen
Organization: Harrington Group, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 13:03:46 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee did not accept the recommended addition which appears to be based on attenuation of pressure. The attenuation of pressure does not actually happen in the scale of building or building compartments and the addition of the proposed text would give the incorrect impression of the degree of protection provided through separation. A research paper published by R. Zalosh describes how pressure decay occurs outside away from the venting deflagration. Current annex text is specific to building separation rather than an exploding vessel. In addition, separation is not intended for managing an explosion but more so for managing the effects from the propagation of the flame front.
Public Comment No. 411-NFPA 652-2013 [ Section No. 8.2.5.3.3 ]

8.2.5.3.3
The separation area shall be free of dust, or where dust accumulations exist on any surface, the surface colors below shall be readily discernible.

Statement of Problem and Substantiation for Public Comment
Reworded to be more clear.

Submitter Information Verification
Submitter Full Name: John Cholin
Organization: J. M. Cholin Consultants Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 11:07:07 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-65-NFPA 652-2014
Statement: Several of the provisions in this section are inappropriately stated in absolute terms without regard to feasibility, practicality, or the level of residual risk. The addition of the proposed Risk Assessment paragraph here will make this section consistent with the other sections of this Chapter.

Based on comments 214, 302 and 88, the requirement in 8.2.3.2 was deleted.

Annex: Since the Committee modified this requirement to apply to enclosed means of egress within buildings or building compartments and not applicable to facility compartments, the existing annex no longer applied and new annex has been provided.
Public Comment No. 182-NFPA 652-2013 [New Section after 8.3.1]

8.1 Risk Assessment

A documented Process Hazard Analysis as described in Section 7.3.1 shall be permitted to be conducted to determine the level of protection to be provided which may include, but not be limited to, the prescriptive protection measures described in Chapter 8.

Statement of Problem and Substantiation for Public Comment

This paragraph is easy to miss with it imbedded within Section 8.3. It should be moved to the beginning of the chapter. This section describes mitigation and prevention methods in support of the Process Hazard Analysis. It applies to the entire process (and therefore all of Chapter 8), not just equipment design. Therefore, it should be moved to the beginning of the chapter and renumbered. See comment in section 7.3.1.

Related Public Comments for This Document

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Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Tue Nov 12 14:03:39 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee does not support the proposed relocation of this risk assessment provision as the standard currently allows the use of risk assessment selectively and not globally; if accepted, this change would undo that approach and is therefore not supported by the Committee.
Public Comment No. 240-NFPA 652-2013 [Section No. 8.3.1]

8.3.1 * Risk Assessment *
A documented risk assessment acceptable to the authority having jurisdiction shall be permitted to be conducted to determine the level of protection to be provided, including, but not limited to, protection measures addressed in Section 8.3.

Statement of Problem and Substantiation for Public Comment

This section describes mitigation and prevention methods in support of the Process Hazard Analysis. It applies to the entire process (and therefore all of chapter 8), not just equipment design. Therefore it should be moved to the beginning of the chapter and renumbered. Then it can be deleted in section 8.3. See comment in section 7.3.1.

Related Public Comments for This Document

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Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Tue Nov 12 16:06:45 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: Based on the Committee's action and reasoning for not accepting Public Comment No. 182, the Committee does not support deleting this requirement that permits use of the risk assessment for equipment design in this section.
**Public Comment No. 502-NFPA 652-2013 [Sections 8.3.1, 8.3.2]**

**Sections 8.3.1, 8.3.2**

**8.3.2.1** *Risk Assessment.*
A documented risk assessment acceptable to the authority having jurisdiction shall be permitted to be conducted to determine the level of protection to be provided, including, but not limited to, protection measures for equipment addressed in Section 8.3.2 or in other parts of Section 8.3.

**8.3.2.1** *Design for Dust Containment.*

**8.3.2.1.1** All components of enclosed systems that handle combustible particulate solids shall be designed to prevent the escape of dust, except for openings intended for intake and discharge of air and material.

**8.3.2.2** Where the equipment cannot be designed for dust containment, dust collection shall be provided. *(See also 8.3.3.)*

**8.3.2** Design guidance for equipment not addressed in this chapter shall be obtained from specific criteria in other appropriate NFPA Standards such as 654, 484, 61, 664, and 655.

**Statement of Problem and Substantiation for Public Comment**

This section title is misleading in that one expects some general equipment design criteria but the chapter basically talks only about 3 specific systems in 8.3.3 and AMS in 8.3.4. In addition, the first requirement in 8.3.1 calling for Risk Assessment is written with a 'shall be permitted to be' phrasing. This terminology is typically used as representing an alternative option to the main requirement. I see no main requirement. On top of that, requiring a risk assessment which requires a documented review of the hazard from scratch as well as approval from an AHJ rather than first relying on some prescriptive requirement in another standard - since none are in this one - would frequently be a case of reinventing the wheel.

My solution has been to reorder the requirements under "Design for Containment" which should be the main focus of hazard control, provide other NFPA standards as a resource for design guidance not provided in this section and finally allow a risk assessment where all else fails. Actually since most other standards allow equivalency approaches, if not exactly defined as a 'risk assessment I would not be unhappy to see existing 8.3.1 eliminated.

Existing A.8.3.2 only a placeholder - should be deleted.

**Submitter Information Verification**

**Submitter Full Name:** Henry Febo  
**Organization:** FM Global  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Fri Nov 15 15:14:26 EST 2013

**Committee Statement**
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<tr>
<td>Resolution:</td>
<td>The Committee is not clear on the intent of the submitter based on the proposed changes in the comment and the supporting substantiation. If the changes are made then the provisions would only apply to Design for Containment which is not the intent and would conceivably weaken the standard.</td>
</tr>
</tbody>
</table>
8.3.3.1.2 *
Where it is necessary to make changes to an existing system, all changes shall be managed in accordance with the management of change requirements in 9.9.

Statement of Problem and Substantiation for Public Comment

A more specific reference to the applicable portion of chapter 9 is warranted.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organisation: Frank Risk Solutions, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 23:27:54 EST 2013

Committee Statement

Committee Action: Accepted
Statement: A more specific reference to the applicable portion of chapter 9 is warranted.
8.3.3.1.3 *
The system shall be designed and maintained to ensure that the air/gas velocity used shall meet or exceed the minimum required to keep the interior surfaces of all piping or ducting free of accumulations under all operating modes.

Statement of Problem and Substantiation for Public Comment

These systems are designed to meet this requirement under normal operating ranges. The phrase ‘under all operating modes’ has been deleted as in an upset condition, these systems will be operating outside its design parameters and may fail (product choke).

Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 14:10:06 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Statement: These systems are designed to meet this requirement under normal operating ranges. The phrase ‘under all operating modes’ has been deleted as in an upset condition, these systems will be operating outside its design parameters and may fail (product choke).

Annex: Revised to clarify ambiguous language.
8.3.3.1.3*
The system shall be designed and maintained to ensure that the air/gas velocity used shall meet or exceed the minimum required to keep the interior surfaces of all piping or ducting free of accumulations under all operating modes.

Comment: revise this section to read as follows:
The system shall be designed and maintained to ensure that the air/gas velocity used shall meet or exceed the minimum required to keep the interior surfaces of all piping or ducting free of accumulations under all operating modes. The term "operating modes" does not include emergency shutdowns, shutdowns resulting from loss of power or equipment or system failure.

Statement of Problem and Substantiation for Public Comment

Substantiation: This clarification is needed because the standard ties the requirement to “operating modes,” but does not define that term.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement
| **Committee Action:** | Rejected but see related SR |
| **Resolution:** | SR-67-NFPA 652-2014 |
| **Statement:** | These systems are designed to meet this requirement under normal operating ranges. The phrase 'under all operating modes' has been deleted as in an upset condition, these systems will be operating outside its design parameters and may fail (product choke). Annex: Revised to clarify ambiguous language. |
8.3.3.1.3 *

The system shall be designed and maintained to ensure that the air/gas velocity used shall meet or exceed the minimum required to keep the interior surfaces of all piping or ducting free of accumulations under all operating modes. The term “operating modes” does not include emergency shutdowns, shutdowns resulting from loss of power or equipment or system failure.

Statement of Problem and Substantiation for Public Comment

This clarification is needed because the standard ties the requirement to “operating modes,” but does not define that term.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 14:17:54 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Statement: These systems are designed to meet this requirement under normal operating ranges. The phrase ‘under all operating modes’ has been deleted as in an upset condition, these systems will be operating outside its design parameters and may fail (product choke).

Annex: Revised to clarify ambiguous language.
8.3.3.1.3, Revised text

Comment: revise this section to read as follows:

The system shall be designed and maintained to ensure that the air/gas velocity used shall meet or exceed the minimum required to keep the interior surfaces of all piping or ducting free of accumulations under all operating modes. The term "operating modes" does not include emergency shutdowns, shutdowns resulting from loss of power or equipment or system failure.

Statement of Problem and Substantiation for Public Comment

Substantiation: This clarification is needed because the standard ties the requirement to "operating modes," but does not define that term.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.
Street Address: 
City: 
State: 
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Submittal Date: Fri Nov 08 16:26:21 EST 2013

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<td>Statement:</td>
<td>These systems are designed to meet this requirement under normal operating ranges. The phrase ‘under all operating modes’ has been deleted as in an upset condition, these systems will be operating outside its design parameters and may fail (product choke). Annex: Revised to clarify ambiguous language.</td>
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</tbody>
</table>
8.3.3.2.3 *

Pneumatic conveying systems conveying combustible particulate solids and posing an explosion hazard shall be protected in accordance with Section 8.8.

Statement of Problem and Substantiation for Public Comment

The current text would require protective features on conveying systems that pose no hazard. Dense-phase pneumatic conveying systems can be shown to be incapable of supporting continuing combustion but would still be subject to the requirements of this section. The revised text limits the applicability of this section to those systems that pose a hazard.

Submitter Information Verification

Submitter Full Name: John Cholin
Organization: J. M. Cholin Consultants Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 11:23:19 EST 2013

Committee Statement

Committee Action: Accepted
Resolution: SR-68-NFPA 652-2014
Statement: The current text would require protective features on conveying systems that pose no hazard. Dense-phase pneumatic conveying systems can be shown to be incapable of supporting continuing combustion but would still be subject to the requirements of this section. The revised text limits the applicability of this section to those systems that pose a hazard.
8.3.3.3.1 *
At each collection point, the system shall be designed to achieve the minimum required face velocity for dust capture over the entire opening of the hood or pickup point.

Statement of Problem and Substantiation for Public Comment

Flow dynamics thru an opening are such that at the edges of the hood the velocity is lower than the center there by creating an instance where the face velocity at the edges of pickup hoods may be lower than design velocity. Also in very large hoods, ie: 40' x 8' loading hood over an open top semi truck, the goal is not to maintain minimum velocity across the entire hood, but at the trailer hood interface which is a smaller area.

Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 14:16:02 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Statement: Section 8.3.3.3.1 Dust Collection, Collection Points:

a. Section indicates that the collection point hoods or pickup points shall be designed to achieve the minimum required face velocity for dust capture over the entire opening of the hood or pickup point. There are a multitude of effective hood and dust collector designs, and not all meet this requirement. Larger hoods, in particular, often don't have uniform airflow across the entire opening, but are designed to ensure the hood perimeter does have adequate airflow and they are therefore effective. Recommended language change:

b. At each collection point, the system shall be designed to achieve the minimum required face velocity for effective dust capture over the entire opening of the hood or pickup point.
Public Comment No. 26-NFPA 652-2013 [Section No. 8.3.3.3.1]

8.3.3.3.1 *
At each collection point, the system shall be designed to achieve the minimum required face velocity for dust capture over the entire opening of the hood or pickup point.

Statement of Problem and Substantiation for Public Comment

Section 8.3.3.3.1 Dust Collection, Collection Points:

a. Section indicates that the collection point hoods or pickup points shall be designed to achieve the minimum required face velocity for dust capture over the entire opening of the hood or pickup point. There are a multitude of effective hood and dust collector designs, and not all meet this requirement. Larger hoods, in particular, often don’t have uniform airflow across the entire opening, but are designed to ensure the hood perimeter does have adequate airflow and they are therefore effective. Recommended language change:

b. At each collection point, the system shall be designed to achieve the minimum required face velocity for effective dust capture over the entire opening of the hood or pickup point.

Submitter Information Verification

Submitter Full Name: Jennifer Gradnigo
Organization: CRA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Oct 09 13:28:31 EDT 2013

Committee Statement
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<td><strong>Resolution:</strong></td>
<td>SR-69-NFPA 652-2014</td>
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<tr>
<td><strong>Statement:</strong></td>
<td>Section 8.3.3.3.1 Dust Collection, Collection Points:</td>
</tr>
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<td>a. Section indicates that the collection point hoods or pickup points shall be designed to achieve the minimum required face velocity for dust capture over the entire opening of the hood or pickup point. There are a multitude of effective hood and dust collector designs, and not all meet this requirement. Larger hoods, in particular, often don’t have uniform airflow across the entire opening, but are designed to ensure the hood perimeter does have adequate airflow and they are therefore effective. Recommended language change:</td>
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<td>b. At each collection point, the system shall be designed to achieve the minimum required face velocity for effective dust capture over the entire opening of the hood or pickup point.</td>
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</table>
8.3.3.3.5 *

Dust collection systems that remove material from operations that generate flames, sparks, or hot material under normal operating conditions shall not be interconnected with dust collection systems without isolation that transport combustible particulate solids or hybrid mixtures. (See 8.8.4.)

Statement of Problem and Substantiation for Public Comment

The current text does not seem to make sense. I am not convinced that isolation can be achieved. Keep the sparks and ignitions sources away from deflagrable dust clouds!

Submitter Information Verification

Submitter Full Name: John Cholin
Organization: J. M. Cholin Consultants Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 11:26:54 EST 2013

Committee Statement

Committee Action: Accepted
Resolution: SR-70-NFPA 652-2014
Statement: The current text does not seem to make sense. I am not convinced that isolation can be achieved. Keep the sparks and ignitions sources away from deflagrable dust clouds!
8.3.3.4.3*
Where ignition-sensitive materials are collected, vacuum tools shall be constructed of metal or static dissipative materials and provide proper grounding to the hose.

Statement of Problem and Substantiation for Public Comment

The TC should define ignition sensitive materials. Is there an MIE value that the TC has in mind?

Submitter Information Verification

<table>
<thead>
<tr>
<th>Submitter Full Name:</th>
<th>Craig Froehling</th>
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<tbody>
<tr>
<td>Organization:</td>
<td>Cargill, Inc.</td>
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<td>Tue Nov 12 14:22:13 EST 2013</td>
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Committee Statement

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<td>Resolution:</td>
<td>The Committee rejected adding a specific MIE value in the mandatory text as recommended by these comments, but has modified the annex for this section, A.8.3.3.4.3 changing the limit of MIE from 30 mJ to 100 mJ, which should limit the types of materials subject to these requirements regarding ignition-sensitive materials.</td>
</tr>
</tbody>
</table>
8.3.3.4.3*
Where ignition-sensitive materials are collected, vacuum tools shall be constructed of metal or static dissipative materials and provide proper grounding to the hose.

Statement of Problem and Substantiation for Public Comment

Section 8.3.3.4.3 Vacuum Systems, Ignition Sensitive Materials:

a. Refers to "ignition sensitive" materials and the need to use metal or static dissipating central vacuum equipment. The Appendix provides additional guidance indicating that these are materials with a Minimum Ignition Energy of 30 mJ or less. There is some concern that the 30 mJ threshold is too low, and NFPA should re-evaluate.

Submitter Information Verification

Submitter Full Name: Jennifer Gradnigo
Organization: CRA
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Oct 09 13:31:06 EDT 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee rejected adding a specific MIE value in the mandatory text as recommended by these comments, but has modified the annex for this section, A.8.3.3.4.3 changing the limit of MIE from 30 mJ to 100 mJ, which should limit the types of materials subject to these requirements regarding ignition-sensitive materials.
Public Comment No. 219-NFPA 652-2013 [ New Section after 8.3.4.1.2 ]

8.3.4.1.1.3, New text

Comment: Insert the following new section:

8.3.4.1.1.3 Rotary drum filters shall be permitted to be located indoors without protection from combustible dust hazards when all of the following criteria are met:

1. The drum filter is designed to prevent the formation of a combustible dust cloud within the air-material separator enclosure housing the drum filter;
2. The drum filter has sprinkler protection; and
3. AMS downstream from the rotary drum filter shall be protected in accordance with Section 8.8.

Statement of Problem and Substantiation for Public Comment

Substantiation: Rotary drum filters have long been used in the textile and cellulosic industries, and have proven to be inherently safe from deflagration. The rotating media drum’s filter media contains only a minimal amount of dust at any time during use which is never suspended in air – in contrast to baghouse operation. It is only vacuumed off a felt on the rotating drum with vacuum nozzles similar to home vacuum cleaner nozzles and conveyed to a secondary (conventional) AMS (e.g., cyclone) which should be protected in accordance with this standard. As it is written, it appears that this document would disallow interior rotary drum filters by taking away the qualifying requirement of “where an explosion hazard exists” arbitrarily requiring protection on equipment that (i) does not require protection and (ii) is impossible to protect with chemical suppression or relief venting.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 14:47:57 EST 2013

Committee Statement
Committee Action: Rejected but held

Resolution: These comments propose addition of new text regarding rotary drum filters and where they are permitted to be located and with what protection features. The Committee is not familiar enough with these devices and needs more information to verify the type of equipment (does it have a housing or is it more like enclosureless AMS) and how does the design prevent the formation of a dust cloud? Since this type of information has not been provided in the substantiation for these comments, the Committee believes it is appropriate to act at this time to reject, but hold these comments for the next revision cycle.
Public Comment No. 400-NFPA 652-2013 [New Section after 8.3.4.1.1.2]

8.3.4.1.1.3, New text
Rotary drum filters shall be permitted to be located indoors without protection from combustible dust hazards when all of the following criteria are met:

1. The drum filter is designed to prevent the formation of a combustible dust cloud within the air-material separator enclosure housing the drum filter;
2. The drum filter has sprinkler protection; and
3. AMS downstream from the rotary drum filter shall be protected in accordance with Section 8.8.

Statement of Problem and Substantiation for Public Comment

Rotary drum filters have long been used in the textile and cellulosic industries, and have proven to be inherently safe from deflagration. The rotating media drum’s filter media contains only a minimal amount of dust at any time during use which is never suspended in air – in contrast to baghouse operation. It is only vacuumed off a felt on the rotating drum with vacuum nozzles similar to home vacuum cleaner nozzles and conveyed to a secondary (conventional) AMS (e.g., cyclone) which should be protected in accordance with this standard. As it is written, it appears that this document would disallow interior rotary drum filters by taking away the qualifying requirement of “where an explosion hazard exists” arbitrarily requiring protection on equipment that (i) does not require protection and (ii) is impossible to protect with chemical suppression or relief venting.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 09:40:05 EST 2013

Committee Statement
Committee Action: Rejected but held

Resolution: These comments propose addition of new text regarding rotary drum filters and where they are permitted to be located and with what protection features. The Committee is not familiar enough with these devices and needs more information to verify the type of equipment (does it have a housing or is it more like enclosureless AMS) and how does the design prevent the formation of a dust cloud? Since this type of information has not been provided in the substantiation for these comments, the Committee believes it is appropriate to act at this time to reject, but hold these comments for the next revision cycle.
8.3.4.1.1.3

Comment: Insert the following new section:

8.3.4.1.1.3 Rotary drum filters shall be permitted to be located indoors without protection from combustible dust hazards when all of the following criteria are met:

1. The drum filter is designed to prevent the formation of a combustible dust cloud within the air-material separator enclosure housing the drum filter;
2. The drum filter has sprinkler protection; and
3. AMS downstream from the rotary drum filter shall be protected in accordance with Section 8.8.

Statement of Problem and Substantiation for Public Comment

Substantiation: Rotary drum filters have long been used in the textile and cellulosic industries, and have proven to be inherently safe from deflagration. The rotating media drum’s filter media contains only a minimal amount of dust at any time during use which is never suspended in air – in contrast to baghouse operation. It is only vacuumed off a felt on the rotating drum with vacuum nozzles similar to home vacuum cleaner nozzles and conveyed to a secondary (conventional) AMS (e.g., cyclone) which should be protected in accordance with this standard. As it is written, it appears that this document would disallow interior rotary drum filters by taking away the qualifying requirement of “where an explosion hazard exists” arbitrarily requiring protection on equipment that (i) does not require protection and (ii) is impossible to protect with chemical suppression or relief venting.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.

Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 08 16:27:53 EST 2013

Committee Statement
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</tr>
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</table>
Public Comment No. 419-NFPA 652-2013 [Section No. 8.3.5]

8.3.5 - Recycle of AMS Clean Air AMS Exhaust.

8.3.5.1
Exhaust air from the final air-material separator shall be discharged outside of buildings to a restricted area and away from air intakes separated from clean air intakes for the building.

8.3.5.2 *
Air from air-material separators shall be permitted to be recirculated directly back to the pneumatic conveying system.

8.3.5.3 *
Recycling of air-material separator exhaust to buildings or rooms shall be permitted when all of the following requirements are met:

1) Combustible or flammable gases or vapors are not present either in the intake or the recycled air in concentrations above applicable industrial hygiene exposure limits or 1 percent of the LFL, whichever is lower.

2) Combustible particulate solids are not present in the recycled air in concentrations above applicable industrial hygiene exposure limits or 1 percent of the MEC, whichever is lower.

3) The oxygen concentration of the recycled air stream is between 19.5 percent and 23.5 percent by volume.

4) Provisions are incorporated to prevent transmission of flame and pressure effects from a deflagration in an air-material separator back to the facility unless a process hazards analysis indicates that those effects do not pose a threat to the facility or the occupants.

5) Provisions are incorporated to prevent transmission of smoke and flame from a fire in an air-material separator back to the facility unless a process hazards analysis indicates that those effects do not pose a threat to the facility or the occupants.

6) The system includes a method for detecting air-material separator malfunctions that would reduce collection efficiency and allow increases in the amount of combustible particulate solids returned to the building.

7) The building or room to which the recycled air is returned meets the requirements of Section 8.4.

8) Recycled-air ducts are inspected and cleaned at least annually.

Statement of Problem and Substantiation for Public Comment

The revised title makes more sense. The revised text states the requirement more clearly.

Submitter Information Verification
<table>
<thead>
<tr>
<th><strong>Submitter Full Name:</strong></th>
<th>John Cholin</th>
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<tbody>
<tr>
<td><strong>Organization:</strong></td>
<td>J. M. Cholin Consultants Inc.</td>
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<td><strong>Street Address:</strong></td>
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**Committee Statement**

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<tr>
<td><strong>Statement:</strong></td>
<td>The revised title makes more sense. The revised text states the requirement more clearly.</td>
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</table>
Public Comment No. 191-NFPA 652-2013 [ Section No. 8.3.5.3 ]

8.3.5.3 *
Recycling of air-material separator exhaust to buildings or rooms shall be permitted when all of the following requirements are met:

(1) Combustible or flammable gases or vapors are not present either in the intake or the recycled air in concentrations above applicable industrial hygiene exposure limits or 1 percent of the LFL, whichever is lower.

(2)* Combustible particulate solids are not present in the recycled air in concentrations above applicable industrial hygiene exposure limits or 1% of the MEC, whichever is lower.

(3)* The oxygen concentration of the recycled air stream is between 19.5 percent and 23.5 percent by volume.

(4) Provisions are incorporated to prevent transmission of flame and pressure effects from a deflagration in an air-material separator back to the facility unless a process hazards analysis indicates that those effects do not pose a threat to the facility or the occupants.

(5) Provisions are incorporated to prevent transmission of smoke and flame from a fire in an air-material separator back to the facility unless a process hazards analysis indicates that those effects do not pose a threat to the facility or the occupants.

(6) The system includes a method for detecting air-material separator malfunctions that would reduce collection efficiency and allow increases in the amount of combustible particulate solids returned to the building.

(7) The building or room to which the recycled air is returned meets the requirements of Section 8.4.

(8) Recycled-air ducts are inspected and cleaned at least annually.

Statement of Problem and Substantiation for Public Comment

The TC should explain where 1% of MEC as a max concentration in recycled air comes from. Why not 5% or 10%?

Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 14:24:42 EST 2013

Committee Statement
Committee Action: Rejected
Resolution: There is no specific technical recommendation provided by the submitter in this comment, so there is no recommended action for the Committee to consider.
Public Comment No. 329-NFPA 652-2013 [Section No. 8.3.6]

8.3.6 Transfer Points. (Reserved)

Statement of Problem and Substantiation for Public Comment

Reserved sections should not be included in this document.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 15:07:44 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: It is not the intent of the Committee that the "reserved" sections be used to develop any new requirements at this stage in the development of NFPA 652, and "reserved" sections have no mandatory element to them at this stage. The Committee is using the "reserved" sections (like other NFPA committees) to establish a draft structure at this initial document stage indicating through the use of the reserved sections where future content might be developed in subsequent revisions. So, the Committee does not intend to accept the proposed deletion of these sections where they exist and where Public Comments have proposed deletion as part of this Second Draft.
8.4 Housekeeping Control of fugitive dust accumulations.
8.4.1 Methods to Limit Accumulation.

8.4.1 General.

1* Interior surfaces where dust accumulations can occur shall be designed and constructed so as to facilitate cleaning and to minimize combustible dust accumulations.

8.4.1.2 Enclosed building spaces inaccessible to routine housekeeping shall be sealed to prevent dust accumulation.

8.4.1.3* Enclosed building spaces that are difficult to access for routine housekeeping shall be designed to facilitate routine inspection for the purpose of determining the need for periodic cleaning.

8.4.2 Houskeeping

Unless otherwise specified, the requirements of Section 8.4 shall be applied retroactively.

[Renumber the rest of chapter 8 accordingly]

8.4.2 Methodology.
8.4.2.1 Procedure.

8.4.2.1.1* Housekeeping procedures shall be documented in accordance with the requirements of Chapters 7 and 9.

8.4.2.2 Vacuum Cleaning Method.

8.4.2.2.1* For residual accumulations, vacuum cleaning shall be the preferred method.

8.4.2.2.2* Portable vacuum cleaners that meet the following minimum requirements shall be permitted to be used to collect combustible particulate solids:

(1) Materials of construction shall comply with 8.5.7.1.
(2) Hoses shall be conductive or static dissipative.
(3) All conductive components, including wands and attachments, shall be bonded and grounded.

(4) Dust-laden air shall not pass through the fan or blower.

(5) Electrical motors shall not be in the dust-laden air stream unless listed for Class II, Division 1 locations.

(6)* When 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, *Standard for Combustible Metals.*

8.4.2.2.3 *
In Class II electrically classified (hazardous) locations, electrically powered vacuum cleaners shall be listed for the purpose and location, or shall be a fixed-pipe suction system with a remotely located exhauster and air-material separator installed in conformance with Section 8.3, and shall be suitable for the dust being collected.

8.4.2.2.4
Where flammable vapors or gases are present, vacuum cleaners shall be listed for Class I and Class II hazardous locations.

8.4.2.3 *
Sweeping/Shoveling/Scoop and Brush Cleaning Method.

For spills, cleaning with scoops and brushes shall be the preferred method.

8.4.2.4 *
Water Wash Down Cleaning Method.

8.4.2.4.1
The use of water wash down shall be a permitted cleaning method.

8.4.2.4.2
Where the combustible dust being removed is metal or metal-containing dust or powder within the scope of NFPA 484, *Standard on Combustible Metals,* the requirements of NFPA 484 shall be followed.

8.4.2.4.3 *
Where the combustible dust being removed is a water-reactive material, additional precautions shall be taken to control the associated hazards.

8.4.2.5 Water Foam Wash Down Systems. (Reserved)

8.4.2.6 Compressed Air–Blow Down Method.

8.4.2.6.1 *
Blow downs using compressed air or steam shall be permitted to be used for cleaning inaccessible surfaces or surfaces where other methods of cleaning result in greater personal safety risk.

Where blow down using compressed air is used, the following precautions shall be followed:

(1) Vacuum cleaning, sweeping, or water wash down methods are used first to clean surfaces that can be safely accessed prior to using compressed air.

(2) Dust accumulations in the area after vacuum cleaning, sweeping, or water wash down 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 potentially exposed to airborne dust in the area meets, at a minimum, NFPA 70, *National Electrical Code*; NEMA 12 as defined by NEMA 250; or the equivalent.
(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) Where metal or metal-containing dust or powder under the scope of NFPA 484, Standard for Combustible Metal, are present, the requirements of NFPA 484 apply.

8.4.2.7 Steam Blow Down Method. (Reserved)

8.4.3 Training.
Operator and contractor training shall include housekeeping procedures, required personal protective equipment during housekeeping, and proper use of equipment.

8.4.4 Equipment. (Reserved)

8.4.5 Vacuum Trucks.

8.4.5.1 Vacuum trucks shall be grounded and bonded.

8.4.5.2 Vacuum truck hoses and couplings shall be static dissipative or conductive and grounded.

8.4.6 Frequency and Goal.

8.4.6.1 * Housekeeping frequency and accumulation goals shall be established to ensure that the accumulated fugitive dust levels on surfaces do not exceed the threshold housekeeping dust accumulation limits.

8.4.6.2 The threshold housekeeping dust accumulation limits shall be in accordance with the industry or commodity-specific NFPA standard. (See 1.3.1.)

8.4.6.3 * Housekeeping frequency and provisions for unscheduled housekeeping shall include specific requirements establishing time to clean local dust spills or transient releases.

8.4.7 Auditing and Documentation.

8.4.7.1 * Housekeeping effectiveness shall be assessed based on the results of routine scheduled cleaning and inspection, not including transient releases.

8.4.7.2 The owner/operator shall retain documentation that routine scheduled cleaning occurs in accordance with the frequency and accumulation goals established in 8.4.6.1.

**Statement of Problem and Substantiation for Public Comment**

The intent is to consolidate all requirements related to controlling dust accumulations on the same section.

**Submitter Information Verification**

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 21:17:11 EST 2013
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<td>Resolution:</td>
<td>The Committee prefers to retain the title for this section as &quot;Housekeeping&quot; as it believes the term and concept are much better understood than &quot;control of fugitive dust accumulations.&quot;</td>
</tr>
</tbody>
</table>
Public Comment No. 220-NFPA 652-2013 [Section No. 8.4.2.1.1]

8.4.2.1.1*
Housekeeping procedures shall be documented in accordance with the requirements of Chapters 7 and 9.

Comment: Revise this section to read as follows:
Housekeeping procedures shall be documented in accordance with the requirements of Chapters 7 and 9.

Statement of Problem and Substantiation for Public Comment

Substantiation: The proposed requirement to document housekeeping procedures in accordance with Chapters 7 and 9 is not meaningful.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Street Address: 
City:
State:
Zip: 
Submittal Date: Tue Nov 12 14:48:43 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-72-NFPA 652-2014
Statement: The proposed requirement to document housekeeping procedures in accordance with Chapters 7 and 9 is not meaningful. Adequate guidance is provided in A.8.4.2.1.1.
Public Comment No. 306-NFPA 652-2013 [Section No. 8.4.2.1.1]

8.4.2.1.1 *
Housekeeping procedures shall be documented in accordance with the requirements of Chapters 7 and 9.

Statement of Problem and Substantiation for Public Comment

The proposed requirement to document housekeeping procedures in accordance with Chapters 7 and 9 is not meaningful. Adequate guidance is provided in A.8.4.2.1.1, which reads as follows:

A.8.4.2.1.1
Items that should be included in the housekeeping procedure include the following:
(1) A risk assessment that considers the specific characteristics of the dust being cleaned (particle size, moisture content, MEC, MIE) and other safety risks introduced by the cleaning methods used
(2) Personal safety procedures, including fall protection when working at heights
(3) Personal protective equipment (PPE), including flame-resistant garments in accordance with the hazard analysis required by NFPA 2113, Standard on Selection, Care, Use, and Maintenance of Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire
(4) Cleaning sequence
(5) Cleaning methods to be used
(6) Equipment, including lifts, vacuum systems, attachments, and so forth
(7) Cleaning frequency

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Nov 13 14:20:02 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-72-NFPA 652-2014
Statement: The proposed requirement to document housekeeping procedures in accordance with Chapters 7 and 9 is not meaningful. Adequate guidance is provided in A.8.4.2.1.1.
8.4.2.1.1*

Housekeeping procedures shall be documented in accordance with the requirements of Chapters 7 and 9.

Statement of Problem and Substantiation for Public Comment

The proposed requirement to document housekeeping procedures in accordance with Chapters 7 and 9 is not meaningful. Adequate guidance is provided in A.8.4.2.1.1.

Submitter Information Verification

Submitter Full Name: Dale Hansen
Organization: Harrington Group, Inc.
Street Address:  
City:  
State:  
Zip:  
Submittal Date:  Fri Nov 15 13:35:14 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-72-NFPA 652-2014
Statement: The proposed requirement to document housekeeping procedures in accordance with Chapters 7 and 9 is not meaningful. Adequate guidance is provided in A.8.4.2.1.1.
8.4.2.1.1 * 
Housekeeping procedures shall be documented in accordance with the requirements of Chapters 7 and 9.

Comment: Revise this section to read as follows:
Housekeeping procedures shall be documented in accordance with the requirements of Chapters 7 and 9.

Statement of Problem and Substantiation for Public Comment

Substantiation: The proposed requirement to document housekeeping procedures in accordance with Chapters 7 and 9 is not meaningful. The information provided in A.8.4.2.1.1 is adequate.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-72-NFPA 652-2014
Statement: The proposed requirement to document housekeeping procedures in accordance with Chapters 7 and 9 is not meaningful. Adequate guidance is provided in A.8.4.2.1.1.
8.4.2.1.2
Surfaces shall be cleaned in a manner that minimizes the risk of generating a fire or explosion hazard.

Comment: Revise Section 8.4.2.1.2 to read as follows:
Section 8.4.2.1.2 To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, surfaces shall be cleaned in a manner that minimizes the risk of generating a fire or explosion hazard.

Statement of Problem and Substantiation for Public Comment

Substantiation:
As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. This retroactive provision, which seems to imply that all surfaces must be vacuumed or wet cleaned, and never blown down, is impractical and inconsistent with Section 8.4.2.6.2. It would impose this cleaning obligation even if it would reduce the risk well below the acceptable risk level at completely unwarranted costs that would result in an inappropriate allocation of limited resources. The risk should be reduced to an acceptable level rather than to whatever level might be achieved by cleaning in a manner that minimizes the risk of generating a fire or explosion hazard.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement
Committee Action: Rejected
Resolution: As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style.
8.4.2.1.2
Surfaces.
To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, surfaces shall be cleaned in a manner that minimizes the risk of generating a fire or explosion hazard.

Statement of Problem and Substantiation for Public Comment

As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. This retroactive provision, which seems to imply that all surfaces must be vacuumed or wet cleaned, and never blown down, is impractical and inconsistent with Section 8.4.2.6.2. It would impose this cleaning obligation even if it would reduce the risk well below the acceptable risk level at completely unwarranted costs that would result in an inappropriate allocation of limited resources. The risk should be reduced to an acceptable level rather than to whatever level might be achieved by cleaning in a manner that minimizes the risk of generating a fire or explosion hazard.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 14:22:44 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style.
8.4.2.1.2
Surfaces shall be cleaned in a manner such that minimizes the risk of generating a fire or explosion hazard is not unacceptable.

Statement of Problem and Substantiation for Public Comment

As written, the provision requires the user to select the cleaning method that has the lowest risk, even though another method may still have an acceptable risk. The only methods that should be prohibited are those that are unacceptable. The standard should not demand the minimum risk in any provision.

Submitter Information Verification

Submitter Full Name: Dale Hansen
Organization: Harrington Group, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 13:37:07 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-73-NFPA 652-2014
Statement: As written, the provision requires the user to select the cleaning method that has the lowest risk, even though another method may still have an acceptable risk. The only methods that should be prohibited are those that are unacceptable. The standard should not demand the minimum risk in any provision.
8.4.2.1.2
Surfaces shall be cleaned in a manner that minimizes the risk of generating a fire or explosion hazard.

Comment: Revise Section 8.4.2.1.2 to read as follows:
Section 8.4.2.1.2 To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, surfaces shall be cleaned in a manner that minimizes the risk of generating a fire or explosion hazard.

Statement of Problem and Substantiation for Public Comment

Substantiation:

As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. This retroactive provision, which seems to imply that all surfaces must be vacuumed or wet cleaned, and never blown down, is impractical and inconsistent with Section 8.4.2.6.2. It would impose this cleaning obligation even if it would reduce the risk well below the acceptable risk level at completely unwarranted costs that would result in an inappropriate allocation of limited resources. The risk should be reduced to an acceptable level rather than to whatever level might be achieved by cleaning in a manner that minimizes the risk of generating a fire or explosion hazard.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 08 16:30:44 EST 2013

Committee Statement
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<td>As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style.</td>
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</table>
Public Comment No. 603-NFPA 652-2013 [ Section No. 8.4.2.1.3 ]

| **8.4.2.1.3** | *Cleaning methods shall be in accordance with this standard **and or** the industry or commodity-specific NFPA standard. (See 1.3.1.)* |

**Statement of Problem and Substantiation for Public Comment**

The word “and” needs to be changed to “or”, and the cross-reference should be deleted. The feasibility of cleaning methods are so industry- or commodity-dependent that industry or commodity-specific standards should control if there is a divergence on cleaning methods between them and this standard.

**Submitter Information Verification**

- **Submitter Full Name:** ARTHUR SAPPER
- **Organization:** for United States Beet Sugar Association
- **Street Address:**
- **City:**
- **State:**
- **Zip:**
- **Submittal Date:** Mon Nov 18 10:26:31 EST 2013

**Committee Statement**

- **Committee Action:** Rejected but see related SR
- **Resolution:** SR-74-NFPA 652-2014
- **Statement:** The word “and” needs to be changed to “or”, and the cross-reference should be deleted. The feasibility of cleaning methods are so industry- or commodity-dependent that industry or commodity-specific standards should control if there is a divergence on cleaning methods between them and this standard.
8.4.2.2 Vacuum Cleaning Method.

8.4.2.2.1* For residual accumulations routine cleaning and for removal of residual accumulations from spills, vacuum cleaning shall be the preferred method.

8.4.2.2.2* Portable vacuum cleaners that meet the following minimum requirements shall be permitted to be used to collect combustible particulate solids in unclassified (non-hazardous) areas:

1. Materials of construction shall comply with 8.5.7.1.
2. Hoses shall be conductive or static dissipative.
3. All conductive components, including wands and attachments, shall be bonded and grounded.
4. Dust-laden air shall not pass through the fan or blower.
5. Electrical motors shall not be in the dust-laden air stream unless listed for Class II, Division 1 locations.
6.* When 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, Standard for Combustible Metals.

8.4.2.2.3* In Class II electrically classified (hazardous) locations, electrically powered vacuum cleaners shall be listed for the purpose and location, or shall be a fixed-pipe suction system with a remotely located exhauster and air-material separator installed in conformance with Section 8.3, and shall be suitable for the dust being collected.

8.4.2.2.4 Where flammable vapors or gases are present, vacuum cleaners shall be listed for Class I and Class II hazardous locations.

Statement of Problem and Substantiation for Public Comment

The renumbering of this section presumes that public comment 150 is adopted.

8.4.2.3.1 (new numbering) is revised to clarify that vacuum cleaning is the preferred method for routine cleaning and for removal of residual material after sweeping, etc., per 8.4.2.2.

8.4.2.3.2 is revised to clarify the committee's intent that the specified criteria define vacuums deemed to be suitable for cleaning up dust in general purpose areas.

Submitter Information Verification
Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Submittal Date: Mon Nov 11 21:35:53 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-111-NFPA 652-2014
Statement:

The renumbering of this section presumes that public comment 150 is adopted.

The Committee accepted the recommendation of PC No. 197 and deleted the statement that vacuum cleaning is preferred.

8.4.2.3.2 is revised to clarify the committee's intent that the specified criteria define vacuums deemed to be suitable for cleaning up dust in general purpose areas.
8.4.2.2.1 For residual accumulations, vacuum cleaning shall be the preferred method.

**Statement of Problem and Substantiation for Public Comment**

This requirement as been deleted as it is inaccurate to state vacuum cleaning is the fundamental preferred method of sanitation for all industries. In a flour mill or packaging area for instance the preferred method of residual dust removal from the floor is a ‘dust mop’ dampened with food grade mineral oil.

**Submitter Information Verification**

Submitter Full Name: Craig Froehling  
Organization: Cargill, Inc.  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Tue Nov 12 14:27:49 EST 2013

**Committee Statement**

Committee Action: Rejected but see related SR  
Resolution: SR-111-NFPA 652-2014  
Statement: The renumbering of this section presumes that public comment 150 is adopted.

The Committee accepted the recommendation of PC No. 197 and deleted the statement that vacuum cleaning is preferred.

8.4.2.3.2 is revised to clarify the committee's intent that the specified criteria define vacuums deemed to be suitable for cleaning up dust in general purpose areas.
8.4.2.3  Sweeping/Shoveling/Scoop and Brush Cleaning Method.
For spills, cleaning with scoops and brushes shall be the preferred method.

Statement of Problem and Substantiation for Public Comment

The proposal moves this paragraph so that it is before the paragraph addressing use of vacuum cleaners (since sweeping, etc., is the preferred method of cleaning up spills).

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address: 
City:
State:
Zip:
Submittal Date: Mon Nov 11 21:31:13 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee did not approve moving this paragraph within the section.
Public Comment No. 152-NFPA 652-2013 [Section No. 8.4.2.4.3]

8.4.2.4.3 *
Where the combustible dust being removed is a water-reactive material, additional precautions water wash down shall be taken to control the associated hazards prohibited.

Statement of Problem and Substantiation for Public Comment

Water wash down should not be used with water-reactive materials.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 21:46:30 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee does not support the prohibition that acceptance of this comment would bring against using water at all. Based on the annex there could be circumstances such as with mixtures or recycling applications where water is not suitable.
Public Comment No. 330-NFPA 652-2013 [ Section No. 8.4.2.5 ]

8.4.2.5 – Water Foam Wash Down Systems (Reserved) –

Statement of Problem and Substantiation for Public Comment

Reserved sections should not be included in this document since there has been no opportunity to comment.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Nov 13 15:09:33 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: It is not the intent of the Committee that the "reserved" sections be used to develop any new requirements at this stage in the development of NFPA 652, and "reserved" sections have no mandatory element to them at this stage. The Committee is using the "reserved" sections (like other NFPA committees) to establish a draft structure at this initial document stage indicating through the use of the reserved sections where future content might be developed in subsequent revisions. So, the Committee does not intend to accept the proposed deletion of these sections where they exist and where Public Comments have proposed deletion as part of this Second Draft.
8.4.2.6 Compressed Air Blow Down Method.

Blow downs using compressed air or steam shall be permitted to be used for cleaning inaccessible surfaces or surfaces where other methods of cleaning result in greater personal safety risk.

8.4.2.6.1 *
Where blow down using compressed air is used, the following precautions shall be followed:

1. Vacuum cleaning, sweeping, or water wash down methods are used first to clean surfaces that can be safely accessed prior to using compressed air.

2. Dust accumulations in the area after vacuum cleaning, sweeping, or water wash down do not exceed the threshold housekeeping dust accumulation determined in 7.3.4.2.2.

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 potentially exposed to airborne dust in the area meets, at a minimum, NFPA 70, National Electrical Code; NEMA 12 as defined by NEMA 250; or the equivalent.

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. Where metal or metal-containing dust or powder under the scope of NFPA 484, Standard for Combustible Metal, are present, the requirements of NFPA 484 apply.

Statement of Problem and Substantiation for Public Comment

The proposed revision removes reference to steam blow down, as this is to be covered in 8.4.2.7.

Item 2 in 8.4.2.6.2 is clarified to point out where dust thresholds are determined.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Nov 11 21:53:29 EST 2013

Committee Statement
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<td><strong>Resolution:</strong></td>
<td>SR-77-NFPA 652-2014</td>
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<tr>
<td><strong>Statement:</strong></td>
<td>The proposed revision removes reference to steam blowdown, as this is to be covered in 8.4.2.7.</td>
</tr>
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</table>

Item 2 in 8.4.2.6.2 is clarified to point out where dust thresholds are determined. The Committee does not support deletion of item (2) as it only applies if item (1) is satisfied, otherwise the accumulations do not apply.

Annex: Blowdown can be an acceptable means with the appropriate safeguards. Other methods may pose other significant hazards. For example wash down with water may be an acceptable method for dust removal, but introduction of water into a facility may create an environment for microbiological growth creating a significant food safety risk.
8.4.2.6.1 *
Blow downs using compressed air or steam shall be permitted to be used for cleaning inaccessible surfaces or surfaces where other methods of cleaning result in greater personal safety risk as a cleaning method.

Statement of Problem and Substantiation for Public Comment

Determining which cleaning method is of greater personal safety risk is subjective. Simply stating its permitted and following up with 8.4.2.6.2 for appropriate precautions with this method is sufficient instruction for Users.

Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Tue Nov 12 14:30:27 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-77-NFPA 652-2014
Statement: The proposed revision removes reference to steam blowdown, as this is to be covered in 8.4.2.7.

Item 2 in 8.4.2.6.2 is clarified to point out where dust thresholds are determined. The Committee does not support deletion of item (2) as it only applies if item (1) is satisfied, otherwise the accumulations do not apply.

Annex: Blowdown can be an acceptable means with the appropriate safeguards. Other methods may pose other significant hazards. For example wash down with water may be an acceptable method for dust removal, but introduction of water into a facility may create an environment for microbiological growth creating a significant food safety risk.
8.4.2.6.1 *

Blow downs using compressed air or steam shall be permitted to be used for cleaning inaccessible surfaces or surfaces where other methods of cleaning are ineffective or result in greater personal safety risk.

Statement of Problem and Substantiation for Public Comment

Section 8.4.2.6.1 and Appendix, Compressed Air Blow Down:

a. These sections discuss the use of compressed air for cleaning combustible dusts, and state that compressed air can be used only “where other methods of cleaning result in greater personal safety risk”. It is unclear what the intent of this statement is, and the Appendix provides little help in assessing relative personal risk in this area. Note that other sections provide appropriate precautions to follow when using blow down.

b. Recommended revisions to this section: Blow downs using compressed air or steam shall be permitted to be used for cleaning inaccessible surfaces where other methods of cleaning are ineffective or result in greater personal safety risk.

Submitter Information Verification

Submitter Full Name: Jennifer Gradnigo
Organization: CRA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Oct 09 13:33:03 EDT 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-77-NFPA 652-2014
Statement: The proposed revision removes reference to steam blowdown, as this is to be covered in 8.4.2.7.

Item 2 in 8.4.2.6.2 is clarified to point out where dust thresholds are determined. The Committee does not support deletion of item (2) as it only applies if item (1) is satisfied, otherwise the accumulations do not apply.

Annex: Blowdown can be an acceptable means with the appropriate safeguards. Other methods may pose other significant hazards. For example, wash down with water may be an acceptable method for dust removal, but introduction of water into a facility may create an environment for microbiological growth creating a significant food safety risk.
8.4.2.6.2 *
Where blow down using compressed air is used, the following precautions shall be followed:

(1) Vacuum cleaning, sweeping, or water wash down methods are used first to clean surfaces that can be safely accessed prior to using compressed air.

(2) Dust accumulations in the area after vacuum cleaning, sweeping, or water wash down 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 potentially exposed to airborne dust in the area meets, at a minimum, NFPA 70, National Electrical Code; NEMA 12 as defined by NEMA 250; or the equivalent.

(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 blow down method is complete, residual dust on lower surfaces are cleaned prior to re-introduction of potential ignition sources.

(7) Where metal or metal-containing dust or powder under the scope of NFPA 484, Standard for Combustible Metal, are present, the requirements of NFPA 484 apply.

Statement of Problem and Substantiation for Public Comment

An overhead environment (e.g., ledges) may be inaccessible to other cleaning methods and be above threshold accumulation, but represent a very small % of total floor area – resulting in a low hazard. A statement was added that dust from blow down activities should be removed prior to re-introducing potential ignition sources.

Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 14:33:33 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-77-NFPA 652-2014
Statement: The proposed revision removes reference to steam blowdown, as this is to be covered in 8.4.2.7.

Item 2 in 8.4.2.6.2 is clarified to point out where dust thresholds are determined. The Committee does not support deletion of item (2) as it only applies if item (1) is satisfied, otherwise the accumulations do not apply.

Annex: Blowdown can be an acceptable means with the appropriate safeguards. Other methods may pose other significant hazards. For example wash down with water may be an acceptable method for dust removal, but introduction of water into a facility may create an environment for microbiological growth creating a significant food safety risk.
8.4.2.6.2*

Where blow down using compressed air is used, the following precautions shall be followed:

(1) Vacuum cleaning, sweeping, or water wash down methods are used first to clean surfaces that can be safely accessed prior to using compressed air.

(2) Dust accumulations in the area after vacuum cleaning, sweeping, or water wash down 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 potentially exposed to airborne dust in the area meets, at a minimum, NFPA 70, National Electrical Code; NEMA 12 as defined by NEMA 250; or the equivalent.

(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) Where metal or metal-containing dust or powder under the scope of NFPA 484, Standard for Combustible Metal, are present, the requirements of NFPA 484 apply.

Comment: Revise Section 8.4.2.6.2 to read as follows:

To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, where blow down using compressed air is used, the following precautions shall be followed:

(1) Vacuum cleaning, sweeping, or water wash down methods are used first to clean surfaces that can be safely accessed prior to using compressed air.

(2) Dust accumulations in the area after vacuum cleaning, sweeping, or water wash down 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 potentially exposed to airborne dust in the area meets, at a minimum, NFPA 70, National Electrical Code; NEMA 12 as defined by NEMA 250; or the equivalent.

(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) Where metal or metal-containing dust or powder under the scope of NFPA 484, Standard for Combustible Metal, are present, the requirements of NFPA 484 apply.
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).

All electrical equipment potentially exposed to airborne dust in the area meets, at a minimum, NFPA 70, National Electrical Code; NEMA 12 as defined by NEMA 250; or the equivalent.

Where metal or metal-containing dust or powder under the scope of NFPA 484, Standard for Combustible Metal, are present, the requirements of NFPA 484 apply.

**Statement of Problem and Substantiation for Public Comment**

**Substantiation:**
As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. This retroactive provision appears to be inappropriately written in a way designed to achieve zero risk. If, per item5, "all ignition sources and hot surfaces capable of igniting a dust cloud or dust layer are shut down or removed from the area," it is unclear why the remainder of the precautionary measures is required.

**Submitter Information Verification**

Submitter Full Name: Richard Krock  
Organization: The Vinyl Institute  
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Street Address:  
City:  
State:  
Zip:  
Submittal Date: Tue Nov 12 14:56:20 EST 2013

**Committee Statement**

Committee Action: Rejected  
Resolution: As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style.
8.4.2.6.2 * Where, To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, where blow down using compressed air is used, the following precautions shall be followed:

(1) Vacuum cleaning, sweeping, or water wash down methods are used first to clean surfaces that can be safely accessed prior to using compressed air.

(2) Dust accumulations in the area after vacuum cleaning, sweeping, or water wash down 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 potentially exposed to airborne dust in the area meets, at a minimum, NFPA 70, National Electrical Code; NEMA 12 as defined by NEMA 250; or the equivalent.

(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) Where metal or metal-containing dust or powder under the scope of NFPA 484, Standard for Combustible Metal, are present, the requirements of NFPA 484 apply.

Statement of Problem and Substantiation for Public Comment

As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. This retroactive provision appears to be inappropriately written in a way designed to achieve zero risk. If, per item 5, “all ignition sources and hot surfaces capable of igniting a dust cloud or dust layer are shut down or removed from the area,” it is unclear why the remainder of the precautionary measures is required.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 14:23:37 EST 2013

Committee Statement
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<td>As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style.</td>
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8.4.2.6.2 *
Where blow down using compressed air is used, the following precautions shall be followed:

1. Vacuum cleaning, sweeping, or water wash down methods are used first to clean surfaces that can be safely accessed prior to using compressed air.

2. Dust accumulations in the area after vacuum cleaning, sweeping, or water wash down 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, potentially including lighting, potentially exposed to airborne dust in the area meets, at a minimum, during cleaning is Listed as suitable for a Class 2, Division 2 Hazardous Location in accordance with NFPA 70, National Electrical Code; NEMA 12 as defined by NEMA 250; or the equivalent.

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. Where metal or metal-containing dust or powder under the scope of NFPA 484, Standard for Combustible Metal, are present, the requirements of NFPA 484 apply.

Statement of Problem and Substantiation for Public Comment

Reworded the text to be more consistent with the normally encountered language. Text broadened to explicitly cover lighting. The reference to NEMA 12 enclosures should be in the Annex, not the body of the document.

Submitter Information Verification

Submitter Full Name: John Cholin
Organization: J. M. Cholin Consultants Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 11:42:54 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-77-NFPA 652-2014
Statement: The proposed revision removes reference to steam blowdown, as this is to be covered in 8.4.2.7.

Item 2 in 8.4.2.6.2 is clarified to point out where dust thresholds are determined. The Committee does not support deletion of item (2) as it only applies if item (1) is satisfied, otherwise the accumulations do not apply.

Annex: Blowdown can be an acceptable means with the appropriate safeguards. Other methods may pose other significant hazards. For example wash down with water may be an acceptable method for dust removal, but introduction of water into a facility may create an environment for microbiological growth creating a significant food safety risk.
Where blow down using compressed air is used, the following precautions shall be followed:

(1) Vacuum cleaning, sweeping, or water wash down methods are used first to clean surfaces that can be safely accessed prior to using compressed air.

(2) Dust accumulations in the area after vacuum cleaning, sweeping, or water wash down 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 potentially exposed to airborne dust in the area meets, at a minimum, NFPA 70, National Electrical Code; NEMA 12 as defined by NEMA 250; or the equivalent.

(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) Where metal or metal-containing dust or powder under the scope of NFPA 484, Standard for Combustible Metal, are present, the requirements of NFPA 484 apply.

To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, where blow down using compressed air is used, the following precautions shall be followed:

A.8.4.2.6.2

All of the listed precautions might not be required for limited use of compressed air for cleaning minor accumulations of dust from machines or other surfaces between shifts. A risk assessment should be conducted to determine which precautions are required for the specific conditions under which compressed air is being used.

(1) Vacuum cleaning, sweeping, or water wash down methods are used first to clean surfaces that can be safely accessed prior to using compressed air.

(2) Dust accumulations in the area after vacuum cleaning, sweeping, or water wash down 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 potentially exposed to airborne dust in the area meets, at a minimum, NFPA 70, National Electrical Code; NEMA 12 as defined by NEMA 250; or the equivalent.

(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) Where metal or metal-containing dust or powder under the scope of NFPA 484, Standard for Combustible Metal, are present, the requirements of NFPA 484 apply.

(7) Vacuum cleaning, sweeping, or water wash down methods are used first to clean surfaces that can be safely accessed prior to using compressed air.

(8) Dust accumulations in the area after vacuum cleaning, sweeping, or water wash down do not exceed the threshold housekeeping dust accumulation.

(9) 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).

(10) All electrical equipment potentially exposed to airborne dust in the area meets, at a minimum, NFPA 70, National Electrical Code; NEMA 12 as defined by NEMA 250; or the equivalent.

(11) Where metal or metal-containing dust or powder under the scope of NFPA 484, Standard for Combustible Metal, are present, the requirements of NFPA 484 apply.

Statement of Problem and Substantiation for Public Comment

Substantiation:

As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. This retroactive provision appears to be inappropriately written in a way designed to achieve zero risk. If, per item 5, “all ignition sources and hot surfaces capable of igniting a dust cloud or dust layer are shut down or removed from the area,” it is unclear why the remainder of the precautionary measures is required.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.

Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 08 16:31:19 EST 2013

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<td>As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style.</td>
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</tbody>
</table>
8.4.2.7 – Steam Blow Down Method. (Reserved).

Statement of Problem and Substantiation for Public Comment

Reserved sections should not be included in this document since there has been no opportunity to comment.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Nov 13 15:10:40 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: It is not the intent of the Committee that the "reserved" sections be used to develop any new requirements at this stage in the development of NFPA 652, and "reserved" sections have no mandatory element to them at this stage. The Committee is using the "reserved" sections (like other NFPA committees) to establish a draft structure at this initial document stage indicating through the use of the reserved sections where future content might be developed in subsequent revisions. So, the Committee does not intend to accept the proposed deletion of these sections where they exist and where Public Comments have proposed deletion as part of this Second Draft.
8.4.3 Training. Operator and Employee and contractor training shall include housekeeping procedures, required personal protective equipment during housekeeping, and proper use of equipment.

Statement of Problem and Substantiation for Public Comment

Employee is substituted for operator, since employees other than operators (e.g., mechanics) may be doing housekeeping.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 21:59:30 EST 2013

Committee Statement

Committee Action: Accepted
Resolution: SR-78-NFPA 652-2014
Statement: Employee is substituted for operator, since employees other than operators (e.g., mechanics) may be doing housekeeping.
Public Comment No. 332-NFPA 652-2013 [Section No. 8.4.4]

8.4.4 - Equipment. (Reserved).

Statement of Problem and Substantiation for Public Comment

Reserved sections should not be included in this standard since there has been no opportunity to comment.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, IOMSA, NGFA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 15:12:15 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: It is not the intent of the Committee that the "reserved" sections be used to develop any new requirements at this stage in the development of NFPA 652, and "reserved" sections have no mandatory element to them at this stage. The Committee is using the "reserved" sections (like other NFPA committees) to establish a draft structure at this initial document stage indicating through the use of the reserved sections where future content might be developed in subsequent revisions. So, the Committee does not intend to accept the proposed deletion of these sections where they exist and where Public Comments have proposed deletion as part of this Second Draft.
Public Comment No. 155-NFPA 652-2013 [Section No. 8.4.6.2]

8.4.6.2 –
The threshold housekeeping dust accumulation limits shall be in accordance with the industry or commodity-specific NFPA standard. (See 1.3.1.)

Statement of Problem and Substantiation for Public Comment

8.4.6.2 is proposed for deletion since it repeats 7.3.4.2.2.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 22:02:00 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee notes that this provision is dealing with different activities and so, believes it is acceptable to repeat some of the requirements. For that reason, it does not agree with the submitter’s recommendation to delete the subject paragraph.
Public Comment No. 156-NFPA 652-2013 [Section No. 8.4.6.3]

8.4.6.3 *

Housekeeping frequency and provisions. Provisions for unscheduled housekeeping shall include specific requirements establishing time to clean local dust spills or transient releases.

Statement of Problem and Substantiation for Public Comment

Housekeeping frequency (i.e., for routine housekeeping) cannot anticipate the need for cleaning up spills and transient releases.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 22:04:14 EST 2013

Committee Statement

Committee Action: Accepted
Resolution: SR-79-NFPA 652-2014
Statement: Housekeeping frequency (i.e., for routine housekeeping) cannot anticipate the need for cleaning up spills and transient releases.
8.4.7.2 - The owner/operator shall retain documentation that routine scheduled cleaning occurs in accordance with the frequency and accumulation goals established in 8.4.6.1.

Statement of Problem and Substantiation for Public Comment

This provision should be struck because it requires documentation that is unnecessary for safety. The purpose of the provision appears to be assisting AHJs in proving lack of past cleaning efforts. That is not a proper purpose of the standard. Also, as a general comment, the draft imposes too many documentation requirements.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Nov 18 10:28:05 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee is not in favor of revising the standard as proposed in this comment by deleting the requirement; the housekeeping provisions require some level of documentation in order to establish a culture around housekeeping.
8.5.1* General. 
Unless otherwise specified, the requirements of Section 8.5 shall be applied retroactively.

Comment: Revise this section as follows:
Unless otherwise specified, the requirements of Section 8.5 shall be applied retroactively to the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level.

Statement of Problem and Substantiation for Public Comment

Substantiation: As written, there appears to be a conflict between Sections 8.5.1 and A.8.5.1 in that Section 8.5.1 imposes retroactive application unless otherwise provided in the text of the standard and Section A.8.5.1 seems to create an exemption based on the non-mandatory annex.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 15:08:14 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style. In addition, the Committee believes that the submitters for the comments have misunderstood the intent of the annex text.
Public Comment No. 29-NFPA 652-2013 [Section No. 8.5.1]

8.5.1 * General.
Unless otherwise specified, the requirements of Section 8.5 shall be applied retroactively. Sections that require material process/facility modifications should not be applied retroactively, and cannot realistically be achieved by the effective date of this Standard. Per this draft, Sections 8.5.4, Hot Surfaces, 8.5.5, Bearings are not applied retroactively, yet, Sections 8.5.6 Electrical Equipment and Wiring and 8.5.7 Electrostatic Discharges are applied retroactively. These two sections should not be applied retroactively. Recommended language changes are to add language indicating so.

Statement of Problem and Substantiation for Public Comment

Section 8.5.1 Ignition Source Control:
a. This section indicates that 8.5 is to be applied retroactively, unless specified otherwise. Sections that require material process/facility modifications should not be applied retroactively, and cannot realistically be achieved by the effective date of this Standard. Per this draft, Sections 8.5.4, Hot Surfaces, 8.5.5, Bearings are not applied retroactively, yet, Sections 8.5.6 Electrical Equipment and Wiring and 8.5.7 Electrostatic Discharges are applied retroactively. These two sections should not be applied retroactively. Recommended language changes are to add language indicating so.

Submitter Information Verification

Submitter Full Name: Jennifer Gradnigo
Organization: CRA
Street Address: 
City:
State:
Zip: 
Submittal Date: Wed Oct 09 13:35:07 EDT 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee is not accepting the recommendations of the submitter with respect to the proposed added text; instead, the Committee notes that the submitter's rationale for proposing the change is already discussed in the annex, A.8.5.1 to this requirement and therefore, the Committee does not believe the proposed change is needed.
8.5.1 * General.
Unless otherwise specified, the requirements of Section 8.5 shall be applied retroactively to the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level.

Statement of Problem and Substantiation for Public Comment

As written, there appears to be a conflict between Sections 8.5.1 and A.8.5.1 in that Section 8.5.1 imposes retroactive application unless otherwise provided in the text of the standard and Section A.8.5.1 seems to create an exemption based on the non-mandatory annex, which reads as follows:

A.8.5.1
It is not always possible or practical for existing facilities to be in compliance with the new provisions of a standard at the effective date of that standard. Therefore, retroactivity in this section means that a plan should be established to achieve compliance within a reasonable time frame.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Nov 13 14:29:11 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style. In addition, the Committee believes that the submitters for the comments have misunderstood the intent of the annex text.
Public Comment No. 95-NFPA 652-2013 [Section No. 8.5.1]

8.5.1 General.
Unless otherwise specified, the requirements of Section 8.5 shall be applied retroactively.

There seems to be a conflict between the retroactive requirement in 8.5.1 and the flexibility in A.8.5.1, requiring a modification of 8.5.1.

8.5 Ignition Source Control.
8.5.1 General. Revised text

Comment: Revise this section as follows:

Unless otherwise specified, the requirements of Section 8.5 shall be applied retroactively to the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level.

A.8.5.1

It is not always possible or practical for existing facilities to be in compliance with the new provisions of a standard at the effective date of that standard. Therefore, retroactivity in this section means that a plan should be established to achieve compliance within a reasonable time frame.

Statement of Problem and Substantiation for Public Comment

Substantiation: As written, there appears to be a conflict between Sections 8.5.1 and A.8.5.1. Section 8.5.1 imposes retroactive application unless otherwise provided in the text of the standard. Section A.8.5.1 reads as follows and seems to create an exemption based on the non-mandatory annex.
**Committee Action:** Rejected

**Resolution:** As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style. In addition, the Committee believes that the submitters for the comments have misunderstood the intent of the annex text.
8.5.3.2*
The area affected by hot work shall be thoroughly cleaned of combustible dust prior to commencing any hot work.

Statement of Problem and Substantiation for Public Comment

Wetting down the dust should be permitted.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 10:31:00 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: There is no specific technical language proposed with this comment and the Committee notes that wetting is not sufficient as a control as wet dust is a hazard also. So, no change is made.
8.5.3.3
Equipment that contains combustible dust and is located within the hot work area shall be shut down, shielded, or both.

Comment: Revise 8.5.3.3 to read as follows:

Section 8.5.3.3 Open (non-enclosed) equipment within the hot work area that contains combustible dust shall be shut down, shielded, or both.

Statement of Problem and Substantiation for Public Comment

Substantiation: There is no apparent reason to shut down or shield closed/enclosed equipment that would protect the enclosed dust from the hot work.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 15:09:17 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The proposed revisions to this section introduce a term - open, non-enclosed equipment - that has not been defined. The Committee is aware of incidents where operating equipment malfunctioned and contributed to the ignition of combustible dusts associated with the process. The Committee believes the current requirement is appropriate without the proposed modification.
Public Comment No. 313-NFPA 652-2013 [ Section No. 8.5.3.3 ]

8.5.3.3  
Equipment that contains combustible dust and is located, Open (non-enclosed) equipment within the hot work area that contains combustible dust shall be shut down, shielded, or both.

Statement of Problem and Substantiation for Public Comment

There is no apparent reason to shut down or shield closed/enclosed equipment that would protect the enclosed dust from the hot work.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO  
Organization: SPI  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Wed Nov 13 14:30:40 EST 2013

Committee Statement

Committee Action: Rejected  
Resolution: The proposed revisions to this section introduce a term - open, non-enclosed equipment - that has not been defined. The Committee is aware of incidents where operating equipment malfunctioned and contributed to the ignition of combustible dusts associated with the process. The Committee believes the current requirement is appropriate without the proposed modification.
8.5.3.3
Equipment that contains combustible dust and is located within the hot work area shall be shut down, shielded, or both.

**Section 8.5.3.3**  Open (non-enclosed) equipment within the hot work area that contains combustible dust shall be shut down, shielded, or both.

### Statement of Problem and Substantiation for Public Comment

Substantiation: There is no apparent reason to shut down or shield closed/enclosed equipment that would protect the enclosed dust from the hot work.

### Submitter Information Verification

<table>
<thead>
<tr>
<th><strong>Submitter Full Name:</strong></th>
<th>Stan Lancey</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organization:</strong></td>
<td>American Forest &amp; Paper Ass</td>
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<td><strong>Affiliation:</strong></td>
<td>These materials were developed through a cooperative effort involving AF&amp;PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&amp;PA/AWC staff and AF&amp;PA/AWC member company representatives. These comments also reflect input we received from other trade associations.</td>
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### Committee Statement

**Committee Action:** Rejected

**Resolution:** The proposed revisions to this section introduce a term - open, non-enclosed equipment - that has not been defined. The Committee is aware of incidents where operating equipment malfunctioned and contributed to the ignition of combustible dusts associated with the process. The Committee believes the current requirement is appropriate without the proposed modification.
Statement of Problem and Substantiation for Public Comment

Reserved sections should not be included in this standard since there has been no opportunity to comment.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NGFA, NOPA, IOMSA
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Nov 13 15:13:37 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: It is not the intent of the Committee that the "reserved" sections be used to develop any new requirements at this stage in the development of NFPA 652, and "reserved" sections have no mandatory element to them at this stage. The Committee is using the "reserved" sections (like other NFPA committees) to establish a draft structure at this initial document stage indicating through the use of the reserved sections where future content might be developed in subsequent revisions. So, the Committee does not intend to accept the proposed deletion of these sections where they exist and where Public Comments have proposed deletion as part of this Second Draft.
8.5.4.2 *

Heated external surfaces of process equipment and piping in dust deflagration hazard areas containing combustible dust shall be maintained at a temperature at least 50°C below the dust layer hot surface ignition temperature and dust cloud ignition temperatures, measured in a standardized test acceptable to the authority having jurisdiction.

Statement of Problem and Substantiation for Public Comment

The phrase "containing combustible dust" is superfluous since dust hazards areas contain combustible dust.

The requirement should also address the potential ignition of combustible dust clouds in contact with hot surfaces.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Nov 11 22:15:28 EST 2013

Committee Statement

Committee Action: Accepted
Resolution: SR-80-NFPA 652-2014
Statement: The phrase "containing combustible dust" is superfluous since dust hazards areas contain combustible dust.

The requirement should also address the potential ignition of combustible dust clouds in contact with hot surfaces.
8.5.4.3 * - --
Internal surfaces of process equipment heated with hot air and having a potential for dust accumulation shall be maintained at a temperature at least 20°C below a standard dust layer hot air ignition temperature acceptable to the authority having jurisdiction.

Statement of Problem and Substantiation for Public Comment

This section is proposed for deletion for several reasons.

First, equipment might be heated by means other than the use of hot air.

More importantly, as discussed in a prior committee meeting, some driers may operate at temperatures in excess of the dry dust AIT at the feed end of the dryer (where the solids are wet and thus, non-ignitable). By the time the solids are dry enough to ignite, they could be in a region of the dryer where the temperature is below the AIT. The concern is that the requirement, as written, might prohibit the operation of such dryers.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Nov 11 22:18:31 EST 2013

Committee Statement

Committee Action: Accepted
Resolution: SR-81-NFPA 652-2014
Statement: This section is proposed for deletion for several reasons.

First, equipment might be heated by means other than the use of hot air.

More importantly, as discussed in a prior committee meeting, some driers may operate at temperatures in excess of the dry dust AIT at the feed end of the dryer (where the solids are wet and thus, non-ignitable). By the time the solids are dry enough to ignite, they could be in a region of the dryer where the temperature is below the AIT. The concern is that the requirement, as written, might prohibit the operation of such dryers.
8.5.5.1 –
This section shall not be required to be applied retroactively.

Statement of Problem and Substantiation for Public Comment

Bearing monitoring, where this can be accomplished without engineering changes/investment should be required to be applied retroactively.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 22:27:06 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee is concerned with the economic issues in making this retroactive and also notes that through the risk assessment provision it would be permitted to not apply this to all bearings. So, the Committee does not support the proposed revision.
8.5.5.2 *
Bearing that are directly exposed to a combustible dust atmosphere or subject to dust accumulation, either of which poses a deflagration hazard, which exceeds the MEC of the dust, shall be monitored for overheating.

Statement of Problem and Substantiation for Public Comment

All bearings are subject to some accumulation of dust and it is not fundamental to monitor every bearing. Also there are bearings such as hanger bearings in screw conveyors and idler bearings on belt conveyors that are impossible to monitor and pose a very low risk of ignition source.

Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 14:41:54 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee points out that the MEC is not practical to be determined as it is proposed to be used as a monitoring criteria for bearing protection. The intent for this requirement is to focus on those bearings that should be targeted as either being in the atmosphere or subject to dust accumulations.
8.5.5.2 *

**Bearings**

This section should be deleted.

If this section is not deleted, this section should be revised to read as follows:

Inboard bearings, that are directly exposed to a combustible dust atmosphere or subject to dust accumulation, either of which poses a deflagration-dust ignition hazard, shall be monitored for overheating.

**Statement of Problem and Substantiation for Public Comment**

#1, re: deletion - This requirement is problematic as there could be hundreds (or thousands) of bearings in a process. If retained, the standard should give examples of how this can be done without installing temperature transmitters on every bearing. Monitoring could be done by:

- Thermal scan guns
- Touching
- Observing for carbonized material or other indicators of overheating

#2: Overheated bearings only pose a deflagration hazard if they are inside a dust cloud, which typically is not the case. Outboard bearings typically are not a problem, and they should be excluded from this requirement.

**Submitter Information Verification**

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 14:32:56 EST 2013

**Committee Statement**

Committee Action: Rejected
Resolution: The Committee is not in favor of deleting the requirement as bearings are common ignition sources. It is not possible to make universal judgment as to whether inboard or outboard bearings should be considered the greater hazard. The current provision is intended to provide multiple acceptable means for monitoring bearings and not specify how monitoring should be accomplished. The annex offers multiple monitoring means and does not require electronic monitoring only.
8.5.5.2 *  
Bearings that are directly exposed to a combustible dust atmosphere or subject to dust accumulation, either of which poses a deflagration hazard, shall be monitored for overheating.

8.5.5.2. Deleted text or, in the alternative, Revised Text

Comment 1: This section should be deleted.

Comment 2: If this section is not deleted, this section should be revised to read as follows:

Inboard bearings that are directly exposed to a combustible dust atmosphere or subject to dust accumulation, either of which poses a deflagration, dust ignition hazard, shall be monitored for overheating.

Statement of Problem and Substantiation for Public Comment

Substantiation 1: This requirement is problematic as there could be hundreds (or thousands) of bearings in a process. If retained, the standard it should give examples of how this can be done without installing temperature transmitters on every bearing. Monitoring could be done by:

- Thermal scan guns
- Touching
- Observing for carbonized material or other indicators of overheating

Substantiation 2:
Overheated bearings only pose a deflagration hazard if they are inside a dust cloud, which typically is not the case. Outboard bearings typically are not a problem, and they should be excluded from this requirement.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Thu Nov 14 12:26:12 EST 2013
Committee Statement

Committee Action:  Rejected

Resolution:  The Committee is not in favor of deleting the requirement as bearings are common ignition sources. It is not possible to make universal judgment as to whether inboard or outboard bearings should be considered the greater hazard. The current provision is intended to provide multiple acceptable means for monitoring bearings and not specify how monitoring should be accomplished. The annex offers multiple monitoring means and does not require electronic monitoring only.
8.5.5.2 * 
Bearings that are directly exposed to a combustible dust atmosphere or subject to dust accumulation, either of which poses a deflagration hazard (as to which reference may be made to an industry- or commodity-specific standard), shall be monitored for overheating. This provision does not apply to flanged bearings on Hi-Roller-style conveyors, outside legs with flange bearings, sleeve- and friction-type bearings, plastic bearings, and oil-impregnated wood bearings, operating at 150 rpm or less, and bearings in inside bucket elevator legs handling agricultural bulk materials with capacities less than 106 m³/hr (3750 ft³/hr).

Statement of Problem and Substantiation for Public Comment

The phrase "either of which poses a deflagration hazard" is unnecessarily vague and fails to alert the user that an industry- or commodity-specific standard may have a special provision stating whether a deflagration hazard exists. If an industry- or commodity-specific standard provides that a deflagration hazard does not exist in a certain situation, then there is no reason why the provision should not permit reliance on the expert judgment embodied there. Moreover, flanged bearings on Hi-Roller-style conveyors, outside legs with flange bearings, sleeve- and friction-type bearings, plastic bearings, and oil-impregnated wood bearings operating at 150 rpm or less do not require such monitoring. The same is true of bearings in inside bucket elevator legs with capacities less than 106 m³/hr (3750 ft³/hr). Such legs are so small and weigh so much less than other legs commonly used in industry that they exert far less stress on equipment, such as bearings, and are so much less likely to experience mechanical problems, such as misalignment, that the probability of overheating becoming an ignition source is not significant. That is why historically there is no significant history of ignitions in such legs. Moreover, the burden of compliance on manufacturers who use small legs in large numbers in manufacturing and other facilities would be exorbitant and unjustified by the evidence of any hazard. For example, grain millers can have up to fifty small legs. Contrast that with grain elevators, which can have up to ten extremely large elevators.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 10:32:04 EST 2013

Committee Statement
<table>
<thead>
<tr>
<th>Committee Action:</th>
<th>Rejected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>The submitter's added language pertaining to the industry or commodity-specific NFPA standards provision has been taken care of with SR No. 4 in section 1.4, so it is not needed in this requirement. The text as written is also not suitable as mandatory requirements per the NFPA Manual of Style.</td>
</tr>
</tbody>
</table>
8.5.5.4 *
It shall be permitted to eliminate bearing monitoring based on a risk assessment acceptable unless unacceptable to the authority having jurisdiction.

Statement of Problem and Substantiation for Public Comment

As now worded, this provision is impractical. It literally bars an owner from doing what his risk assessment indicates until an AHJ responds to a request for approval. However, AHJ’s cannot be depended upon or forced to respond to a request for approval from an owner about bearings. AHJ’s have no incentive to take responsibility for approving such changes, and many do not in practice respond to such requests. Yet, until they do, the owner/operator will be unable to implement changes that his or her engineering study says are sensible. A change should be made similar to that made to section 8.5.9.2, which posed the same problem.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Nov 18 10:34:48 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee has retained the wording as originally written in the First Draft, which is consistent with requirements subject to acceptance by the AHJ.
Public Comment No. 9-NFPA 652-2013 [Section No. 8.5.6.1]

8.5.6.1 *
The identification of the possible presence and extent of Class II and Class III locations shall be made based on the criteria in NFPA 70, National Electrical Code, Article 500.5(C) and (D).

8.5.6.1.1 *
The locations and extent of Class II and Class III areas shall be documented, and such documentation shall be preserved for access at the facility.

Statement of Problem and Substantiation for Public Comment

CC NOTE: The following CC Note No. 6 appeared in the First Draft Report.

The Correlating Committee requests that the TC develop annex material explaining the differences between the two applications of layer accumulation criteria – one for determining the presence of a dust flash fire or dust deflagration hazard and the other for determining electrical area classification.

Submitter Information Verification

Submitter Full Name: CC on CMD-AAC
Organization: CC on Combustible Dists
Street Address:
City:
State:
Zip:
Submittal Date: Thu Sep 19 08:57:56 EDT 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution:
Statement: The Committee expanded the annex to highlight that both flash fire and explosion hazard conditions and electrical area classification use a criteria based on layer depth to indicate the need for further protective measures.
Public Comment No. 499-NFPA 652-2013 [ New Section after 8.5.6.4 ]

Zone Classification for Dusts in accordance with NFPA 70 National Electrical Code, Article 506, shall not be permitted.

Statement of Problem and Substantiation for Public Comment

Article 502 of NFPA 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 yet 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 non-conductive 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), a metal dust could be in Division Group E, but not conductive enough to be in Zone Group IIIC.

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

Both of these discrepancies are non-conservative in comparison to the Division classification system. While the NEC has established a framework for the use of Zone classification for dusts, these non-conservative 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 has previously coordinated the boundaries between Zone and Division for gases, but has not yet addressed this significant issue for dusts. Until such time as these discrepancies can be addressed, NFPA 652 should not permit the application of Zone classification for combustible dusts in industrial occupancies.

Submitter Information Verification

Submitter Full Name: Samuel Rodgers
Organization: Honeywell, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 15:08:13 EST 2013

Committee Statement
Committee Action: Accepted
Resolution: SR-82-NFPA 652-2014
Statement: Article 502 of NFPA 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 yet 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 non-conductive 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), a metal dust could be in Division Group E, but not conductive enough to be in Zone Group IIIC.

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

Both of these discrepancies are non-conservative in comparison to the Division classification system. While the NEC has established a framework for the use of Zone classification for dusts, these non-conservative 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 has previously coordinated the boundaries between Zone and Division for gases, but has not yet addressed this significant issue for dusts. Until such time as these discrepancies can be addressed, NFPA 652 should not permit the application of Zone classification for combustible dusts in industrial occupancies.
8.5.6.4 *
Preventive maintenance programs for electrical equipment and wiring in Class II and Class III locations shall include provisions to verify that dusttight electrical enclosures are not experiencing significant dust ingress.

Statement of Problem and Substantiation for Public Comment

We question the wisdom of this provision. Opening electrical boxes to check for “significant” ingress of dust will always expose workers to electric shock hazards. Yet, the probability of significant ingress is rather low and the probability of fire or explosion from such ingress is even lower.
This provision needs to be re-thought. We are aware of the Committee comment that, “The Committee added annex to clarify the intent for this section.” With respect, the annex material does not address the immediate safety hazard to employees that this provision poses, or whether the hazard is justified by verification of dust-tightness.
The provision should be moved to the Annex and amended as shown above.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Nov 18 10:35:56 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The current annex addresses the issues raised by the submitter in terms of worker protection and which pieces of electrical equipment are intended by this requirement. The Committee believes the issues are addressed and makes no changes to the requirement based on this comment.
8.5.7.1.3
Bonding and grounding with a resistance of less than $1.0 \times 10^6$ ohms to ground shall be provided for conductive components.

Statement of Problem and Substantiation for Public Comment

Section 8.5.7.1.3 Bonding and Grounding:
a. Specifies allowable resistance in bonding/grounding. This specification appears inconsistent (high) compared with other published data on this topic. Writer recommends review.

Submitter Information Verification

Submitter Full Name: Jennifer Gradnigo
Organization: CRA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Oct 09 13:37:40 EDT 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-83-NFPA 652-2014
Statement: Section 8.5.7.1.3 Bonding and Grounding:

a. Specifies allowable resistance in bonding/grounding. This specification appears inconsistent (high) compared with other published data on this topic. Writer recommends review.
8.5.7.1.4 - Flexible Connectors

8.5.7.1.4.1
Flexible connectors shall have an end-to-end resistance of less than $1.0 \times 10^8$ ohms to ground even when an internal or external bonding wire connects the equipment to which the flexible connector is attached.

8.5.7.1.4.2
Flexible connectors with a resistance equal to or greater than $1.0 \times 10^8$ ohms shall be permitted under all the following conditions:

1. The dust has a minimum ignition energy (MIE) greater than 2000 mJ.
2. The maximum powder transfer velocity is 10 m/s.
3. Flammable vapors are not present.

Statement of Problem and Substantiation for Public Comment

This section should be stricken because the basis of this provision is that a propagating brush discharge was proven to be theoretically possible in a laboratory situation, but there is was no evidence presented to the TC that this can or has actually occurred in an industrial setting. The cost associated with this change will be large, as this section is not excepted from being applied retroactively. Furthermore, the exceptions listed 8.5.7.1.4.2 do not create safety from this so-called ignition hazard because PBD energies have been documented to exceed 2J.

The committee should not be implementing a provision based on a hazard contrived in a laboratory that has not been proven to present a significant risk in an industrial setting that will warrant the retrofitting of many thousands of hoses at an extremely high cost, where those funds could (and should) be spent identifying and correcting real risks in their plants.

The TCC agrees that this issue needs to be looked at further. Therefore, the provision should be stricken until additional information is presented to prove the hazard is a risk in industry. If the TC decides to retain this provision, at a bare minimum, this provision should NOT be applied retroactively.

Submitter Information Verification

**Submitter Full Name:** Dale Hansen
**Organization:** Harrington Group, Inc.
**Street Address:**
**City:**
**State:**
**Zip:**
**Submittal Date:** Fri Nov 15 13:51:06 EST 2013
Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-84-NFPA 652-2014
Statement: This section should be stricken because the basis of this provision is that a propagating brush discharge was proven to be theoretically possible in a laboratory situation, but there is no evidence presented to the TC that this can or has actually occurred in an industrial setting. The cost associated with this change will be large, as this section is not excepted from being applied retroactively. Furthermore, the exceptions listed 8.5.7.1.4.2 do not create safety from this so-called ignition hazard because PBD energies have been documented to exceed 2J.

The committee should not be implementing a provision based on a hazard contrived in a laboratory that has not been proven to present a significant risk in an industrial setting that will warrant the retrofitting of many thousands of hoses at an extremely high cost, where those funds could (and should) be spent identifying and correcting real risks in their plants.

The TCC agrees that this issue needs to be looked at further. Therefore, the provision should be stricken until additional information is presented to prove the hazard is a risk in industry. If the TC decides to retain this provision, at a bare minimum, this provision should NOT be applied retroactively.
8.5.7.1.4.1 Flexible connectors shall have an end-to-end resistance of less than $1.0 \times 10^8$ ohms to ground even when an internal or external bonding wire connects the equipment to which the flexible connector is attached.

Statement of Problem and Substantiation for Public Comment

CC NOTE: The following CC Note No. 14 appeared in the First Draft Report as First Revision No. 119 and also related to Public Input No. 112.

The Correlating Committee requests that the TC review the basis for the flexible connector requirements and consider separating the requirements for short flexible connections versus such items as conveying hose. The TC should also look at Tom Scherpa’s negative vote on FR 120 regarding the unit conversion error.

Related Item
First Revision No. 119-NFPA 652-2013 [Section No. 7.5.7.1.4.1]
Public Input No. 112-NFPA 652-2013 [Section No. 7.5.7.1.4.1]

Submitter Information Verification

Submitter Full Name: CC on CMD-AAC
Organization: CC on Combustible Dusts
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 07:51:40 EST 2013

Committee Statement
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<tr>
<th>Committee Action:</th>
<th>Rejected but see related SR</th>
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<tbody>
<tr>
<td>Resolution:</td>
<td>SR-84-NFPA 652-2014</td>
</tr>
<tr>
<td>Statement:</td>
<td>This section should be stricken because the basis of this provision is that a propagating brush discharge was proven to be theoretically possible in a laboratory situation, but there is was no evidence presented to the TC that this can or has actually occurred in an industrial setting. The cost associated with this change will be large, as this section is not excepted from being applied retroactively. Furthermore, the exceptions listed 8.5.7.1.4.2 do not create safety from this so-called ignition hazard because PBD energies have been documented to exceed 2J. The committee should not be implementing a provision based on a hazard contrived in a laboratory that has not been proven to present a significant risk in an industrial setting that will warrant the retrofitting of many thousands of hoses at an extremely high cost, where those funds could (and should) be spent identifying and correcting real risks in their plants. The TCC agrees that this issue needs to be looked at further. Therefore, the provision should be stricken until additional information is presented to prove the hazard is a risk in industry. If the TC decides to retain this provision, at a bare minimum, this provision should NOT be applied retroactively.</td>
</tr>
</tbody>
</table>
8.5.7.3.1 Personnel Except as provided in 8.5.7.3.2, personnel involved in manually filling or emptying particulate containers or vessels, or handling open containers of combustible particulates, shall be grounded during such operations.

Statement of Problem and Substantiation for Public Comment

The clause “Except as provided in 8.5.7.3.2” is required to avoid a conflict between 8.5.7.3.1 and 8.5.7.3.2. The requirement in 8.5.7.3.2 should be based on a risk assessment. It would be inappropriate to require every retail restaurant, retail bakery, nursing home, school or prison that handles materials such as flour or sugar, or every pharmacy that compounds a dry pharmaceutical product to ground personnel or hire an expert to advise them of the MIE of the variable dust clouds they might produce in conducting their activities.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO  
Organization: SPI  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Wed Nov 13 14:44:21 EST 2013

Committee Statement

Committee Action: Rejected  
Resolution: The Committee does not believe that the introductory clause proposed for addition by this comment is required as 8.5.7.3.1 establishes the basic requirement and then 8.5.7.3.2 presents an alternative that can be applied when the two prescribed conditions are met. This seems clear to the Committee without modification. See SR No. 85 for information on the changes made to this paragraph as part of the action on another comment.
8.5.7.3.1
Personnel. Where an explosive atmosphere exists and is subject to ignition from an electrostatic discharge from ungrounded personnel, personnel involved in manually filling or emptying particulate containers or vessels, or handling open containers of combustible particulates, shall be grounded during such operations.

Statement of Problem and Substantiation for Public Comment

This provision is missing an important component of the hazard—that the ungrounded person will be able to create an electrostatic ignition within the explosible dust cloud created by the operation. In many cases this is not a reasonable scenario. Further, simply carrying an open container of a combustible particulate is not sufficient grounds for requiring the earth grounding of the person carrying it.

Submitter Information Verification

Submitter Full Name: Dale Hansen
Organization: Harrington Group, Inc.

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-85-NFPA 652-2014
Statement: This provision is missing an important component of the hazard—that the ungrounded person will be able to create an electrostatic ignition within the explosible dust cloud created by the operation. In many cases this is not a reasonable scenario. Further, simply carrying an open container of a combustible particulate is not sufficient grounds for requiring the earth grounding of the person carrying it.
Public Comment No. 361-NFPA 652-2013 [ Sections 8.5.7.3.1, 8.5.7.3.2 ]

Sections 8.5.7.3.1, 8.5.7.3.2

8.5.7.3.1
Personnel involved in manually filling or emptying particulate containers or vessels, or handling open containers of combustible particulates, shall be grounded during such operations.

8.5.7.3.2
Personnel grounding shall not be required where both of the following conditions are met:

(1) Flammable gases, vapors, and hybrid mixtures are not present.
(2) The minimum ignition energy of the dust cloud is greater than 30 mJ.

Comment: These provisions should be revised to read as follows:

8.5.7.3.1 Except as provided in 8.5.7.3.2, personnel involved in manually filling or emptying particulate containers or vessels, or handling open containers of combustible particulates, shall be grounded during such operations.

8.5.7.3.2 Personnel grounding shall not be required where, both, any one of the following conditions are met:

(1) Condition A
(1) Flammable gases, vapors, and hybrid mixtures are not present.
(2) The minimum ignition energy of the dust cloud is greater than 30 mJ.

(1) Condition B: Based on a risk assessment, a determination is made that the amount of powder is too small to present an unacceptable or significant risk.

(2) Condition C: The activity is taking place in a retail facility or institutional facility unless the AHJ, based on appropriate sampling and testing, determines that personnel grounding is required for that activity and advises the facility operator of that determination and provides the facility operator with the test results being relied upon by the AHJ.

Statement of Problem and Substantiation for Public Comment

Substantiation: The clause “Except as provided in 8.5.7.3.2” is required to avoid a conflict between 8.5.7.3.1 and 8.5.7.3.2. The requirement in 8.5.7.3.2 should be based on a risk assessment. It would be inappropriate to require every retail restaurant, retail bakery, nursing home, school or prison that handles materials such as flour or sugar, or every pharmacy that compunds a dry pharmaceutical product to ground personnel or hire an expert to advise them of the MIE of the variable dust clouds they might produce in conducting their activities.

Submitter Information Verification
Committee Statement

Committee Action: Rejected

Resolution: For the modification to 8.5.7.3.1, see SR No. 85. The Committee notes that the non-application to retail that is proposed as part of the revision to 8.5.7.3.2 is already covered in 1.3 of the standard, so no further modification is included for either condition B or condition C as proposed in these comments.
8.5.7.3.2
Personnel grounding shall not be required where both any one of the following conditions are met:

(A) Condition A

(1) Flammable gases, vapors, and hybrid mixtures are not present.
(2) The minimum ignition energy of the dust cloud is greater than 30 mJ.

(B) Condition B: Based on a risk assessment, a determination is made that the amount of powder is too small to present an unacceptable or significant risk.

(C) Condition C: The activity is taking place in a retail facility or institutional facility unless the AHJ, based on appropriate sampling and testing, determines that personnel grounding is required for that activity and advises the facility operator of that determination and provides the facility operator with the test results being relied upon by the AHJ.

Statement of Problem and Substantiation for Public Comment

The clause "Except as provided in 8.5.7.3.2" is required to avoid a conflict between 8.5.7.3.1 and 8.5.7.3.2. The requirement in 8.5.7.3.2 should be based on a risk assessment. It would be inappropriate to require every retail restaurant, retail bakery, nursing home, school or prison that handles materials such as flour or sugar, or every pharmacy that compounds a dry pharmaceutical product to ground personnel or hire an expert to advise them of the MIE of the variable dust clouds they might produce in conducting their activities.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 14:40:38 EST 2013

Committee Statement
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<thead>
<tr>
<th>Committee Action:</th>
<th>Rejected</th>
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</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>For the modification to 8.5.7.3.1, see SR No. 85. The Committee notes that the non-application to retail that is proposed as part of the revision to 8.5.7.3.2 is already covered in 1.3 of the standard, so no further modification is included for either condition B or condition C as proposed in these comments.</td>
</tr>
</tbody>
</table>
Type B, Type C, and Type D FIBCs shall be tested and verified as safe for their intended use by FIBC Manufacturers shall have their FIBCs tested by a recognized testing organization in accordance with the requirements and test procedures specified in IEC 61340-4-4, Electrostatics — Part 4-4: Standard Test Methods for Specific Applications — Electrostatic Classification of Flexible Intermediate Bulk Containers, before being used in hazardous environments verifying the FIBC's meet the requirements of the bag type.

Statement of Problem and Substantiation for Public Comment

The manufacture of the FIBCs are required to have their bags meet the requirements of Type A, B, C, or D. The user is required to understand the hazards and select the appropriate type of FIBC. The user should not be required to send off the bags for testing.

Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 14:47:37 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee does not believe the change proposed in this comment is required as the need to determine that the FIBC meets the necessary type designation already rests with the manufacturer and the specifications provided to someone purchasing the equipment. The Committee believes this to be an implied condition and does not believe it is necessary to further state that in the standard.
Public Comment No. 340-NFPA 652-2013 [Section No. 8.5.8.1]

8.5.8.1 * 
Production, maintenance, or repair activities that can release or lift combustible dust shall not be conducted within 35 ft (11 m) of an open flame or pilot flame. This provision is not retroactive, and not intended to cause the redesign or rebuild of facilities existing at the time of adoption of the Standard.

Statement of Problem and Substantiation for Public Comment

This section provides that combustible dust should not be present within 35 feet of an open or pilot flame. This is not feasible for many existing grain handling facilities because of the location of gas burners and grain driers. It should be made clear that this section is not intended to force a redesign and rebuild of existing facilities.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 16:19:15 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee does not support the proposed modification in PC No. 340 which seeks to add a statement that this section is not retroactive. The subject section is not currently intended to be applied retroactive; therefore, it is not appropriate nor necessary to add a statement indicating that it is not retroactive. The convention in this standard is to explicitly indicate those provisions that are applied retroactive, but no such statement is necessary when provisions are not applied retroactive. The Committee also does not support deleting the requirement as proposed in PC No. 610. Clarification of the intent for this requirement can be found by referring to the Annex, A.8.5.8.1, where examples of the type of activities are given.
8.5.8.1 * - *
Production, maintenance, or repair activities that can release or lift combustible dust shall not be conducted within 35 ft (11 m) of an open flame or pilot flame.

Statement of Problem and Substantiation for Public Comment

First, this provision is not feasible in many applications. Second, it applies to any amount of combustible dust, even if deflagration or explosion cannot result or propagate. It should be struck or amended.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association

Committee Statement

Committee Action: Rejected
Resolution: The Committee does not support the proposed modification in PC No. 340 which seeks to add a statement that this section is not retroactive. The subject section is not currently intended to be applied retroactive; therefore, it is not appropriate nor necessary to add a statement indicating that it is not retroactive. The convention in this standard is to explicitly indicate those provisions that are applied retroactive, but no such statement is necessary when provisions are not applied retroactive. The Committee also does not support deleting the requirement as proposed in PC No. 610. Clarification of the intent for this requirement can be found by referring to the Annex, A.8.5.8.1, where examples of the type of activities are given.
### Public Comment No. 474-NFPA 652-2013 [Sections 8.5.8.1, 8.5.8.2]

<table>
<thead>
<tr>
<th>Sections 8.5.8.1, 8.5.8.2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8.5.8.1</strong></td>
</tr>
<tr>
<td>Production, maintenance, or repair activities that can release or lift combustible dust shall not be conducted within 35–33 ft (11–10 m) of an open flame or pilot flame.</td>
</tr>
<tr>
<td><strong>8.5.8.2</strong></td>
</tr>
<tr>
<td>Fuel fired space heaters drawing local ambient air shall not be located within 30–33 ft (10 m) of equipment transporting, processing, or storing combustible dust.</td>
</tr>
</tbody>
</table>

**Statement of Problem and Substantiation for Public Comment**

Revised the distances noted for consistency, and added metric equivalent.

**Submitter Information Verification**

- **Submitter Full Name:** Dale Hansen
- **Organization:** Harrington Group, Inc.
- **Street Address:**
- **City:**
- **State:**
- **Zip:**
- **Submittal Date:** Fri Nov 15 14:11:49 EST 2013

**Committee Statement**

- **Committee Action:** Rejected but see related SR
- **Resolution:** SR-86-NFPA 652-2014
- **Statement:** Revised the distances noted for consistency, and added metric equivalent.
8.5.8.2
Fuel fired space heaters drawing local ambient air shall not be located within 30 ft of equipment transporting, processing, or storing combustible dust.

Statement of Problem and Substantiation for Public Comment

Section 8.5.8.2 Fuel-fired Space Heaters:
a. Specifies that fuel-fired space heaters drawing ambient air shall not be located within 30-feet of equipment transporting, processing, or storing combustible dust. This would appear to prohibit the storage of packaged goods such as flour or sugar in warehouses heated with fuel fired space heaters, a common practice. This would also appear to prohibit the use of fuel fired space heaters in areas where closed processing equipment, such as pneumatic transfer lines, are within 30’. If an owner/operator has properly classified an area per NFPA 499, the use of fuel fired space heaters is already appropriately addressed. This section provides no additional value and should be eliminated.

Submitter Information Verification

Submitter Full Name: Jennifer Gradnigo
Organization: CRA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Oct 09 13:40:01 EDT 2013

Committee Statement

Committee Action: Rejected
Resolution: Chapter 1 excludes warehouses, so the submitter's concern with the current requirement as expressed in the substantiation is not applicable per the provisions in Chapter 1 that excludes warehouses.
8.5.8.2
Fuel fired space heaters drawing local ambient air shall not be located within 30 ft of equipment transporting, processing, or storing combustible dust, with the exception that a space heater may be within 30 ft of sealed blowpipe.

Statement of Problem and Substantiation for Public Comment

Section 8.5.8.2—“Fuel fired space heaters drawing local ambient air shall not be located within 30 feet of equipment transporting, processing, or storing combustible dust, with the exception that a space heater may be within 30-feet of a sealed blowpipe.

Section 8.3.4.1.1.1. & 8.8.3.1. “Where an explosion hazard exists within an operating enclosure greater than 8 12 ft³ (0.2 0.3 m³) of contain volume, the enclosure shall be protected from the effects of deflagration.” JELD-WEN believes the operating enclosure should be greater than 12 ft³ to accommodate normal sizing.

B.4.5 “…Usually a volume exemption of 8 12 ft³ (0.2 0.3 m³) or smaller is applied to enclosed pieces of process equipment in deflagration hazard management. …Assuming an 8-to-1 a 12-to-1 volumetric expansion from a dust deflagration, an 8 12 ft³ (0.2 0.3 m³) enclosure will yield a fireball volume of approximately 64 144 ft³ (1.8 4.1 m³), the volume of a 10-ft (3 m) diameter sphere. …If a piece of process equipment includes a column of less than 8 12 ft³ (0.2 0.3 m³), it should be documented as such in the process hazard analysis.”

Section 8.5.8.6 “In facility locations where airborne dust or dust accumulations on horizontal surfaces are apt to occur, heating units shall be provided with a source of combustion air ducted directly from the building exterior which comply with Section 8.5.8.2.”

Submitter Information Verification

Submitter Full Name: Cheryl Carbone
Organization: JELD-WEN, Inc.
Affiliation: none
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 16:39:33 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-86-NFPA 652-2014
Statement: Revised the distances noted for consistency, and added metric equivalent.
8.5.8.6
In facility locations where airborne dust or dust accumulations on horizontal surfaces are apt to occur, heating units shall be provided with a source of combustion air ducted directly from the building exterior which comply with Section 8.5.8.2.

Statement of Problem and Substantiation for Public Comment

Section 8.5.8.6 “In facility locations where airborne dust or dust accumulations on horizontal surfaces are apt to occur, heating units shall be provided with a source of combustion air ducted directly from the building exterior which comply with Section 8.5.8.2.” Consistency within the standard.

Submitter Information Verification

Submitter Full Name: Cheryl Carbone
Organization: JELD-WEN, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 16:45:12 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-87-NFPA 652-2014
Statement: Section 8.5.8.6 “In facility locations where airborne dust or dust accumulations on horizontal surfaces are apt to occur, heating units shall be provided with a source of combustion air ducted directly from the building exterior which comply with Section 8.5.8.2.” Consistency within the standard.
Where industrial trucks, in accordance with NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations*, are not commercially available, a documented risk assessment shall be permitted to be used to specify the fire and explosion prevention features for the equipment being used.

### Statement of Problem and Substantiation for Public Comment

In many grain handling facilities with flat storage or steel bins, diesel powered loaders are used to load and unload grain. This section could conceivably restrict the use of such equipment, unless there is a documented risk assessment. An assessment will not be conducted by the equipment manufacturer, and is not feasible for most facilities. A risk assessment should not be necessary if there is a standard operating procedure that is utilized. A hazard analysis is not achievable and not commercially available. The requirement should be eliminated.

### Submitter Information Verification

**Submitter Full Name:** MARC FLEISCHAKER  
**Organization:** ARENT FOX LLP  
**Affiliation:** NOPA, NGFA, IOMSA  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Wed Nov 13 16:23:18 EST 2013

### Committee Statement

**Committee Action:** Rejected  
**Resolution:** The Committee does not support the proposed deletion of paragraph 8.5.9.2 which offers an option for situations where an approved industrial truck is not available. The annex acknowledges that certain types of such vehicles are known not to be commercially available. So, deleting this provision, which offers an alternative to the base requirement in 8.5.9.1 is not a good option in this case.
# Public Comment No. 611-NFPA 652-2013 [Section No. 8.5.9.2]

| 8.5.9.2 * | Where industrial trucks, in accordance that comply with NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations*, are not commercially available, a documented risk assessment shall be permitted to be used to determine whether there is a significant risk and, if there is one, to specify to the extent feasible fire and explosion prevention or suppression features for the equipment being used.

## Statement of Problem and Substantiation for Public Comment

The provision imposes a duty that is unachievable as worded. It does not appear that there are commercially available front-end loaders with "fire and explosion prevention features" that can be provided, whether a risk assessment is performed or not. Moreover, any risk assessment should be permitted to conclude that there is no risk warranting "fire and explosion prevention features" in the first place. The provision is also worded in a way that is awkward and difficult to follow.

## Submitter Information Verification

**Submitter Full Name:** ARTHUR SAPPER  
**Organization:** for United States Beet Sugar Association  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Mon Nov 18 10:39:11 EST 2013

## Committee Statement

**Committee Action:** Rejected  
**Resolution:** As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style.
8.5.11.2
Provisions. Where a self-heating hazard is identified, provisions shall be in place for managing the consequences of self-heating in storage silos or bins.

Statement of Problem and Substantiation for Public Comment

As written, the standard would require provisions for managing self-heating hazards whether or not they exist. The suggested change remedies this.

Submitter Information Verification

Submitter Full Name: Dale Hansen
Organization: Harrington Group, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 14:43:47 EST 2013

Committee Statement

Committee Action: Accepted
Resolution: SR-88-NFPA 652-2014
Statement: As written, the standard would require provisions for managing self-heating hazards whether or not they exist. The suggested change remedies this.
8.5.12.2 * - 

**Foreign.** When conducting a Process Hazard Analysis on a combustible dust process, the owner/operator shall consider the potential that foreign materials, such as tramp metal, could be introduced into the process and provide an ignition source. Where warranted, foreign materials, that are capable of igniting combustible material being processed shall be removed from the process stream.

**Statement of Problem and Substantiation for Public Comment**

Section 8.5.12.2 Foreign Materials:

a. This section requires the removal of foreign materials, such as tramp metal, from process streams. The Appendix provides information on available technologies for removing the materials, but no guidance on where such technologies are warranted. Large agricultural processing facilities have miles on conveyors/pneumatic conveying lines, airlocks, blenders, mills, dust collectors, cyclones, and dryers. The NFPA should provide guidance on how to apply this requirement. Recommended language:

b. When conducting a Process Hazard Analysis on a combustible dust process, the owner/operator shall consider the potential that foreign materials, such as tramp metal, could be introduced into the process and provide an ignition source. Where warranted, foreign materials that are capable of igniting combustible material being processed shall be removed from the process stream.

**Submitter Information Verification**

Submitter Full Name: Jennifer Gradnigo  
Organization: CRA  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Wed Oct 09 13:41:03 EDT 2013

**Committee Statement**

Committee Action: Rejected  
Resolution: The proposed new material to be included with this requirement introduces a process hazards analysis (dust hazards analysis) which is already required to be conducted as part of Chapter 7. The Committee believes that as part of the Chapter 7 DHA, if tramp materials are known or suspected, then the hazard analysis would identify and seek control options for those tramp materials and it would not be necessary to add to this requirement. In addition, as noted in the submitter's substantiation, the annex offers some common control methods used to address this hazard.
Public Comment No. 541-NFPA 652-2013 [ New Section after 8.6 ]

Pyrophoric Dusts ..... to be Inserted at the end of the Ignition Control Section
8.5 ....Reserved
Type your content here ...

Statement of Problem and Substantiation for Public Comment

Pyrophoric dusts need special ignition prevention measures to be developed later.

Submitter Information Verification

Submitter Full Name: Robert Zalosh
Organization: Firexplo
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 21:44:04 EST 2013

Committee Statement

Committee Action: Accepted
Resolution: SR-89-NFPA 652-2014
Statement: Pyrophoric dusts need special ignition prevention measures to be developed later. So, the Committee is approving a new "reserved" section 8.7.
Public Comment No. 334-NFPA 652-2013 [ Section No. 8.6.3 ]

8.6.3 – Limitations of PPE to Combustible Dust Flash-Fires. (Reserved)

Statement of Problem and Substantiation for Public Comment

Reserved sections should not be included in this standard since there has been no opportunity to comment.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 15:15:02 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: It is not the intent of the Committee that the "reserved" sections be used to develop any new requirements at this stage in the development of NFPA 652, and "reserved" sections have no mandatory element to them at this stage. The Committee is using the "reserved" sections (like other NFPA committees) to establish a draft structure at this initial document stage indicating through the use of the reserved sections where future content might be developed in subsequent revisions. So, the Committee does not intend to accept the proposed deletion of these sections where they exist and where Public Comments have proposed deletion as part of this Second Draft.
Statement of Problem and Substantiation for Public Comment

Reserved sections should not be included in this document since there has been no opportunity to comment.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address: 
City:  
State: 
Zip: 
Submittal Date: Wed Nov 13 15:16:18 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: It is not the intent of the Committee that the "reserved" sections be used to develop any new requirements at this stage in the development of NFPA 652, and "reserved" sections have no mandatory element to them at this stage. The Committee is using the "reserved" sections (like other NFPA committees) to establish a draft structure at this initial document stage indicating through the use of the reserved sections where future content might be developed in subsequent revisions. So, the Committee does not intend to accept the proposed deletion of these sections where they exist and where Public Comments have proposed deletion as part of this Second Draft.
Public Comment No. 337-NFPA 652-2013 [ Section No. 8.7.3 ]

8.7.3 Fans to Limit Accumulation. (Reserved )

Statement of Problem and Substantiation for Public Comment

Reserved sections should not be included since there has been no opportunity to comment.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER  
Organization: ARENT FOX LLP  
Affiliation: NOPA, NGFA, IOMSA  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Wed Nov 13 15:17:45 EST 2013

Committee Statement

Committee Action: Rejected  
Resolution: It is not the intent of the Committee that the "reserved" sections be used to develop any new requirements at this stage in the development of NFPA 652, and "reserved" sections have no mandatory element to them at this stage. The Committee is using the "reserved" sections (like other NFPA committees) to establish a draft structure at this initial document stage indicating through the use of the reserved sections where future content might be developed in subsequent revisions. So, the Committee does not intend to accept the proposed deletion of these sections where they exist and where Public Comments have proposed deletion as part of this Second Draft.
8.8.1 General. If an explosion hazard exists within a building, enclosure, or process system, measures shall be taken as specified in Section 8.8 to protect personnel from the consequences of an explosion or deflagration in those enclosed spaces.

Statement of Problem and Substantiation for Public Comment

revised wording to be more consistent with the definitions of terms in Chapter 3

Submitter Information Verification

Submitter Full Name: John Cholin
Organization: J. M. Cholin Consultants Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 11:19:12 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-90-NFPA 652-2014
Statement: revised wording to be more consistent with the definitions of terms in Chapter 3
8.8.1 General.
If an explosion hazard exists within a building, enclosure, or process system, measures shall be taken as specified in Section 8.8 to protect personnel from the consequences of an explosion.

Statement of Problem and Substantiation for Public Comment

CC NOTE: The following CC Note No. 9 appeared in the First Draft Report as First Revision No. 56 and also related to Public Input No. 117 and 279.

The Correlating Committee requests that the TC review PI 279 and develop a technical basis for its action on this PI and include that in the response for this item.

Related Item
First Revision No. 56-NFPA 652-2013 [Section No. 8.8.1]
Public Input No. 117-NFPA 652-2013 [Section No. 8.8.1]
Public Input No. 279-NFPA 652-2013 [Section No. 8.8.1]

Submitter Information Verification

Submitter Full Name: CC on CMD-AAC
Organization: CC on Combustible Dusts
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 04 10:46:52 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: No specific action has been proposed and it appears that this PC is linked with the incorrect Chapter; it should be 9.9.1 it appears.
8.8.1 General.
If an explosion hazard exists within a building, enclosure, or process system, feasible measures shall be taken as specified in Section 8.8 to protect personnel from the consequences of an explosion.

Statement of Problem and Substantiation for Public Comment

As written, this provision literally requires perfect safety — that personnel be "protect[ed]" from the "consequences of an explosion." The provision needs to be qualified by insertion of the phrase "to the extent feasible and as specified in this standard."
We are aware of the Committee’s statement that it "revised the statement to ensure that it is only applied to this section, [8].8. Additionally, [8].8.2 permits the use of a risk analysis to omit some or all of the subsections.” With respect, the individual provisions in section 8.8 are written so broadly that they raise this same problem. E.g., 8.8.4.2 requires that isolation devices unqualifiedly "prevent" deflagration propagation. Moreover, a risk analysis deals with risk, not feasibility.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 10:41:30 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style.
8.8.3.1 General.

Where an, To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, where a dust explosion hazard exists within an operating enclosure greater than 8 ft³ (0.23 m³) of containing (dirty side) volume, the operating enclosure shall be protected from the effects of a deflagration.

Statement of Problem and Substantiation for Public Comment

As written, the proposed language is completely infeasible. Furthermore, Section A.8.8.3.1 conflicts with and acknowledges that Section 8.8.3.1 is infeasible in providing as follows:

A.8.8.3.1

Small containers can pose an explosion hazard; however, explosion protection measures for these units are not always practical. Consideration should be given to explosion hazards when electing to omit protection; 8 ft³ (0.23 m³) is roughly the size of a 55-gallon drum.

It appears that the requirements of this standard were developed without giving adequate consideration to the definitions of the critical terminology or the practicality of implementation. The standard fails to differentiate between an enclosure and an operating enclosure (See our separate comments on that issue.) The term "dust explosion hazard" is defined as follows:

3.3.14 Dust Explosion Hazard.

A dust deflagration hazard in an enclosure that is capable of bursting or rupturing the enclosure due to the development of internal pressure from the deflagration.

It is clearly not only impractical, but infeasible to provide explosion protection to every enclosure of at least 8 ft³ where enclosure is define to include every pipe, tube, etc. It is necessary to perform a risk assessment to identify the enclosures where there is a significant risk of initiating a dust explosion and focus on protecting and isolating those enclosures rather than attempting to protect all enclosures.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Nov 13 14:45:39 EST 2013

Committee Statement
<table>
<thead>
<tr>
<th>Committee Action:</th>
<th>Rejected</th>
</tr>
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<tbody>
<tr>
<td>Resolution:</td>
<td>As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style.</td>
</tr>
</tbody>
</table>
Public Comment No. 362-NFPA 652-2013 [Section No. 8.8.3.1]

8.8.3.1 General.
Where an explosion hazard exists within an operating enclosure greater than 8 ft³ (0.23 m³) of containing volume, the enclosure shall be protected from the effects of a deflagration.

8.8.3.1* General, Revised text.

Comment: This section should be revised to read as follows:
To the extent feasible, practical and necessary to reduce the risk posed by combustible dust fires and deflagrations to an acceptable level, where a dust explosion hazard exists within an operating enclosure greater than 8 ft³ (0.23 m³) of containing (dirty side) volume, the operating enclosure shall be protected from the effects of a deflagration.

Statement of Problem and Substantiation for Public Comment

Substantiation: As written, the proposed language is completely infeasible. Furthermore, Section A.8.8.3.1 conflicts with and acknowledges that Section 8.8.3.1 is infeasible in providing as follows:

A.8.8.3.1

Small containers can pose an explosion hazard; however, explosion protection measures for these units are not always practical. Consideration should be given to explosion hazards when electing to omit protection; 8 ft³ (0.23 m³) is roughly the size of a 55-gallon drum.

It appears that the requirements of this standard were developed without giving adequate consideration to the definitions of the critical terminology or the practicality of implementation. The standard fails to differentiate between an enclosure and an operating enclosure (See our separate comments on that issue.) The term “dust explosion hazard” is defined as follows:

3.3.14 Dust Explosion Hazard.

A dust deflagration hazard in an enclosure that is capable of bursting or rupturing the enclosure due to the development of internal pressure from the deflagration.

It is clearly not only impractical, but infeasible to provide explosion protection to every enclosure of at least 8 ft³ where enclosure is define to include every pipe, tube, etc. It is necessary to perform a risk assessment to identify the enclosures where there is a significant risk of initiating a dust explosion and focus on protecting and isolating those enclosures rather than attempting to protect all enclosures.

Submitter Information Verification

http://submittals.nfpa.org/TerraViewWeb/ContentFetcher?commentParams=%28Comment...
Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement
Committee Action: Rejected
Resolution: As proposed the comment recommends adding unenforceable language not consistent with the NFPA Manual of Style.
8.8.3.1* General.
Where an explosion hazard exists within an operating enclosure greater than 8.12 ft³ (0.23 m³) of containing volume, the enclosure shall be protected from the effects of a deflagration.

Statement of Problem and Substantiation for Public Comment

JELD-WEN believes the operating enclosure should be greater than 12 ft³ to accommodate normal sizing.

Submitter Information Verification

Submitter Full Name: Cheryl Carbone
Organization: JELD-WEN, Inc.

Committee Statement

Committee Action: Rejected
Resolution: The submitter has not provided any technical basis or justification for modifying the existing requirement from 8 ft³ to 12 ft³, so without that information the Committee is not prepared at this time to change a requirement that has been used in existing standards for several revision cycles without change.
8.8.4 Equipment Isolation.
8.8.4.1* General.
Where a dust explosion hazard exists within any operating equipment, isolation devices shall be provided to prevent deflagration propagation between connected enclosures in accordance with NFPA 69, *Standard on Explosion Prevention Systems*.

8.8.4.2* Where a dust explosion hazard exists within any operating equipment, isolation devices shall be provided to prevent deflagration propagation to any work space in accordance with NFPA 69, *Standard on Explosion Prevention Systems*.

8.8.4.3 Where a dust explosion hazard exists within any operating equipment, isolation devices shall be provided when recycling enclosure exhaust to building interiors to prevent deflagration propagation and transmission of energy from a fire or explosion in accordance with NFPA 69, *Standard on Explosion Prevention Systems*.

8.8.4.4 Isolation devices shall be provided when recycling enclosure exhaust to building interiors to prevent deflagration propagation and transmission of energy from a fire or explosion in accordance with NFPA 69, *Standard on Explosion Prevention Systems*.

**Statement of Problem and Substantiation for Public Comment**

CC NOTE: The following CC Note No. 7 appeared in the First Draft Report as First Revision No. 244 and also related to Public Input No. 326.

The Correlating Committee requests that the TC review the requirement in this paragraph. The TC should consider the ease of ignition of the particulate, the presence of credible ignition sources, and address the practicality of implementation and the basis for application to every installation. Examples of “enclosures” found in facilities where isolation could be impractical include: mechanical conveyors, such as screw conveyors, spouting. The CC notes that requirements in NFPA 654 and 664 might provide some guidance to the TC as they consider this request.

**Related Item**
First Revision No. 244-NFPA 652-2013 [Section No. 7.8.5]
Public Input No. 326-NFPA 652-2013 [Section No. 7.8.5]

**Submitter Information Verification**

Submitter Full Name: CC on CMD-AAC
Organization: CC on Combustible Dusts
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 07:55:19 EST 2013
Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-113-NFPA 652-2014

Statement: CC NOTE: The following CC Note No. 7 appeared in the First Draft Report as First Revision No. 244 and also related to Public Input No. 326.

The Correlating Committee requests that the TC review the requirement in this paragraph. The TC should consider the ease of ignition of the particulate, the presence of credible ignition sources, and address the practicality of implementation and the basis for application to every installation. Examples of "enclosures" found in facilities where isolation could be impractical include: mechanical conveyors, such as screw conveyors, spouting. The CC notes that requirements in NFPA 654 and 664 might provide some guidance to the TC as they consider this request.

The Committee has used requirements from NFPA 654 as suggested by the Correlating Committee. This SR addresses a number of other Public Comments to revised these requirements.
**Statement of Problem and Substantiation for Public Comment**

Added the 8 ft³ de minimus exclusion to prevent the need to provide isolation between very small vessels that can't be protected.

**Submitter Information Verification**

Submitter Full Name: John Cholin  
Organization: J. M. Cholin Consultants Inc.  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Fri Nov 15 11:52:44 EST 2013

**Committee Statement**

Committee Action: Rejected  
Resolution: The assumption established as the basis for recommending the inclusion of the small enclosure volume exclusion in the requirements for isolation is not valid; it is possible to isolate small enclosures.
Public Comment No. 431-NFPA 652-2013 [Section No. 8.8.4.2]

8.8.4.2 *
Where a dust explosion hazard exists within any operating equipment within operating equipment having an interior volume greater than 8 ft^3, isolation devices shall be provided to prevent deflagration propagation to any work space in accordance with NFPA 69, Standard on Explosion Prevention Systems.

Statement of Problem and Substantiation for Public Comment

added the 8 ft^3 de minimus volume exclusion.

Submitter Information Verification

Submitter Full Name: John Cholin
Organization: J. M. Cholin Consultants Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 11:54:53 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The assumption established as the basis for recommending the inclusion of the small enclosure volume exclusion in the requirements for isolation is not valid; it is possible to isolate small enclosures.
8.8.4.2*
Where a dust explosion hazard exists within any operating equipment, and the process hazards analysis in Section 7.3 identifies a potential for explosion propagation, isolation devices shall be provided to prevent deflagration propagation to any work space in accordance with NFPA 69, Standard on Explosion Prevention Systems.

Statement of Problem and Substantiation for Public Comment

The proposed additional wording is intended to establish the need for explosion isolation via the Process Hazards Analysis, which will now explicitly account for the possible explosion propagation hazard.

Submitter Information Verification

Submitter Full Name: Robert Zalosh
Organization: Firexplo
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 20:18:12 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-113-NFPA 652-2014
Statement: CC NOTE: The following CC Note No. 7 appeared in the First Draft Report as First Revision No. 244 and also related to Public Input No. 326.

The Correlating Committee requests that the TC review the requirement in this paragraph. The TC should consider the ease of ignition of the particulate, the presence of credible ignition sources, and address the practicality of implementation and the basis for application to every installation. Examples of “enclosures” found in facilities where isolation could be impractical include: mechanical conveyors, such as screw conveyors, spouting. The CC notes that requirements in NFPA 654 and 664 might provide some guidance to the TC as they consider this request.

The Committee has used requirements from NFPA 654 as suggested by the Correlating Committee. This SR addresses a number of other Public Comments to revised these requirements.
Statement of Problem and Substantiation for Public Comment

This requirement is overly broad and would be construed to require isolation where ever there is the return of cleaned air to the facility interior.

Submitter Information Verification

Submitter Full Name: John Cholin
Organization: J. M. Cholin Consultants Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 11:57:51 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-113-NFPA 652-2014
Statement: CC NOTE: The following CC Note No. 7 appeared in the First Draft Report as First Revision No. 244 and also related to Public Input No. 326.

The Correlating Committee requests that the TC review the requirement in this paragraph. The TC should consider the ease of ignition of the particulate, the presence of credible ignition sources, and address the practicality of implementation and the basis for application to every installation. Examples of “enclosures” found in facilities where isolation could be impractical include: mechanical conveyors, such as screw conveyors, spouting. The CC notes that requirements in NFPA 654 and 664 might provide some guidance to the TC as they consider this request.

The Committee has used requirements from NFPA 654 as suggested by the Correlating Committee. This SR addresses a number of other Public Comments to revised these requirements.
Isolation devices shall be provided when recycling enclosure exhaust to building interiors to prevent deflagration propagation and transmission of energy from a fire or explosion in accordance with NFPA 69, Standard on Explosion Prevention Systems.

Statement of Problem and Substantiation for Public Comment

There appears to be no substantive difference in the requirements of 8.8.4.3 and 8.8.4.4.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 22:53:05 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-113-NFPA 652-2014
Statement: CC NOTE: The following CC Note No. 7 appeared in the First Draft Report as First Revision No. 244 and also related to Public Input No. 326.

The Correlating Committee requests that the TC review the requirement in this paragraph. The TC should consider the ease of ignition of the particulate, the presence of credible ignition sources, and address the practicality of implementation and the basis for application to every installation. Examples of “enclosures” found in facilities where isolation could be impractical include: mechanical conveyors, such as screw conveyors, spouting. The CC notes that requirements in NFPA 654 and 664 might provide some guidance to the TC as they consider this request.

The Committee has used requirements from NFPA 654 as suggested by the Correlating Committee. This SR addresses a number of other Public Comments to revised these requirements.
8.8.4.4 –
Isolation devices shall be provided when recycling enclosure exhaust to building interiors to prevent deflagration propagation and transmission of energy from a fire or explosion in accordance with NFPA 69, Standard on Explosion Prevention Systems.

Statement of Problem and Substantiation for Public Comment

Duplicate of 8.4.3.3. Overly broad and can be construed to require isolation where there is no history, that I know of, to justify it.

Submitter Information Verification

Submitter Full Name: John Cholin
Organization: J. M. Cholin Consultants Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 11:59:28 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-113-NFPA 652-2014
Statement: CC NOTE: The following CC Note No. 7 appeared in the First Draft Report as First Revision No. 244 and also related to Public Input No. 326.

The Correlating Committee requests that the TC review the requirement in this paragraph. The TC should consider the ease of ignition of the particulate, the presence of credible ignition sources, and address the practicality of implementation and the basis for application to every installation. Examples of “enclosures” found in facilities where isolation could be impractical include: mechanical conveyors, such as screw conveyors, spouting. The CC notes that requirements in NFPA 654 and 664 might provide some guidance to the TC as they consider this request.

The Committee has used requirements from NFPA 654 as suggested by the Correlating Committee. This SR addresses a number of other Public Comments to revised these requirements.
8.8.4.4 - Isolation devices shall be provided when recycling enclosure exhaust to building interiors to prevent deflagration propagation and transmission of energy from a fire or explosion in accordance with NFPA 69, Standard on Explosion Prevention Systems.

Statement of Problem and Substantiation for Public Comment

This section appears to be redundant to 8.8.4.3, as the requirement is simply a restatement of the second half of 8.8.4.3 without the qualification "Where a dust explosion hazard exists within any operating equipment".

Submitter Information Verification

Submitter Full Name: Dale Hansen
Organization: Harrington Group, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 15:29:12 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-113-NFPA 652-2014
Statement: CC NOTE: The following CC Note No. 7 appeared in the First Draft Report as First Revision No. 244 and also related to Public Input No. 326.

The Correlating Committee requests that the TC review the requirement in this paragraph. The TC should consider the ease of ignition of the particulate, the presence of credible ignition sources, and address the practicality of implementation and the basis for application to every installation. Examples of "enclosures" found in facilities where isolation could be impractical include: mechanical conveyors, such as screw conveyors, spouting. The CC notes that requirements in NFPA 654 and 664 might provide some guidance to the TC as they consider this request.

The Committee has used requirements from NFPA 654 as suggested by the Correlating Committee. This SR addresses a number of other Public Comments to revised these requirements.
8.8.4.4
Isolation devices shall be provided when recycling enclosure exhaust to building interiors to prevent deflagration propagation and transmission of energy from a fire or explosion in accordance with NFPA 69, Standard on Explosion Prevention Systems. Where a dust fire hazard exists in equipment that recycles outlet air into a building, an automatic fire detector in accord with NFPA 72, National Fire Alarm and Signaling Code, shall initiate the activation of a listed smoke control or diverter device to prevent recycling of combustion products into the building.

Statement of Problem and Substantiation for Public Comment

The current paragraph wording appears to be a duplication of the preceding paragraph. The proposed revision is intended to provide a requirement for preventing combustion products from a fire from being recycled into the building. The means to accomplish this is not covered by NFPA 69. Instead the cited NFPA 72 standard describes requirements for fire detection devices and the initiation of signals to initiate equipment interlocks.

Submitter Information Verification

Submitter Full Name: Robert Zalosh
Organization: Firexplo
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 20:34:16 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee believes this additional requirement is covered by the changes made to 8.8.4 and no further changes are required to address this situation.
Public Comment No. 49-NFPA 652-2013 [Sections 8.9.1, 8.9.2, 8.9.3]

Sections 8.9.1, 8.9.2, 8.9.3

8.9.1 General.

8.9.1.1 Where a fire hazard exists in a building or operating enclosure as determined in Chapter 7, manual or automatic fire protection means shall be provided in accordance with Section 8.9.

8.9.1.2* Automatic fire protection systems shall be provided when at least one of the following conditions exists:

(1)* Manual fire-fighting poses an unacceptable risk to facility personnel and emergency responders.

(2)* Manual fire-fighting is not expected to be effective for a fire hazard assessed in accordance with Chapter 7.

(3) They are required by the local building code adopted by the authority having jurisdiction.

8.9.2 System Requirements.

Fire protection systems where provided shall comply with 8.9.2.1 through 8.9.2.4.

8.9.2.1* Fire-extinguishing agents shall be compatible with the conveyed, handled, and stored materials.

8.9.2.2 Where fire detection systems are incorporated into pneumatic conveying, centralized vacuum, or dust collection systems, the process hazards analysis shall identify safe interlocking requirements for air-moving devices and process operations.

8.9.2.3 Where fire-fighting water or wet product can accumulate in the system, the vessel, pipe supports, and drains shall be designed in accordance with NFPA 91, Standard for Exhaust Systems for Air Conveying Vapors, Gases, Mists, and Noncombustible Particulate Solids.

8.9.2.4* Extinguishing agents shall be applied to the combustible particulate fire at a sufficiently low momentum to avoid generating a suspended dust cloud.

8.9.3 Fire Extinguishers.

8.9.3.1* Portable fire extinguishers shall be provided throughout all buildings in accordance with the requirements of NFPA 10, Standard for Portable Fire Extinguishers.

8.9.3.2* Personnel designated to use portable fire extinguishers shall be trained to use them in a manner that minimizes the generation of dust clouds during discharge.

Statement of Problem and Substantiation for Public Comment

* Manual fire-fighting poses an unacceptable risk to facility personnel and emergency responders.

* Manual fire-fighting is not expected to be effective for a fire hazard assessed in accordance with Chapter 7.

They are required by the local building code adopted by the authority having jurisdiction.
CC NOTE: The following CC Note No. 8 appeared in the First Draft Report in the First Revision No. 60 and also related to Public Input No. 114, 123, 124, and 119.

The Correlating Committee requests that the TC review the submitter’s recommendation in PI 114 and its response which refers the submitter to the section of the standard on "documentation", since that section on documentation does not currently address the submitter’s proposed change to include a period of retention for the documentation. The CC also notes that the TC might review and revise the annex to 9.1

**Related Item**
First Revision No. 60-NFPA 652-2013 [Sections 8.9.1, 8.9.2, 8.9.3]
Public Input No. 114-NFPA 652-2013 [Section No. 8.7.2]
Public Input No. 123-NFPA 652-2013 [New Section after 8.10]
Public Input No. 124-NFPA 652-2013 [New Section after 8.10]
Public Input No. 119-NFPA 652-2013 [Section No. 8.9.2]

**Submitter Information Verification**
Submitter Full Name: CC on CMD-AAC
Organization: CC on Combustible Dusts
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Mon Nov 04 11:00:47 EST 2013

**Committee Statement**
Committee Action: Rejected
Resolution: Document retention is addressed in section 9.10 of the standard; the Committee believes this is sufficient as currently written.
8.9.1.1
Where a fire hazard exists in a building or operating enclosure as determined in
Chapter 7, manual or automatic fire protection means shall be provided in
accordance with Section 8.9.

Statement of Problem and Substantiation for Public Comment

Section 8.9.1.1 Fire Protection Systems:
a. This section requires manual or automatic fire protection when a fire hazard exists in
a building or operating enclosure. Section directs the reader to Chapter 7 to serve as basis
for determining if a fire hazard exists. Chapter 7 and related sections in the Appendix
provide extensive guidance on determining if a deflagration hazard exists, but nothing
related to fire hazard. This leaves the user to rely on the definition of a fire hazard, which
refers to "applicable data", which is neither defined nor discussed in the Appendix. If NFPA
intends to cover fire hazards in this Standard, additional information is needed.

Submitter Information Verification

Submitter Full Name: Jennifer Gradnigo
Organization: CRA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Oct 09 13:42:37 EDT 2013

Committee Statement

Committee Action: Rejected
Resolution: No specific technical recommendation for revising the standard has been
provided with this comment, so the Committee has no specific revisions to
consider and no further action is required for this comment.
Public Comment No. 343-NFPA 652-2013 [Section No. 8.9.1.1]

8.9.1.1
Where a fire hazard exists in a building or operating enclosure as determined in Chapter 7, manual or automatic fire protection means shall be provided in accordance with the applicable commodity or occupancy standard, or in accordance with Section 8.9 if not addressed in the occupancy or commodity standard.

Statement of Problem and Substantiation for Public Comment

The current restriction to section 8.9 is too limiting when there are applicable commodity or occupancy standards.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 16:26:39 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The subject of the relationship between NFPA 652 and the industry or commodity-specific NFPA standards is covered in 1.4 of the standard based on the revisions in SR No. 4 to the Second Draft; therefore, the Committee does not believe it is necessary to restate those relationships in this Chapter.
8.9.1.1
Where a fire hazard exists in a building or operating enclosure as determined in Chapter 7, manual or automatic fire protection means shall be provided in accordance with an industry- or commodity-specific combustible dust standard, an occupancy standard, or Section 8.9.

Statement of Problem and Substantiation for Public Comment

This is too inflexible.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 10:43:22 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The subject of the relationship between NFPA 652 and the industry or commodity-specific NFPA standards is covered in 1.4 of the standard based on the revisions in SR No. 4 to the Second Draft; therefore, the Committee does not believe it is necessary to restate those relationships in this Chapter.
8.9.1.2*
Automatic fire protection systems shall be provided when at least one of the following conditions exists:

(1)* Manual fire-fighting poses an unacceptable risk to facility personnel and emergency responders.

(2)* Manual fire-fighting is not expected to be effective for a fire hazard assessed in accordance with Chapter 7.

(3) They. Automatic fire protection systems are required by the local building code adopted by the authority having jurisdiction.

**Statement of Problem and Substantiation for Public Comment**

Eliminates potential ambiguity with the work "They"

**Submitter Information Verification**

Submitter Full Name: Dale Hansen
Organization: Harrington Group, Inc.

**Committee Statement**

Committee Action: Accepted
Resolution: SR-93-NFPA 652-2014
Statement: Eliminates potential ambiguity with the work "They"
8.9.1.2 *
Automatic fire protection systems shall be provided when at least one of the following conditions exists:

1) Manual fire-fighting poses an unacceptable risk to facility personnel and emergency responders.
2) Manual fire-fighting is not expected to be effective for a fire hazard assessed in accordance with Chapter 7.
3) They are required by another NFPA commodity or industry specific code.
4) They are required by the local building code adopted by the authority having jurisdiction.

Statement of Problem and Substantiation for Public Comment

For areas that have not adopted appropriate fire protection codes, the new item 3 covers another valid requirement. I also would see it as appropriate to re-order the priorities emphasizing code and local jurisdiction first and providing the manual protection options last.

Submitter Information Verification

Submitter Full Name: Henry Febo
Organization: FM Global
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 16:58:32 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The proposed changes included in this comment are covered by the revision to the standard in SR No. 4 to section 1.4 on the relationship with NFPA 652 and the industry or commodity-specific NFPA standards; therefore, there is no need to further revise this section of the standard to restate those provisions from Chapter 1.
8.9.3.1 *
Portable fire extinguishers shall be provided throughout all buildings in accordance with the requirements of NFPA 10, Standard for Portable Fire Extinguishers.

8.9.3.1.1 For areas handling, storing or processing combustible metals provide portable extinguishers in accordance with the requirements of NFPA 484

Statement of Problem and Substantiation for Public Comment

Fire fighting requirements and hazards of combustible metals are unique and rightfully should be highlighted in the main document text not in the Annex as currently presented and delete A.8.9.3.1

Submitter Information Verification

Submitter Full Name: Henry Febo
Organization: FM Global
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 17:17:45 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee believes the recommended changes in this comment are already covered by section 1.4 for the industry or commodity-specific standards and also that the reference to NFPA 10 in 8.9.3.1 would direct you to NFPA 484 for metals, so adding a separate pointer as proposed in this comment is not needed.
Public Comment No. 34-NFPA 652-2013 [Section No. 9.1]

9.1 Retroactivity.
This chapter shall apply to new and existing facilities and processes. Required management systems shall be developed and implemented within 18-months of the effective date of this Standard.

Statement of Problem and Substantiation for Public Comment

Section 9.1 Management Systems Retroactivity:

a. This section indicates that Chapter 9 shall apply to new and existing facilities and processes. While it is appropriate that the management systems discussed in this chapter apply to existing facilities and processes, it is unrealistic to expect that they will be in place on the effective date of the Standard. Because OSHA will likely enforce NFPA652 as a consensus standard under the General Duty Clause, an implementation schedule for the Management Systems is needed. Note that this is consistent with the approach taken by OSHA when it promulgates new regulatory requirements. Recommended language changes:

b. This chapter shall apply to new and existing facilities and processes. Required management systems shall be developed and implemented within 18-months of the effective date of this Standard.

Submitter Information Verification

Submitter Full Name: Jennifer Gradnigo
Organization: CRA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Oct 09 13:44:10 EDT 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee is not in favor of any phase-in period for these requirements. There are essential parts of this chapter that cannot be delayed from the effective date of the standard. As noted by the CSB, the Committee would be concerned that a phase-in period could create a condition of selected applicability and some hazards could become normalized by virtue of being accepted for some period rather than being addressed once they have been identified.
9.3.2 *  
The owner/operator shall establish safe work practices to address combustible dust ignition hazards associated with maintenance and servicing operations. 
9.3.2.1  
The safe work practices shall apply to employees and contractors.

Statement of Problem and Substantiation for Public Comment

As worded, the provision is not limited to avoidance of combustible dust ignition hazards.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER  
Organization: for United States Beet Sugar Association  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Mon Nov 18 10:47:11 EST 2013

Committee Statement

Committee Action: Rejected  
Resolution: The Committee does not intend that this requirement be limited only to ignition hazards, so it is not in favor of adding the text as proposed in the Public Comment. To confirm this, the Committee notes the annex item to the existing text, which demonstrates that this is not limited only to ignition hazards as would be the case if the change as proposed was to be accepted by the committee.
Public Comment No. 518-NFPA 652-2013 [ New Section after 9.4.1 ]

TITLE OF NEW CONTENT

Type your content here ..9.1.X.. The inspection, testing, and maintenance program shall include the following: (similar language as NFPA 654-2013: 12.1.2)

(1) Fire and explosion protection and prevention equipment in accordance with the applicable NFPA standards.
(2) Dust control equipment as per NFPA 91
(3) Housekeeping
(4) Potential ignition sources
(5) Electrical, process, and mechanical equipment including process interlocks
(6) Process changes
(7) Lubrication of bearings

Statement of Problem and Substantiation for Public Comment

All the equipment listed is important to protecting the workplace from combustible dust deflagrations. Dust control equipment systems are critical to minimizing fugitive dust accumulations but a very common gap today is lack of commissioning or proof of performance at new system startup or after system modifications. There have been incidents where the failure of the dust control system contributed to the severity of the incident. NFPA 91 has clear direction in Section 10.3 to confirm local exhaust ventilation systems (dust control systems are one example) performance over its lifetime. A clear reference to the types of equipment covered by inspection, testing, and maintenance and the expectations for dust control systems will greatly improve control of fugitive dust over the long haul.

Submitter Information Verification

Submitter Full Name: GARY JOHNSON
Organization: WORKPLACE EXPOSURE SOLUTIONS
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 16:18:06 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-50-NFPA 652-2014
Statement: All the equipment listed is important to protecting the workplace from combustible dust deflagrations. Dust control equipment systems are critical to minimizing fugitive dust accumulations but a very common gap today is lack of commissioning or proof of performance at new system startup or after system modifications. There have been incidents where the failure of the dust control system contributed to the severity of the incident. NFPA 91 has clear direction in Section 10.3 to confirm local exhaust ventilation systems (dust control systems are one example) performance over its lifetime. A clear reference to the types of equipment covered by inspection, testing, and maintenance and the expectations for dust control systems will greatly improve control of fugitive dust over the long haul.
9.4.1 *
Equipment affecting the prevention, control, and mitigation of combustible dust fires, deflagrations, and explosions shall be inspected and tested in accordance with the applicable NFPA standard and the manufacturer's recommendations and documented facility maintenance program.

Statement of Problem and Substantiation for Public Comment

Manufacturers recommendations are the primary source of maintenance of their equipment along with leading industry practices in a documented proactive maintenance program.

Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submit Date: Tue Nov 12 15:00:32 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee believes the standard is more complete and consistent with similar usage in other NFPA standards by retaining the need for requirements to be in accordance with both applicable NFPA standard and manufacturer's recommendations.
9.4.1 *  
Equipment affecting the prevention, control, and mitigation of combustible dust fires, deflagrations, and explosions shall be inspected and tested in accordance with the applicable NFPA standard and the manufacturers' recommendations. The owner/operator may rely on the manufacturer's recommendations and not conduct its own testing.

Statement of Problem and Substantiation for Public Comment

This provision as currently drafted is not feasible. The owner/operator should be entitled to rely upon the manufacturer's recommendations rather than independently test each piece of equipment in accordance with the applicable NFPA standard.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER  
Organization: ARENT FOX LLP  
Affiliation: NOPA, NGFA, IOMSA  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Wed Nov 13 16:30:09 EST 2013

Committee Statement

Committee Action: Rejected  
Resolution: The Committee believes the standard is more complete and consistent with similar usage in other NFPA standards by retaining the need for requirements to be in accordance with both applicable NFPA standard and manufacturer's recommendations.
9.4.1 *
Equipment affecting the prevention, control, and mitigation of combustible
dust fires, deflagrations, and explosions shall be inspected and tested in
accordance with the applicable NFPA standard and/or the manufacturers’
recommendations.

Statement of Problem and Substantiation for Public Comment
By adding "or" allows the owner/operator to comply with OSHA regulations in that OSHA
requires the owner/operator to follow manufacturer's recommendations if such
recommendation differs greatly from NFPA.

Submitter Information Verification
Submitter Full Name: J. Yount
Organization: ConAgra Food Ingredients
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 16:41:15 EST 2013

Committee Statement
Committee Action: Rejected
Resolution: The Committee believes the standard is more complete and consistent with
similar usage in other NFPA standards by retaining the need for
requirements to be in accordance with both applicable NFPA standard and
manufacturer's recommendations.
9.4.1 *
Equipment affecting the prevention, control, and mitigation of combustible dust fires, deflagrations, and explosions shall be inspected and tested in accordance with the applicable NFPA standard and/or the manufacturers' recommendations.

Statement of Problem and Substantiation for Public Comment
The word “and” in the phrase “the applicable NFPA standard and the manufacturers’ recommendations” needs to be changed to “or.” Equipment need not be inspected in accordance with both NFPA standards and the manufacturer’s recommendations if they differ.

Submitter Information Verification
Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 10:48:40 EST 2013

Committee Statement
Committee Action: Rejected
Resolution: The Committee believes the standard is more complete and consistent with similar usage in other NFPA standards by retaining the need for requirements to be in accordance with both applicable NFPA standard and manufacturer's recommendations.
9.4.3 *

Where equipment deficiencies that affect the prevention, control, and mitigation of dust fires, deflagrations, and explosions are identified or become known, the owner/operator shall establish and implement a corrective action plan with an explicit appropriate deadline.

Statement of Problem and Substantiation for Public Comment

The word "explicit" has a connotation that would not allow a deadline to be missed or adjusted. Missing a deadline beyond the owner/operator's control is just that beyond their control. It may be interpreted by certain AHJ that the process or system can no longer be operated beyond an explicit deadline, which is impractical.

Submitter Information Verification

Submitter Full Name: J. Yount
Organization: ConAgra Food Ingredients
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 16:45:44 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The addition of the word "appropriate" is unenforceable, so the Committee has rejected this comment.
9.4.4 * -
Inspections. The process for inspections and testing activities that affect the prevention, control, and mitigation of dust fires, deflagrations, and explosions shall be documented.

Statement of Problem and Substantiation for Public Comment

It is not feasible to document every single action that affects dust fires and explosions. That would require extensive documentation of every preventive maintenance action, every time a floor is swept, and many other day-to-day activities.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Wed Nov 13 16:33:41 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee believes the requirement should remain as it exists in the First Draft as the intent of the standard would be to document actual inspections and not just the process for inspections which is how the submitter of this PC has proposed changing the standard.
Public Comment No. 616-NFPA 652-2013 [ Section No. 9.4.4 ]

9.4.4 *
Inspections and testing activities that affect the prevention, control, and mitigation of dust fires, deflagrations, and explosions shall be documented.

Statement of Problem and Substantiation for Public Comment

The provision should be struck as unnecessarily burdensome. The standard has too many documentation requirements.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 10:49:51 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee has not accepted this comment as it proposes to delete the requirement for documentation of inspections as this is an essential requirement as demonstrated by loss histories from other incidents where failure to document inspections has contributed to incidents.
9.5.1 *

Employees, contractors, and temporary workers, and visitors, shall be included in a training program according to the potential exposure to combustible dust hazards and the potential risks to which they might be exposed or could cause.

Statement of Problem and Substantiation for Public Comment

Contractors and visitors cannot be brought into regular training sessions unless they are already contracted and located at the facility. The references to contractors and visitors should be deleted from this section.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Nov 13 16:36:09 EST 2013

Committee Statement

Committee Action: Rejected

Resolution: The Committee does not agree with the proposed change in this comment to delete the requirement to train contractors and visitors; it is essential to train any person who visits the facility - the standard does not establish any specific details as to the degree of training, recognizing that is left to the owner/operator to determine as needed. However, the Committee believes that it is essential to train both contractors and visitors to the facility; it is common practice for all visitors entering various industrial facilities to watch a training video prior to being admitted to the facility even when not going into the actual plant area, just so there is a fundamental level of hazard awareness due to being within an industrial environment where hazards exist.
9.5.1*
Employees, contractors, temporary workers, and visitors shall be included in a training program according to the potential exposure to combustible dust hazards and the potential risks to which they might be exposed or could cause.

Statement of Problem and Substantiation for Public Comment

RMA recommends that section 9.5.1 should be changed to read: “Employees shall be included in a training program according to the potential exposure to combustible dust.” The Occupational Safety and Health Administration’s (OSHA) Hazard Communication Rule covers contractor’s safety and therefore contractor safety should not also be addressed by the NFPA 652 standard. (29 CFR 1910.1200). Additionally, OSHA regulations do not typically cover visitors. (See Pendergrass John, Standard Interpretation 1910.134, U.S. Department of Labor (Nov. 11, 2013, 5:00 PM), https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=19592.) RMA recommends that visitors should also be excluded from the requirements of section 9.5.1.

Submitter Information Verification

Submitter Full Name: SARAH AMICK
Organization: RUBBER MANUFACTURERS ASSN
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 15:20:19 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The proposed change recommended in this comment would violate the OSHA Hazard Communication standard. The proposed deletion of contractors, visitors, and temporary workers from the requirement is fundamentally not acceptable. The wording of the existing requirement is intentionally written so it permits the level of training to be determined by the owner/operator of the facility based on the potential hazards.
Public Comment No. 232-NFPA 652-2013 [ Section No. 9.5.3 ]

9.5.3 Refresher training shall be provided as required by the authority having jurisdiction and as required by other relevant industry or commodity-specific NFPA standards. (See 1.3.1) - at established intervals.

Statement of Problem and Substantiation for Public Comment

it is not appropriate for the AHJ to set frequency of refresher training. The owner needs to determine that based on multiple sources and facility needs.

Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 15:35:58 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee believes the existing requirement is consistent with typical refresher training requirements and does not support any revision to this requirement.
Section 9.5.3
Refresher training shall be provided as required by the authority having jurisdiction and as required by other relevant industry or commodity-specific NFPA standards. *(See 1.3.1.)*

**Statement of Problem and Substantiation for Public Comment**

Section 1.3.1 does not contain relevant information as it is currently written.

**Submitter Information Verification**

Submitter Full Name: J. Yount  
Organization: ConAgra Food Ingredients  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Fri Nov 15 16:51:31 EST 2013

**Committee Statement**

Committee Action: Accepted  
Resolution: SR-51-NFPA 652-2014  
Statement: Section 1.3.1 does not contain relevant information as it is currently written.
9.6.2 *
Only qualified contractors shall be employed for work involving the installation, repair, or modification of buildings (interior and exterior), machinery, and fire protection and explosion protection equipment that could adversely affect the prevention, control, or mitigation of fires and explosions.

Statement of Problem and Substantiation for Public Comment
This requirement should also apply to explosion protection equipment

Submitter Information Verification
Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 22:57:17 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-52-NFPA 652-2014
Statement: This requirement should also apply to explosion protection equipment
9.6.2*  
Only qualified contractors shall be employed for work involving the installation, repair, or modification of buildings (interior and exterior), machinery, and fire/explosion protection equipment that could adversely affect the prevention, control, or mitigation of fires and explosions.

Statement of Problem and Substantiation for Public Comment

Only qualified contractors should work on explosion protection equipment in addition to the other categories listed.

Submitter Information Verification

Submitter Full Name: Dale Hansen  
Organization: Harrington Group, Inc.  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Fri Nov 15 15:40:10 EST 2013

Committee Statement

Committee Action: Rejected but see related SR  
Resolution: SR-52-NFPA 652-2014  
Statement: This requirement should also apply to explosion protection equipment
9.6.3.1 - Contractors operating owner/operator equipment shall be trained and qualified to operate the equipment and perform the work.

Statement of Problem and Substantiation for Public Comment

The implication in this section is that the owner/operator should train the contractor on the operation of equipment. That should not be necessary if the contractor is already trained, as is normally the case.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER  
Organization: ARENT FOX LLP  
Affiliation: NOPA, NGFA, IOMSA  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Wed Nov 13 16:38:45 EST 2013

Committee Statement

Committee Action: Rejected  
Resolution: The Committee does not support the proposed deletion of this requirement as contractors need to be trained on the equipment. However, the Committee believes that the submitter's statement of the problem is incorrect. It is not the Committee's intent that the owner/operator provide the contractor with the specific training, only to monitor that contractors are suitably trained.
### Statement of Problem and Substantiation for Public Comment

This document does not cover toxic releases.

### Submitter Information Verification

<table>
<thead>
<tr>
<th>Submitter Full Name</th>
<th>Craig Froehling</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Cargill, Inc.</td>
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<tr>
<td>Street Address</td>
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### Committee Statement

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<tr>
<td>Statement</td>
<td>This document does not cover toxic releases.</td>
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</table>
9.7.1 *
A written emergency response plan shall be developed for preventing, preparing for, and responding to work-related emergencies including, but not limited to, that includes responding to fire and explosion emergencies.

Statement of Problem and Substantiation for Public Comment

An ERP does not prevent emergencies but is a plan to respond to foreseeable emergencies. In addition modified the text to align with the scope of this standard. All work-related emergencies are outside the scope of this standard.

Submitter Information Verification

Submitter Full Name: Chris Aiken
Organization: Cargill, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 11:29:54 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-54-NFPA 652-2014
Statement: An emergency response plan is designed for response not prevention of fires and explosions. The facility's Fire/Explosion Prevention Plan is designed and developed to communicate the appropriate information to prevent an incident from occurring. By leaving the word "preventing" in this section would require the inclusion of the Fire/Explosion Prevention Plan to be incorporated into the Emergency Response Plan.
9.7.1*
A. Facilities that identify combustible dust is present shall address their response to combustible dust emergencies in a written emergency response plan shall be developed for preventing, preparing for, and responding to work-related emergencies including, but not limited to, fire and explosion.
. The emergency response plan for combustible dust that is identified in a facility may be a component of an emergency response plan already in place at a facility that addresses other emergencies.

Statement of Problem and Substantiation for Public Comment

NFPA 652 is a combustible dust standard and should not be expanded to cover other potential work-related emergencies. The Rubber Manufacturers Association recommends that section 9.7.1 should be revised to read: "Facilities that identify combustible dust is present shall address their response to combustible dust emergencies in a written emergency response plan. The emergency response plan for combustible dust that is identified in a facility may be a component of an emergency response plan already in place at a facility that addresses other emergencies."

Submitter Information Verification

Submitter Full Name: SARAH AMICK
Organization: RUBBER MANUFACTURERS ASSN
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 15:22:50 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-54-NFPA 652-2014
Statement: An emergency response plan is designed for response not prevention of fires and explosions. The facility's Fire/Explosion Prevention Plan is designed and developed to communicate the appropriate information to prevent an incident from occurring. By leaving the word "preventing" in this section would require the inclusion of the Fire/Explosion Prevention Plan to be incorporated into the Emergency Response Plan.
9.7.1 *
A written emergency response plan shall be developed for preparing for preventing, preparing for, and responding to work-related emergencies including, but not limited to, fire and explosion.

Statement of Problem and Substantiation for Public Comment

An emergency response plan is designed for response not prevention of fires and explosions. The facility's Fire/Explosion Prevention Plan is designed and developed to communicate the appropriate information to prevent an incident from occurring. By leaving the word "preventing" in this section would require the inclusion of the Fire/Explosion Prevention Plan to be incorporated into the Emergency Response Plan.

Submitter Information Verification

Submitter Full Name: J. Yount
Organization: ConAgra Food Ingredients
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 16:54:51 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-54-NFPA 652-2014
Statement: An emergency response plan is designed for response not prevention of fires and explosions. The facility's Fire/Explosion Prevention Plan is designed and developed to communicate the appropriate information to prevent an incident from occurring. By leaving the word "preventing" in this section would require the inclusion of the Fire/Explosion Prevention Plan to be incorporated into the Emergency Response Plan.
Public Comment No. 349-NFPA 652-2013 [ Section No. 9.8 ]

9.8 - - Incident Investigation, -

9.8.1 - -
The owner/operator shall have a system to ensure that every incident that results in a fire, deflagration, or explosion is reported and investigated in a timely manner.

9.8.2 -
The investigation shall be documented and include findings and recommendations.

9.8.3 -
A system shall be established to address and resolve the findings and recommendations.

9.8.4 - -
The investigation findings and recommendations shall be reviewed with affected personnel.

 Statement of Problem and Substantiation for Public Comment

This entire section contains incident investigation requirements that go beyond applicable law. NFPA does not have the authority to mandate requirements of that sort, but should rely on OSHA and other regulatory authorities. The entire section should be deleted.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 16:40:48 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee has rejected this comment as incident investigation is an important component of a safety program as demonstrated from incidents such as Hoeganaes in 2011 where fires became a normalized occurrence rather than something to address as unsafe conditions. See the Committee's action in 9.9 in SR No. 55.
Public Comment No. 234-NFPA 652-2013 [Section No. 9.8.1]

9.8.1 *
The owner/operator shall have a system to ensure that every incident that results in a fire, deflagration, or explosion is reported and investigated in a timely manner.

Statement of Problem and Substantiation for Public Comment

Deleted the word 'every'. The owner needs to have a system in place to process incidents and investigations. Which incidents get entered could depend on severity and may not include every incident.

Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 15:53:41 EST 2013

Committee Statement

Committee Action: Accepted
Resolution: SR-61-NFPA 652-2014
Statement: Deleted the word 'every'. The owner needs to have a system in place to process incidents and investigations. Which incidents get entered could depend on severity and may not include every incident. Added comments to Annex material to include the concept of near-miss and how including near-miss reporting into an investigation program can strengthen the overall incident investigation program.
9.9.1 *
Written procedures shall be established and implemented to manage proposed changes to process materials, staffing, job tasks, technology, and equipment, procedures, and facilities.

Statement of Problem and Substantiation for Public Comment

It is not common to require an MOC for staffing changes, task changes or procedure changes. The term 'facilities' is too broad to use in this requirement.

Submitter Information Verification

Submitter Full Name: Craig Froehling
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 16:01:50 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: Any organizational change needs to be taken into consideration. The Committee uses the term facilities as it encompasses the area often associated with secondary hazards. The written procedures are not actually what's required in the MOC itself; this requirement is one to have written procedures in place to manage the MOC program.
9.9.1 *  
Written. Except for commodities and industries subject to an industry or commodity-specific NFPA standard, and except for facilities with fewer than 50 persons regularly present, written procedures shall be established and implemented to manage proposed changes to process materials, staffing, job tasks, technology, equipment, procedures, and facilities that could affect combustible dust ignition hazards.

Statement of Problem and Substantiation for Public Comment

The provision is very much overbroad. First, the provision is not appropriately applied to all industries, across the board. Management of change procedures, like PHA’s, are burdensome and expensive procedures that originated in the chemical industry, which frequently has novel chemicals and varied and complex processes, the behavior of which together is dynamic and can be difficult to predict. In contrast, the behavior of agricultural dusts and their handling processes have long been known, have remained essentially unchanged for decades, and are not complex. Imposing this process safety management requirement on the agricultural sector would impose burdens out of all proportion to its usefulness, and could not be justified. Unlike most facilities with combustible dust, and particularly the chemical industry, in which management-of-change precautions originated, in agricultural facilities, the frequency of subtle changes that can significantly increase fire and explosion hazards and yet not be detected by an experienced employee or manager is simply not great enough to require the multi-factor review process and documentation required of changes to less well understood or more complex processes. Furthermore, elaborate procedures for consideration of changes and their documentation are not justifiable. In small establishments, whether by reason of the size of the facility or the small number of managers, all changes come to the attention of a qualified person.

Second, the language of the proposal is not even limited to combustible dust ignition hazards. As worded, it is a general safety provision, requiring MOC procedures to the changing of a point-of-operation guard and thus outside the standard’s scope.

Third, almost any change in employee routines might be considered a “staffing” or "job task" change. The inclusion of staffing changes and job tasks will cause needless labor strife and internal organizational friction. The phrases add too little safety to be warranted.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER  
Organization: for United States Beet Sugar Association  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Mon Nov 18 10:50:53 EST 2013

Committee Statement
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<tr>
<th><strong>Committee Action:</strong></th>
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<tr>
<td><strong>Resolution:</strong></td>
<td>The edits proposed in this comment have already been addressed in revisions to section 1.3 on application and in response to PC No. 583, where the establishment of a threshold based on employee size of the facility has already been rejected and explained. So, the Committee does not support similar proposed changes in this Chapter for the same reasons as explained in Chapter 1 and Chapter 7.</td>
</tr>
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9.9.2 The procedures shall ensure that the following are addressed prior to any change:

1. The technical basis for the proposed change
2. Safety and health implications related to fire and deflagration hazards posed by the handling of combustible dusts and particulate solids.
3. Whether the change is permanent or temporary, including the authorized duration of temporary changes
4. Modifications to operating and maintenance procedures
5. Employee training requirements
6. Authorization requirements for the proposed change
7. Results of characterization tests used to assess the hazard, if conducted

Comment: Revise Section 9.9.2 to read as provided below.

9.9.2 The procedures shall ensure that the following are addressed prior to any change:

1. The technical basis for the proposed change
2. Safety and health implications related to fire and deflagration hazards posed by the handling of combustible dusts and particulate solids.

Statement of Problem and Substantiation for Public Comment

The section is revised to reflect the fact that the jurisdiction of the committee is limited to combustible dust.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement
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<tr>
<td>Resolution:</td>
<td>SR-55-NFPA 652-2014</td>
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</table>
| Statement:        | The first numbered item “(1) The technical basis for the proposed change,” should be struck. Persons experienced with the way that a parallel requirement in OSHA’s PSM Standard has been implemented inform us that, because the phrase has no apparent meaning or relation to safety, employers do not know what this phrase requires of them. Some think that it requires a statement of the purpose of the change (such as “environmental compliance” or “equipment reliability”) but such a statement is unrelated to safety and does not enhance the quality of the MOC procedure. More importantly, the phrase “safety and health implications” in clause (2) adequately covers whatever point clause (1) is trying to make.  

We also question whether this provision is too elaborate to be imposed on every facility with combustible dust. It should be struck in its entirety or simplified.  

The annex added shows examples of hazards not limited to fire and explosions that are also to be considered. |
9.9.2 The procedures shall ensure that the following are addressed prior to any change:

1. The technical basis for the proposed change
2. Safety and health implications related to fire and deflagration hazards posed by the handling of combustible dusts and particulate solids.
3. Whether the change is permanent or temporary, including the authorized duration of temporary changes
4. Modifications to operating and maintenance procedures
5. Employee training requirements
6. Authorization requirements for the proposed change
7. Results of characterization tests used to assess the hazard, if conducted

Statement of Problem and Substantiation for Public Comment

The proposed text exceeds the scope of the standard - combustible dust (and other combustible particulate solids only to the extent that the other combustible particulate solids are converted to combustible dust or would influence an event involving combustible dust). The proposed change would address that issue.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 14:53:30 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-55-NFPA 652-2014
Statement: The first numbered item “(1) The technical basis for the proposed change,” should be struck. Persons experienced with the way that a parallel requirement in OSHA’s PSM Standard has been implemented inform us that, because the phrase has no apparent meaning or relation to safety, employers do not know what this phrase requires of them. Some think that it requires a statement of the purpose of the change (such as “environmental compliance” or “equipment reliability”) but such a statement is unrelated to safety and does not enhance the quality of the MOC procedure. More importantly, the phrase “safety and health implications” in clause (2) adequately covers whatever point clause (1) is trying to make.

We also question whether this provision is too elaborate to be imposed on every facility with combustible dust. It should be struck in its entirety or simplified.

The annex added shows examples of hazards not limited to fire and explosions that are also to be considered.
Public Comment No. 618-NFPA 652-2013 [Section No. 9.9.2]

9.9.2
The procedures shall ensure that the following are addressed prior to any change:

- The technical basis for the proposed change

(1) Safety and health implications
(2) Whether the change is permanent or temporary, including the authorized duration of temporary changes
(3) Modifications to operating and maintenance procedures
(4) Employee training requirements
(5) Authorization requirements for the proposed change
(6) Results of characterization tests used to assess the hazard, if conducted

Statement of Problem and Substantiation for Public Comment

The first numbered item "(1) The technical basis for the proposed change," should be struck. Persons experienced with the way that a parallel requirement in OSHA’s PSM Standard has been implemented inform us that, because the phrase has no apparent meaning or relation to safety, employers do not know what this phrase requires of them. Some think that it requires a statement of the purpose of the change (such as "environmental compliance" or "equipment reliability") but such a statement is unrelated to safety and does not enhance the quality of the MOC procedure. More importantly, the phrase "safety and health implications" in clause (2) adequately covers whatever point clause (1) is trying to make.

We also question whether this provision is too elaborate to be imposed on every facility with combustible dust. It should be struck in its entirety or simplified.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 10:52:47 EST 2013

Committee Statement
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<td>Resolution:</td>
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9.9.2 The procedures shall ensure that the following are addressed prior to any change:

(1) The technical basis for the proposed change
(2) Safety and health implications
(3) Whether the change is permanent or temporary, including the authorized duration of temporary changes
(4) Modifications to operating and maintenance procedures
(5) Employee training requirements
(6) Authorization requirements for the proposed change
(7) Results of characterization tests used to assess the hazard, if conducted

Comment: Revise Section 9.9.2 to read as provided below.

9.9.2 The procedures shall ensure that the following are addressed prior to any change:

(1) The technical basis for the proposed change
(2) *Safety and health implications related to fire and deflagration hazards posed by the handling of combustible dusts and particulate solids.*

Statement of Problem and Substantiation for Public Comment

The section is revised to reflect the fact that the jurisdiction of the committee is limited to combustible dust.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.

Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 08 16:36:26 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-55-NFPA 652-2014
Statement: The first numbered item "(1) The technical basis for the proposed change," should be struck. Persons experienced with the way that a parallel requirement in OSHA’s PSM Standard has been implemented inform us that, because the phrase has no apparent meaning or relation to safety, employers do not know what this phrase requires of them. Some think that it requires a statement of the purpose of the change (such as "environmental compliance" or "equipment reliability") but such a statement is unrelated to safety and does not enhance the quality of the MOC procedure. More importantly, the phrase "safety and health implications" in clause (2) adequately covers whatever point clause (1) is trying to make.

We also question whether this provision is too elaborate to be imposed on every facility with combustible dust. It should be struck in its entirety or simplified.

The annex added shows examples of hazards not limited to fire and explosions that are also to be considered.
9.10.1 The owner/operator shall establish a program and implement a process to manage the retention of documentation, including, but not limited to, the following:

1. Training records
2. Equipment inspection, testing, and maintenance records
3. Incident investigation reports
4. Process hazards analyses
5. *Process and technology information, including required performance parameters and properties of the materials being handled.*
6. Management of change documents
7. Emergency response plan documents
8. *Contractor records*

**9.10.1, Revised text**

**Comment:** This section should be revised as follows:

9.10.1 The owner/operator shall establish a program and implement a process to manage the retention of documentation, including, but not limited to, the following:

1. Training records
2. Equipment inspection, testing, and maintenance records
3. Incident investigation reports
4. Process hazards analyses
5. *Process and technology information, including required performance parameters and properties of the materials being handled.*

The record retention period shall be a minimum of 5 years for the records identified in (1), (2) and (3) above, and for the life of the process, system or equipment for the records identified in (4) and (5) above.

**Statement of Problem and Substantiation for Public Comment**

Substantiation: The meaning of the phrase “process and technology information” is unclear and the suggested change provides clarification. It is important to have a required retention period for these documents so that they will be available to the operator of the facility on an ongoing basis as needed to ensure controls remain in place and remain effective.

**Submitter Information Verification**
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<th><strong>Submitter Full Name:</strong></th>
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<td><strong>Affiliation:</strong></td>
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| **City:**                | |
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| **Zip:**                 | |
| **Submittal Date:**      | Fri Nov 08 16:37:00 EST 2013 |

**Committee Statement**

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<tr>
<td><strong>Resolution:</strong></td>
<td>The Committee has chosen not to include specific retention time frames in the standard, so does not support the recommendation in this comment. See the SR No. 63.</td>
</tr>
</tbody>
</table>
9.10.1  The owner/operator shall establish a program and implement a process to manage the retention of documentation, including, but not limited to, the following:

(1) Training records
(2) Equipment inspection, testing, and maintenance records
(3) Incident investigation reports
(4) Process hazards analyses
(5)* Process and technology information
(6) Management of change documents
(7) Emergency response plan documents
(8)* Contractor records

Comment: This section should be revised as follows:

9.10.1. The owner/operator shall establish a program and implement a process to manage the retention of documentation, including, but not limited to, the following:

(1) Training records
(2) Equipment inspection, testing, and maintenance records
(3) Incident investigation reports
(4) Process hazards analyses
(5)* Process and technology information, including required performance parameters and properties of the materials being handled.

The record retention period shall be a minimum of 5 years for the records identified in (1), (2) and (3) above, and for the life of the process, system or equipment for the records identified in (4) and (5) above.

Statement of Problem and Substantiation for Public Comment

Substantiation: The meaning of the phrase “process and technology information” is unclear and the suggested change provides clarification. It is important to have a required retention period for these documents so that they will be available to the operator of the facility on an ongoing basis as needed to ensure controls remain in place and remain effective.

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<tr>
<th><strong>Submitter Full Name:</strong></th>
<th>Richard Krock</th>
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<tbody>
<tr>
<td><strong>Organization:</strong></td>
<td>The Vinyl Institute</td>
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<td>These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.</td>
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**Committee Statement**

- **Committee Action:** Rejected but see related SR
- **Resolution:** SR-63-NFPA 652-2014
- **Statement:** Substantiation: The meaning of the phrase “process and technology information” is unclear and the suggested change provides clarification. It is important to have a required retention period for these documents so that they will be available to the operator of the facility on an ongoing basis as needed to ensure controls remain in place and remain effective.
9.11.1 The owner/operator shall evaluate the effectiveness of the management systems presented in this standard by conducting a review of each management system.

Comment: This section should be revised as follows:

The owner/operator shall evaluate the effectiveness of the management systems presented in this standard by conducting a review of each management system at least every 3 years.

Statement of Problem and Substantiation for Public Comment

Substantiation: Due to the potential for changes to process, materials, personnel and procedures, a periodic review of each management system at an appropriate frequency is essential. Given the importance of these reviews and the types of changes in conditions that can occur over time, we believe it is appropriate to specify that these reviews be conducted at least every three years.

Submitter Information Verification

Submitter Full Name: Stan Lancy
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-56-NFPA 652-2014
Statement: The requirement should establish that periodic reviews are required for ongoing monitoring of the management systems elements. The committee added a frequency but does not agree with the 3 years proposed in PC 101 or 231 and prefers to leave it to be based on conditions.
Public Comment No. 162-NFPA 652-2013 [ Section No. 9.11.1 ]

9.11.1
The owner/operator shall evaluate the effectiveness of the management systems presented in this standard by conducting a periodic review of each management system.

Statement of Problem and Substantiation for Public Comment

The requirement should establish that periodic reviews are required for on-going monitoring of the management systems elements.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address:
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Submittal Date: Mon Nov 11 23:00:07 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-56-NFPA 652-2014
Statement: The requirement should establish that periodic reviews are required for on-going monitoring of the management systems elements. The committee added a frequency but does not agree with the 3 years proposed in PC 101 or 231 and prefers to leave it to be based on conditions.
9.11.1
The owner/operator shall evaluate the effectiveness of the management systems presented in this standard by conducting a review of each management system.

Comment: This section should be revised as follows:
The owner/operator shall evaluate the effectiveness of the management systems presented in this standard by conducting a review of each management system at least every 3 years.

Statement of Problem and Substantiation for Public Comment
Substantiation: Due to the potential for changes to process, materials, personnel and procedures, a periodic review of each management system at an appropriate frequency is essential. Given the importance of these reviews and the types of changes in conditions that can occur over time, we believe it is appropriate to specify that these reviews be conducted at least every three years.

Submitter Information Verification
Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-56-NFPA 652-2014
Statement: The requirement should establish that periodic reviews are required for ongoing monitoring of the management systems elements. The committee added a frequency but does not agree with the 3 years proposed in PC 101 or 231 and prefers to leave it to be based on conditions.
Public Comment No. 619-NFPA 652-2013 [Section No. 9.11.1]

9.11.1
The owner/operator shall evaluate the effectiveness of the management systems presented in this standard by conducting a review of each management system.

Statement of Problem and Substantiation for Public Comment

This provision is unnecessary. The owner is already responsible for compliance. Ordering him to review how he or she manages his compliance is unnecessary, overbearing, and will invite micromanagement by AHJs.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 18 10:55:35 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: In this comment, the recommendation is to delete the requirement for an evaluation of the effectiveness of the management systems. The Committee is not in favor or deleting the requirement and has made it a periodic evaluation in SR No. 56. The Committee notes an incident such as Hoeganaes in 2011 as demonstrating the need for periodic re-evaluation of the management systems in place in a facility.
9.11.2 - The owner/operator shall be responsible for maintaining and evaluating the ongoing effectiveness of the management systems presented in this standard.

Statement of Problem and Substantiation for Public Comment

This provision is pointless and should be struck. The whole standard makes the owner/operator responsible for this.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address:
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Submittal Date: Mon Nov 18 10:56:21 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: As noted in the response for PC No. 619, the Committee is not in favor of deleting some periodic evaluation of the effectiveness of management systems in place at a facility.
9.12 * Employee Participation.
Owner/operators shall establish and implement a system to ensure effective encourage participation of affected personnel in the implementation of this standard.

Statement of Problem and Substantiation for Public Comment

We question whether this provision should be in an NFPA technical standard. It should be struck or at best placed in the annex.
There is also a problem with the wording of the draft provision. As the provision is now written, an AHJ might think that the duty to "ensure" the "participation" of employees in the "implementation of this standard" literally gives employees a say in the running of the owner's business. OSHA has always been careful when drafting employee-participation provisions to avoid wording them so as to suggest intrusions into management or property rights. If the provision is not struck or moved to the annex, it should be re-worded as shown above.

Submitter Information Verification

Submitter Full Name: ARTHUR SAPPER
Organization: for United States Beet Sugar Association
Street Address: 
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Submittal Date: Mon Nov 18 10:57:27 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-57-NFPA 652-2014
Statement: We question whether this provision should be in an NFPA technical standard. It should be struck or at best placed in the annex.

There is also a problem with the wording of the draft provision. As the provision is now written, an AHJ might think that the duty to "ensure" the "participation" of employees in the "implementation of this standard" literally gives employees a say in the running of the owner's business. OSHA has always been careful when drafting employee-participation provisions to avoid wording them so as to suggest intrusions into management or property rights. If the provision is not struck or moved to the annex, it should be re-worded as shown above.
A.3.3.4 Combustible Dust.

The term *combustible dust* when used in this standard includes powders, fines, fibers, etc.

Dusts traditionally were defined as material 420 μm or smaller (capable of passing through a U.S. No. 40 standard sieve). For consistency with other standards, 500 μm (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 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 with lengths that are large compared to their diameter 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. Consequently, it can be inferred that any particulate that has 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 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 E 1226, *Standard Test Method for Explosibility of Dust Clouds*. Alternatively, a standardized test method such as ASTM E 1515, *Standard Test Method for Minimum Explosible Concentration of Combustible Dusts*, could be used to determine dust explosibility. [654, 2013]

There is some possibility that a sample will result in a false positive in the 20 L sphere when tested by the ASTM E 1226 screening test or the ASTM E 1515 test. This is due to the high energy ignition source overdriving the test. When the lowest ignition energy allowed by either method still results in a positive result, the owner/operator can elect to determine whether the sample is a combustible dust with screening tests performed in a larger scale (≥1 m³) enclosure, which is less susceptible to overdriving and thus will provide more realistic results. [654, 2013]

This possibility for false positives has been known for quite some time and is attributed to “overdriven” conditions that exist in the 20 L chamber due to the use of strong pyrotechnic igniters. For that reason, the reference method for explosibility testing is based on a 1 m³ chamber, and the 20 L chamber test method is calibrated to produce results comparable to those from the 1 m³ chamber for most dusts. In fact, the U.S. standard for 20 L testing (ASTM E 1226) states, “The objective of this test method is to develop data that can be correlated to those from the 1 m³ chamber (described in ISO 6184-1, *Explosion Protection Systems — Part 1: Determination of Explosion Indices of Combustible Dusts in Air*, and VDI 3673, *Pressure Venting of Dust Explosions*)...” ASTM E 1226 further states, “Because a number of factors (concentration, uniformity of dispersion, turbulence of ignition, sample age, etc.) can affect the test results, the test vessel to be used for routine work must be standardized using dust samples whose $K_{st}$ and $P_{max}$ parameters are known in the 1 m³ chamber.” [654, 2013]
NFPA 68, *Standard on Explosion Protection by Deflagration Venting*, also recognizes this problem and addresses it stating that “the 20 L test apparatus is designed to simulate results of the 1 m³ chamber; however, the igniter discharge makes it problematic to determine $K_{St}$ values less than 50 bar-m/sec. Where the material is expected to yield $K_{St}$ values less than 50 bar-m/sec, testing in a 1 m³ chamber might yield lower values.” [654, 2013]

Any time a combustible dust is processed or handled, a potential for deflagration exists. The degree of deflagration hazard varies, depending on the type of combustible dust and the processing methods used. [654, 2013]

A dust deflagration has the following four requirements:

1. Combustible dust
2. Dust dispersion in air or other oxidant
3. Sufficient concentration at or exceeding the minimum explosible concentration (MEC)
4. Sufficiently powerful ignition source such as an electrostatic discharge, an electric current arc, a glowing ember, a hot surface, a welding slag, frictional heat, or a flame

[654, 2013]

If the deflagration is confined and produces a pressure sufficient to rupture the confining enclosure, the event is, by definition, an “explosion.” [654, 2013]

Evaluation of the hazard of a combustible dust should be determined by the means of actual test data. Each situation should be evaluated and applicable tests selected. The following list represents the factors that are sometimes used in determining the deflagration hazard of a dust:

1. MEC
2. MIE
3. Particle size distribution
4. Moisture content as received and as tested
5. Maximum explosion pressure at optimum concentration
6. Maximum rate of pressure rise at optimum concentration
7. $K_{St}$ (normalized rate of pressure rise) as defined in ASTM E 1226
8. Layer ignition temperature
9. Dust cloud ignition temperature
10. Limiting oxidant concentration (LOC) to prevent ignition
11. Electrical volume resistivity
12. Charge relaxation time
13. Chargeability

[654, 2013]

It is important to keep in mind that as a particulate is processed, handled, or transported, the particle size generally decreases due to particle attrition. Consequently, it is often necessary to evaluate the explosibility of the particulate at multiple points along the process. Where process conditions dictate the use of oxidizing media other than air (nominally taken as 21 percent oxygen and 79 percent nitrogen), the applicable tests should be conducted in the appropriate process-specific medium. [654, 2013]
In the case of agricultural dusts, the definition utilized in NFPA 61 may be utilized.

Statement of Problem and Substantiation for Public Comment

See comment on Section 3.3.4. This is to insure consistency in the definitions for agricultural dusts.

Submitter Information Verification

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Submittal Date: Wed Nov 13 10:56:54 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The changes to 1.3 and 1.4 in SR No. 3 and 4 make the changes recommended to this definition not necessary, so no further changes are being made based on this comment. See SR No. 3 and 4.
A.3.3.11 – Dust. —

The terms, particulate solid, dust, and fines are interrelated. It is important to recognize that while these terms refer to various size thresholds or ranges, most particulate solids are composed of a range of particle sizes making comparison to a size threshold difficult. For example, a bulk material that is classified as a particulate solid could contain a significant fraction of dust as part of the particle-size distribution.

While hazards of bulk material are addressed in this document using the provisions related to particulate solids, it might be necessary to apply the portions of the document relating to dust where there is potential for segregation of the material and accumulation of only the fraction of the material that fits the definition of dust. Furthermore, it is difficult to establish a fractional cutoff for the size threshold, such as 10 percent below the threshold size or median particle size below the threshold size, as the behavior of the material depends on many factors including the nature of the process, the dispersibility of the dust, and the shape of the particles.

For the purposes of this document, the term particulate solid does not include an upper size limitation. This is intended to encompass all materials handled as particulates, including golf balls, pellets, wood chunks and chips, etc.

The term particulate solid is intended to include those materials that are typically processed using bulk material handling techniques such as silo storage, pneumatic or mechanical transfer, etc. While particulate solids can present a fire hazard, they are unlikely to present a dust deflagration hazard unless they contain a significant fraction of dust, which can segregate and accumulate within the process or facility.

Dusts traditionally were defined as material 420 μm or smaller (capable of passing through a U.S. No. 40 standard sieve). For consistency with other standards, 500 μm (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 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 with lengths that are large compared to their diameters usually do not pass through a 500 μm sieve; yet could still pose a deflagration hazard. Many particulates accumulate electrostatic charges 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. Consequently, it can be inferred that any particulate that has 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 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.
Typically, the term fines refers to the fraction of material that is below 75 μm or that will pass through a 200-mesh sieve. Alternately, fines can be characterized as the material collected from the final dust collector in a process or the material collected from the highest overhead surfaces in a facility. Fines typically represent a greater deflagration hazard than typical dusts of the same composition because they are more likely to remain suspended for an extended period of time and to have more severe explosion properties (higher Kst, lower MIE, etc.).

Statement of Problem and Substantiation for Public Comment

The definition in the main document has been proposed. The extensive Annex material provides little clarification and duplicates other annex material related to combustible dust.

Submitter Information Verification

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Organization: FM Global
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Submittal Date: Wed Nov 13 16:21:09 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-64-NFPA 652-2014
Statement: The definition in the main document has been proposed. The extensive Annex material provides little clarification and duplicates other annex material related to combustible dust. The Committee is deleting it as recommended by the PC as the definition has been deleted through a separate action. The Committee intends to retain the annex and move it to become annex to the definition for combustible particulate solid (3.3.6).
A.3.3.18 Flash Fire.
A flash fire requires an ignition source and an atmosphere containing a hydrocarbon or an atmosphere containing combustible, finely divided particles (e.g., coal dust or grain) having a concentration greater than the lower explosive limit of the chemical sufficient to propagate a flame. Both hydrocarbon and dust flash fires generate temperatures from 538°C to 1038°C (1000°F to 1900°F). The intensity of a flash fire depends on the size of the gas, vapor, or dust cloud. When ignited, the flame front expands outward in the form of a fireball. The resulting effect of the fireball's energy with respect to radiant heat significantly enlarges the hazard areas around the point of ignition.

Statement of Problem and Substantiation for Public Comment
The proposed revisions avoids the use of the term "lower explosive limit" which NFPA does not apply to either flammable vapors or combustible dusts.

Submitter Information Verification
Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
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Submittal Date: Mon Nov 11 23:07:09 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Statement: The proposed revisions avoids the use of the term "lower explosive limit" which NFPA does not apply to either flammable vapors or combustible dusts.
A.3.3.27 Process Hazards Analysis.

In the context of this definition, the process hazards analysis (PHA) is not intended to imply performance of a PHA that is often associated with a portion of OSHA requirements 29 CFR 1910.119. While the PHA process can be used to perform a PHA as it applies to this standard, other methods can also be used. (See Annex B.)

Comment: Revise this section to read as follows:

A.3.3.27 Process Hazards Analysis.

In the context of this definition, the process hazards analysis (PHA) is not intended to imply performance of a PHA that is often associated with a portion of the requirements in the OSHA Process Safety Management (PSM) Standard, 29 CFR 1910.119. The design of facilities to address combustible dust hazards is generally far less complicated than the design of facilities covered by the OSHA PSM Standard. Furthermore, the risks posed by combustible dust hazards (while substantial) are generally of a significantly lesser magnitude than those posed by facilities covered by 29 CFR 1910.119. Therefore, while the PHA process can be used to perform a PHA as it applies to this standard, other less complex methods can also be used. (See Annex B.)

Statement of Problem and Substantiation for Public Comment

Substantiation: The annex language is ambiguous and needs to be revised to clarify that the PHA contemplated by NFPA 652 is limited to the combustible dust hazard and would not ordinarily require the magnitude of resources required for a PHA under the OSHA Process Safety Management Standard.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.
Street Address: 
City: 
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Zip: 
Submittal Date: Fri Nov 08 17:05:14 EST 2013
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<td>Statement:</td>
<td>The text is revised for clarification and to reflect the fact that the scope of the standard is limited to combustible dust and extends to other combustible particulate solids only to the extent that the other combustible particulate solids are converted to combustible dust or would influence an event involving combustible dust. Annex A changes: The previous discussion was unclear as it used the term PHA twice in the same sentence, intending to potentially mean two different things. The point is that the PHA required by NFPA 652 need not comply with the OSHA PSM requirements for PHAs, unless it is a covered process.</td>
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</table>
A.3.3.27 Process Hazards Analysis.

In the context of this definition, the process hazards analysis (PHA) is not intended to imply performance of a PHA that is often associated with a portion of OSHA requirements 29 CFR 1910.119. While the PHA process can be used to perform a PHA as it applies to this standard, other methods can also be used. (See Annex B.)

Comment: Revise this section to read as follows:

A.3.3.27 Process Hazards Analysis.

In the context of this definition, the process hazards analysis (PHA) is not intended to imply performance of a PHA that is often associated with a portion of the requirements in the OSHA Process Safety Management (PSM) Standard, 29 CFR 1910.119. The design of facilities to address combustible dust hazards is generally far less complicated than the design of facilities covered by the OSHA PSM Standard. Furthermore, the risks posed by combustible dust hazards (while substantial) are generally of a significantly lesser magnitude than those posed by facilities covered by 29 CFR 1910.119. Therefore, while the PHA process can be used to perform a PHA as it applies to this standard, other less complex methods can also be used. (See Annex B.)

Statement of Problem and Substantiation for Public Comment

Substantiation: The annex language is ambiguous and needs to be revised to clarify that the PHA contemplated by NFPA 652 is limited to the combustible dust hazard and would not ordinarily require the magnitude of resources required for a PHA under the OSHA Process Safety Management Standard.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

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Zip: 
Submittal Date: Tue Nov 12 14:29:28 EST 2013

Committee Statement
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<td><strong>Resolution:</strong></td>
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| **Statement:**       | The text is revised for clarification and to reflect the fact that the scope of the standard is limited to combustible dust and extends to other combustible particulate solids only to the extent that the other combustible particulate solids are converted to combustible dust or would influence an event involving combustible dust.  
Annex A changes: The previous discussion was unclear as it used the term PHA twice in the same sentence, intending to potentially mean two different things. The point is that the PHA required by NFPA 652 need not comply with the OSHA PSM requirements for PHAs, unless it is a covered process. |
A.3.3.27 Process Hazards Analysis.

In the context of this definition, the process hazards analysis (PHA) is not intended to imply performance of a PHA that is often associated with a portion of OSHA requirements, the requirements in the OSHA Process Safety Management (PSM) Standard, 29 CFR 1910.119. While the design of facilities to address combustible dust hazards is generally far less complicated than the design of facilities covered by the OSHA PSM Standard, furthermore, the risks posed by combustible dust hazards (while substantial) are generally of a significantly lesser magnitude than those posed by facilities covered by 29 CFR 1910.119. Therefore, while the PHA process can be used to perform a PHA as it applies to this standard, other less complex methods can also be used. (See Annex B.)

Statement of Problem and Substantiation for Public Comment

The annex language is ambiguous and needs to be revised to clarify that the PHA contemplated by NFPA 652 is limited to the combustible dust hazard and would not ordinarily require the magnitude of resources required for a PHA under the OSHA Process Safety Management Standard.

Related Public Comments for This Document

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<td>Public Comment No. 281-NFPA 652-2013 [Section No. 3.3.27]</td>
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Submitter Information Verification

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| Zip:                     |                  |
| Submittal Date: Thu Nov 14 15:45:59 EST 2013 |

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-14-NFPA 652-2014
Statement: The text is revised for clarification and to reflect the fact that the scope of the standard is limited to combustible dust and extends to other combustible particulate solids only to the extent that the other combustible particulate solids are converted to combustible dust or would influence an event involving combustible dust.

Annex A changes: The previous discussion was unclear as it used the term PHA twice in the same sentence, intending to potentially mean two different things. The point is that the PHA required by NFPA 652 need not comply with the OSHA PSM requirements for PHAs, unless it is a covered process.
A.3.3.27 Process Hazards Analysis.  
In the context of this definition, it is not intended that the process hazards analysis (PHA) is not intended to imply performance of a PHA that is often associated with a portion of OSHA requirements. must comply with the PHA requirements contained in OSHA regulation 29 CFR 1910.119. While the PHA process can be used to perform a PHA as it applies to this standard the PHA can comply with OSHA requirements, other methods can also be used. (See Annex B.) However, some processes may fall within the scope of the OSHA regulation 29 CFR 1910.119 and there may be a legal requirement to comply with that regulation.

Statement of Problem and Substantiation for Public Comment

The previous discussion was unclear as it used the term PHA twice in the same sentence, intending to potentially mean two different things. The point is that the PHA required by NFPA 652 need not comply with the OSHA PSM requirements for PHAs, unless it is a covered process.

Submitter Information Verification

Submitter Full Name: Timothy Myers  
Organization: Exponent, Inc.  
Street Address:  
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Zip:  
Submittal Date: Wed Oct 30 22:44:42 EDT 2013

Committee Statement

Committee Action: Rejected but see related SR  
Resolution: SR-14-NFPA 652-2014  
Statement: The text is revised for clarification and to reflect the fact that the scope of the standard is limited to combustible dust and extends to other combustible particulate solids only to the extent that the other combustible particulate solids are converted to combustible dust or would influence an event involving combustible dust.

Annex A changes: The previous discussion was unclear as it used the term PHA twice in the same sentence, intending to potentially mean two different things. The point is that the PHA required by NFPA 652 need not comply with the OSHA PSM requirements for PHAs, unless it is a covered process.
A.3.3.30 Risk Assessment.
A risk assessment is a process that performs the following:

1. Identifies hazards
2. Quantifies the consequences and probabilities of the identified hazards
3. Identifies hazard control options
4. Quantifies the effects of the options on the risks of the hazards
5. Establishes risk acceptability thresholds (minimum acceptable tolerance criteria (maximum tolerable levels of risk))
6. Selects the appropriate control options that meet or exceed the risk acceptability thresholds

Steps 1 through 3 are typically performed as part of a process hazards analysis.

Risk assessments can be qualitative, semi-quantitative, or quantitative. Qualitative methods are usually used to identify the most hazardous events. Semi-quantitative methods are used to determine relative hazards associated with unwanted events and are typified by indexing methods or numerical grading. Quantitative methods are the most extensive and use a probabilistic approach to quantify the risk based on both frequency and consequences.


**Statement of Problem and Substantiation for Public Comment**

"Risk tolerance" is the term preferred by risk practitioners (as opposed to "risk acceptance").

In any event... the criteria establish the maximum levels of risk, not the minimum.

**Submitter Information Verification**

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 23:10:55 EST 2013
<table>
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<td><strong>Statement:</strong></td>
<td>&quot;Risk tolerance&quot; is the term preferred by risk practitioners (as opposed to &quot;risk acceptance&quot;).</td>
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In any event... the criteria establish the maximum levels of risk, not the minimum.
A.3.3.30

--- Risk Assessment, ---

Hazard Analysis

A

risk assessment.

hazard analysis is a

process.

systematic technique that

performs the following

:

(1) Identifies hazards

• Quantifies the consequences and probabilities of the identified hazards
• Identifies hazard control options
• Quantifies the effects of the options on the risks of the hazards
• Establishes risk acceptability thresholds (minimum acceptable levels of risk)
• Selects the appropriate control options that meet or exceed the risk acceptability thresholds

Steps 1 through 3 are typically performed as part of a process hazards analysis.

Risk assessments

within a process

(2) Identifies deviations or failures that can lead to undesirable consequences and the likelihood the deviation with the associated consequence would occur

(3) Identifies safeguards preventing the occurrence of the consequence

(4) Determines if the safeguards are sufficient to reduce the risk to a tolerable level

(5) Recommends additional safeguards if additional risk reduction is needed

The process hazard analysis can be qualitative, semi-quantitative, or quantitative.

Qualitative methods are usually used to identify the most hazardous events. Semi-quantitative methods are used to determine relative hazards associated with unwanted events and are typified by indexing methods or numerical grading. Quantitative methods are the most extensive and use a probabilistic approach to quantify the risk based on both frequency and consequences.

Statement of Problem and Substantiation for Public Comment

Modified the description to better describe standard industry practice

Submitter Information Verification

Submitter Full Name: Chris Aiken
Organization: Cargill, Inc.
Street Address:
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Submittal Date: Fri Nov 15 11:34:52 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee does not support changing the definition name and the other proposed changes are thus not relevant to the defined term that will remain in the standard. In addition, the technical input is not fully documented.
Public Comment No. 103-NFPA 652-2013 [ New Section after A.4.1 ]

A.4.2.1.1

A.4.2.1.1, New text

Comment: Insert a new section to read as follows:

The facility, processes and equipment, and human element programs should be designed, constructed, equipped, and maintained to protect occupants not in the immediate proximity of the ignition from the effects of a combustible dust fire, deflagration, and explosion for the time needed to evacuate, relocate, or take refuge.

Statement of Problem and Substantiation for Public Comment

Substantiation: The text of proposed Section 4.2.1.1 would be moved to the annex where it would be appropriate to explain one aspect of the life safety objective in this manner.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 08 16:58:16 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: See the revisions to Section 4.2 included in SR No. 18 and the annex to A.4.2.1.1. The Committee believes these revisions and the accompanying annex commentary address the proposed changes in these comments.
A.4.2.1.1

Comment: Insert a new section to read as follows:
The facility, processes and equipment, and human element programs shall be designed, constructed, equipped, and maintained to protect occupants not in the immediate proximity of the ignition from the effects of a combustible dust fire, deflagration, and explosion for the time needed to evacuate, relocate, or take refuge.

Statement of Problem and Substantiation for Public Comment

Substantiation: The text of proposed Section 4.2.1.1 would be moved to the annex where it would be appropriate to explain one aspect of the life safety objective in this manner.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement

Committee Action: Rejected
Resolution: See the revisions to Section 4.2 included in SR No. 18 and the annex to A.4.2.1.1. The Committee believes these revisions and the accompanying annex commentary address the proposed changes in these comments.
**Public Comment No. 205-NFPA 652-2013 [ New Section after A.4.1 ]**

### A.4.2.1.2

The structure shall be located, designed, constructed, and maintained to minimize, to the extent practical, the propagation of fire or explosion to adjacent properties and to avoid injury to the public.

**Statement of Problem and Substantiation for Public Comment**

**Substantiation:**

The word “minimize” means to prevent or reduce to risk to the lowest level possible, even if it would reduce the risk well below the acceptable risk level at completely unwarranted costs that would result in an inappropriate allocation of limited resources. The risk should be reduced to an acceptable level rather than to the lowest feasible level.

**Submitter Information Verification**

- **Submitter Full Name:** Richard Krock
- **Organization:** The Vinyl Institute
- **Affiliation:** These materials were developed through a cooperative effort involving the Vinyl Institute’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.
- **Street Address:**
- **City:**
- **State:**
- **Zip:**
- **Submittal Date:** Tue Nov 12 14:35:20 EST 2013

**Committee Statement**

- **Committee Action:** Rejected
- **Resolution:** See the revisions to Section 4.2 included in SR No. 18 and the annex to A.4.2.1.1. The Committee believes these revisions and the accompanying annex commentary address the proposed changes in these comments.
Public Comment No. 393-NFPA 652-2013 [New Section after A.4.1]

A.4.2.1.1, New text
The facility, processes and equipment, and human element programs shall be designed, constructed, equipped, and maintained to protect occupants not in the immediate proximity of the ignition from the effects of a combustible dust fire, deflagration, and explosion for the time needed to evacuate, relocate, or take refuge.

Statement of Problem and Substantiation for Public Comment
The text of proposed Section 4.2.1.1 would be moved to the annex where it would be appropriate to explain (using a "should") one aspect of the life safety objective in this manner.

Related Public Comments for This Document

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Submitter Information Verification

Submitter Full Name: MARIE MARTINKO  
Organization: SPI  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Fri Nov 15 08:17:47 EST 2013

Committee Statement

Committee Action: Rejected  
Resolution: See the revisions to Section 4.2 included in SR No. 18 and the annex to A.4.2.1.1. The Committee believes these revisions and the accompanying annex commentary address the proposed changes in these comments.
A.4.2.1.2, New Text

The structure shall be located, designed, constructed, and maintained to minimize, to the extent practical, the propagation of fire or explosion to adjacent properties and to avoid injury to the public.

Statement of Problem and Substantiation for Public Comment

The word “minimize” means to prevent or reduce to risk to the lowest level possible, even if it would reduce the risk well below the acceptable risk level at completely unwarranted costs that would result in an inappropriate allocation of limited resources. The risk should be reduced to an acceptable level rather than to the lowest feasible level.

Related Public Comments for This Document

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Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 08:25:35 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: See the revisions to Section 4.2 included in SR No. 18 and the annex to A.4.2.1.1. The Committee believes these revisions and the accompanying annex commentary address the proposed changes in these comments.
Public Comment No. 165-NFPA 652-2013 [Section No. A.4.1]

A.4.1
Combustible particulate solids and dust hazard identification, assessment, and mitigation should address known hazards, including the following:

(1) Reactivity hazards (e.g., binary incompatibility or water reactivity)
(2) Smoldering fire in a layer or pile
(3) Flaming fire of a layer or a pile
(4) Deflagration resulting in flash fire (dust cloud combustion)
(5) Deflagration resulting in dust explosion in equipment
(6) Deflagration resulting in dust explosion in rooms and buildings

Include table or list of applicable NAICS codes to identify occupancies that are likely to handle combustible particulate solids and dust.

Statement of Problem and Substantiation for Public Comment

"compatibility" should be "incompatibility" in list item 1.

The deleted text was a reminder to the committee and not intended to be in the final version of the annex.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon Nov 11 23:16:02 EST 2013

Committee Statement
Committee Action: Rejected but see related SR

Resolution: SR-17-NFPA 652-2014

Statement: Nearly every facility in the United States has dust of some sort. The Committee supports the proposed word change by adding "potentially combustible" which brings the standard back into scope of combustible dusts. The Committee has not defined facility in this change to the standard, but has addressed other issues raised through other Public Comments regarding the need to test materials and manage the hazards. This change now directs the user of the standard to the other relevant chapters for those requirements. PC No. 553 recommends deletion of this section; however, this SR addresses the issues cited in the substantiation, so the Committee believes that this action covers this comment as well.

Annex A changes: 'compatibility' should be 'incompatibility' in list item 1. The deleted text was a reminder to the committee and not intended to be in the final version of the annex.
A.5.1

Test data derived from testing material within a facility will result in the most accurate results for the process hazard analysis, performance-based design, and hazard management options. Testing is not required to determine whether the material has combustibility characteristics where reliable, in-house commodity-specific testing data or published data of well-characterized samples (i.e., particle size, moisture content, and test conditions) are available. Published data should be used for preliminary assessment of combustibility only. However, for protection or prevention design methods, the data can be acceptable after a thorough review to ensure that they are representative of owner/operator conditions.

The protection or prevention designs are based on explosivity properties, which can vary based on the specific characteristics of the material. (See 5.2.2 for characteristics that can affect explosibility properties.) Historical knowledge and experience of occurrence or nonoccurrence of process incidents such as flash fires, small fires, sparking fires, pops, or booms, or evidence of vessel, tank, or container overpressure should not be used as a substitute for hazard analysis. Process incidents are indications of a material or process resulting in combustibility or explosion propensity. Process incidents can be used to guide or select samples for and supplement testing.

The following material properties should be addressed by a process hazard analysis for the combustible particulate solids present:

(1) **Particle Size.** Sieve analysis is a crude and unreliable system of hazard determination. Its greatest contribution in managing the hazard is the ease, economy, and speed at which it can be used to discover changes in the process particulate. In any sample of particulate, very rarely are all the particles the same size. Sieve analysis can be used to determine the fraction that would be generally suspected of being capable of supporting a deflagration.

For a sub-500 micron fraction:

(2) Data presented in terms of the percent passing progressively smaller sieves.

(3) Particles that have high aspect ratios produce distorted, nonconservative results.

(4) **Particle Size Distribution.** The particle size distribution of a combustible particulate solid must be known if the explosion hazard is to be assessed. Particle size implies a specific surface area (SSA) and affects the numerical measure of other parameters such as MEC, MIE, dP/\(dt\)\(_{\text{max}}\), \(P_{\text{max}}\), and \(K_{\text{St}}\). Particles greater than 500 microns in effective mean particle diameter are generally not considered deflagratory. Most combustible particulate solids include a range of particle sizes in any given sample. The process hazards analysis should anticipate and account for particle attrition and separation as particulate is handled.
(5) **Particle Shape.** Due to particle shape and agglomeration, some particulates cannot be sieved effectively. Particulates with nonspheric or nonecubic shapes do not pass through a sieve as easily as spheric or cubic particles. For this purpose, fibers can behave just as explosively as spherical particulate. This leads to underestimation of small particle populations and to underassessment of the hazard. Particulates with an aspect ratio greater than 3:1 should be suspect. When particulates are poured into vessels, it is common for the fine particles to separate from the large, creating a deflagration hazard in the ullage space.

(6) **Particle Aging.** Some combustible particulate solid materials could undergo changes in their safety characteristics due to aging. Changes in morphology and chemical composition, for example, can occur from the time a sample is collected to the time it takes to get that sample into the lab for a test. For materials that are known to age, care must be taken in packaging and shipment. The use of vacuum seals, or an inert gas such as nitrogen, could be required to ensure that the tested sample has not changed appreciably due to aging. The lab should be notified in advance of shipment that the material is sensitive to change due to age so that they will know how to handle it and store it until it is tested.

(7) **Particle Attrition.** The material submitted for testing should be selected to address the effects of material attrition as it is moved through the process. As particulates move through a process they usually break down into smaller particles. Reduction in particle size leads to an increase in total surface area to mass ratio of the particulate and increases the hazard associated with the unoxidized particulate.

(8) **Particle Suspension.** Particle suspension maximizes the fuel–air interface. It occurs wherever particulate moves relative to the air or air moves relative to the particulate, such as in pneumatic conveying, pouring, fluidizing, mixing and blending, or particle size reduction.

(9) **Particle Agglomeration.** Some particulates tend to agglomerate into clumps. Agglomerating particulates can be more hazardous than the test data imply if the particulate was not thoroughly deagglomerated when testing was conducted. Agglomeration is usually affected by ambient humidity.

(10) **Triboelectric Attraction.** Particles with a chemistry that allows electrostatic charge accumulation will become charged during handling. Charged particles attract oppositely charged particles. Agglomeration causes particulate to exhibit lower explosion metrics during testing. Humidification decreases the triboelectric effect.

(11) **Hydrogen Bonding.** Hydrophilic particulates attract water molecules that are adsorbed onto the particle surface. Adsorbed water provides hydrogen bonding to adjacent particles, causing them to agglomerate. Agglomeration causes particulate to exhibit lower explosion metrics during testing. Desiccation reduces this agglomerated effect.

(12) **Entrainment Fraction.** The calculation for a dust dispersion from an accumulated layer should be corrected for the ease of entrainment of the dust. Fuel chemistry and agglomeration/adhesion forces should be considered. The dispersion is generally a function of humidity, temperature, and time. Particle shape and morphology and effective particle size should be considered.
Combustible Concentration. When particles are suspended, a concentration gradient will develop where concentration varies continuously from high to low. There is a minimum concentration that must exist before a flame front will propagate. This concentration depends on particle size and chemical composition and is measured in grams/cubic meter (ounces/cubic foot). This concentration is called the minimum explosible concentration (MEC). A dust dispersion can come from a layer of accumulated fugitive dust. The concentration attained depends on bulk density of dust layer (measured in grams/m$^3$), layer thickness, and the extent of the dust cloud. Combustible concentration is calculated as: $\text{Concentration} = (\text{bulk density})*[(\text{layer thickness})/(\text{dust cloud thickness})]$.

Competent Igniter. Ignition occurs where sufficient energy per unit of time and volume is applied to a deflagratory particulate suspension. Energy per unit of mass is measured as temperature. When the temperature of the suspension is increased to the auto-ignition temperature, combustion begins. Ignitability is usually characterized by measuring the minimum ignition energy (MIE). The ignition source must provide sufficient energy per unit of time (power) to raise the temperature of the particulate to its autoignition temperature (AIT).

Dustiness/dispersibility. Ignition and sustained combustion occurs where a fuel and competent ignition course come together in an atmosphere (oxidant) that supports combustion. The fire triangle represents the three elements required for a fire. Not all dusts are combustible, and combustible dusts exhibit a range in degree of hazard. All dusts can exhibit explosion hazards accompanied by propagation away from the source. In the absence of confinement, a flash fire hazard results. If confined, the deflagration can result in damaging overpressures. Deflagration is the process resulting in a flash fire or an explosion. The four elements for a flash fire are the following:

1. A combustible dust sufficiently small enough to burn rapidly and propagate flame
2. A suspended cloud at a concentration greater than the minimum explosion concentration
3. The atmosphere to support combustion
4. An ignition source of adequate energy or temperature to ignite the dust cloud

The heat flux from combustible metal flash fires is greater than organic materials (see Figure A.5.1). A dust explosion requires the following five conditions:

1. A combustible dust sufficiently small enough to burn rapidly and propagate flame
2. A suspended cloud at a concentration greater than the minimum explosion concentration
3. Confinement of the dust cloud by an enclosure or partial enclosure
4. The atmosphere to support combustion
(5) An ignition source of adequate energy or temperature to ignite the dust cloud

Figure A.5.1 Elements required for fires, flash fires, and explosions.

Statement of Problem and Substantiation for Public Comment

It is proposed that this entire annex item be deleted.

Some of the basic content is covered by the annex material proposed for 5.4.4.1 per public comment 116-NFPA 652-2013.

Further, much of the content is not related to common analytical testing for screening for or quantifying combustibility or explosibility.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 08 22:39:33 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-25-NFPA 652-2014
Statement: This is one of series of public comments intended to improve the organization and focus of chapter 5.

The revisions to section 5.2 seek to better focus the section on its intended goal, to screen materials to determine whether they are combustible or exploisible. Content extraneous to that focus has been proposed for deletion or was moved to other sections of Chapter 5. See subsequent public comments.

Section 5.1 was revised in keeping with proposed changes to section 5.2 and other sections addressed in subsequent public comments.

One or more of the Public Comments linked with this SR recommended deleting some of the requirements; the Committee is not accepting those proposed changes and believes that the changes made in sections 5.1 and 5.2 address the various issues raised in the numerous public comments recommending changes to these requirements.

Annex A: It is proposed that the entire annex item for 5.1 be deleted. Some of the basic content is covered by the annex material proposed for 5.4.4.1 per public comment 116-NFPA 652-2013. Further, much of the content is not related to common analytical testing for screening for or quantifying combustibility or explosibility. The Committee is recommending that annex be relocated from A.5.1 to A.5.2 with no other changes.
A.5.24.4.1 —
General categories of combustible dusts are metal dust (aluminum, magnesium, titanium, zirconium, etc.), agricultural (grain dust), wood dust (cellulosic, paper, etc.), chemicals (polymers, plastics, resins, rubber), formulations and mixtures, biosolids, coal dust, organic dust (flour, sugar, soap, etc.), and dust from certain textiles. Assessing the combustibility and explosibility can be performed by testing or by utilizing literature values. While some materials are well-characterized, testing is still the preferred method.

Tables:

Refer to Table A.5.4.4.1 for standard test methods for determining explosibility characteristics of dusts that are used for the process hazard analysis, performance-based design method risk assessments, and hazard management of combustible dusts.

Table A.5.4.4.1 Standard Test Methods to Determine Explosibility Properties

<table>
<thead>
<tr>
<th>Method</th>
<th>Property</th>
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<tbody>
<tr>
<td>ASTM E 2019, Standard Test Method for Minimum Ignition Energy of a Dust Cloud in Air</td>
<td>Minimum ignition energy (MIE) of dust cloud in air</td>
</tr>
<tr>
<td>ASTM E 1491, Standard Test Method for Minimum Autoignition Temperature of Dust Clouds</td>
<td>Minimum ignition temperature ($T_i$) of dust clouds</td>
</tr>
<tr>
<td>ASTM E 1226, Standard Test Method for Explosibility of Dust Clouds</td>
<td>Maximum explosion pressure ($P_{max}$), rate and maximum rate of pressure rise (dP/dt), and explosion severity ($K_{St}$)</td>
</tr>
<tr>
<td>ASTM E 1515, Test Method for Minimum Explosible Concentration of Combustible Dusts</td>
<td>Minimum explosible concentration (MEC)</td>
</tr>
<tr>
<td>ASTM E 2021, Standard Test Method for Hot-Surface Ignition Temperature of Dust Layers</td>
<td>Minimum ignition temperature ($T_i$) of dust layers</td>
</tr>
<tr>
<td>ASTM WK1680, Test Method for Limiting Oxygen (Oxidant) Concentration of Combustible Dust Clouds</td>
<td>Limiting oxygen concentration (LOC)</td>
</tr>
<tr>
<td>ASTM E 2021, Standard Test Method for Hot-Surface Ignition Temperature of Dust Layers, uses a constant temperature hot-plate to heat the dust on one side only. Routine tests use a 12.7 mm (0.5 in.) thick layer, which might simulate a substantial build-up of dust on the outside of hot equipment. However, since the ignition temperature normally decreases markedly with increased dust layer thickness, the method allows layer thickness to be varied according to the application.</td>
<td></td>
</tr>
</tbody>
</table>
ASTM E 2019, *Standard Test Method for Minimum Ignition Energy of a Dust Cloud in Air*, is used to determine the minimum ignition energy (MIE) for any given fuel concentration. The method uses the lowest energy, stored by a capacitor, that when released as a spark will ignite dust cloud-oxidant mixtures. By testing a range of concentrations, the lowest MIE is determined for the optimum mixture. Observed MIE and MIE values are highly sensitive to the test method, particularly the spark electrode geometry and characteristics of the capacitor discharge circuit. Dust ignition energy standard ASTM E 2019 describes test methods in current use that have been found to yield comparable results; however, it is a “performance standard” whereby the methodology adopted must produce data within the expected range for a series of reference dusts.

ASTM E 1491, *Standard Test Method for Minimum Autoignition Temperature of Dust Clouds*, is used to determine the dust cloud autoignition temperature (AIT). The test involves blowing dust into a heated furnace set at a predetermined temperature. The dust concentration is systematically varied to find the lowest temperature at which self-ignition occurs at ambient pressure, known as the minimum autoignition temperature (MAIT). A visible flame exiting the furnace provides evidence for ignition. Four different furnaces are described in ASTM E 1491 (0.27-L Godbert-Greenwald Furnace, 0.35-L BAM Oven, 1.2-L Bureau of Mines Furnace, and 6.8-L Bureau of Mines Furnace). Each yields somewhat different MAIT data, the largest deviations occurring at the greatest MAIT values. However, the lower AIT range is of more practical importance and here the agreement is better (for example 265±25°C for sulfur).

ASTM E 1226, *Standard Test Method for Explosibility of Dust Clouds*, is used to determine the pressure and rate of pressure rise for suspended combustible dusts. The measurement of the explosibility parameters (∝,$P_{\text{max}}$ and $K_{St}$) requires the reproducible generation of a near homogeneous dust cloud inside a containment vessel of known volume. The explosibility parameters $P_{\text{max}}$, (maximum pressure) and $K_{St}$, (maximum rate of pressure rise of the worst case concentration times the cube root of the test volume) are obtained from such measurements. The determination of a $P_{\text{max}}$ and $K_{St}$ for a material first establishes that it is an explosible dust. A bench scale test method in ASTM E 1226 involves a vessel at least 20 liters in volume in which a dust cloud is formed using the discharge of a small cylinder of compressed air. After a prescribed time delay, the highly turbulent dust cloud is ignited using a strong ignition source of known energy. Pressure is monitored versus time by appropriate transducers and expressed as pressure, $P_{ex}$, and pressure rate of rise, $dP/d_{\text{ex}}$. Dust concentration is varied to determine the maxima of both parameters. Particle size and moisture are other variables that must be considered. Particle size should be less than 75 microns ensuring a design that is conservative.
The primary use of the test data, \( P_{\text{max}} \) and \( K_s t \), is for the design of explosion protection systems: venting, suppression, isolation. Vent designs provide a relief area that will limit damage to the process equipment to an acceptable level. The required vent area is calculated using equations from NFPA 68, *Standard on Explosion Protection by Deflagration Venting*, and requires knowledge of the process — volume, temperature, operating pressure, design strength, vent relief pressure — and of the fuel. \( P_{\text{max}} \) and \( K_s t \). Suppression is the active extinguishment of the combustion and again limits the explosion pressure to an acceptable level. Suppression designs require similar process and hazard data in order to determine the hardware requirements such as size, number, and location of containers, detection conditions, and the final or reduced explosion pressure. Isolation, the prevention of flame propagation through interconnections, requires the same process and hazard data to determine hardware needs and locations. The extent of testing should depend on what the scenario or evaluation such as explosion venting for a dust collector would require. \( K_s t \) and \( P_{\text{max}} \).

Additional testing is not required where reliable, in-house, commodity-specific testing data of well-characterized samples (i.e., particle size, moisture content, test conditions) are available.

Published data can be used for preliminary assessment only; they should not be used for design. While some materials are well-characterized, tables, with explosibility properties often lack specific information such as particle size, therefore, it is recommended that literature values that do not provide particle size information be used with extreme caution. NFPA 61, *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities*, NFPA 499, *Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas*, NFPA 68, *Standard on Explosion Protection by Deflagration Venting*, and NFPA 484, *Standard for Combustible Metals*, have lists of combustible and explosive metals and dusts that are used for guidance or informational use only and not to be used for design purposes. Composition, particle size and distribution, and moisture content are the three factors that are known to strongly influence test results. It is recognized that some industries have historical data on the same material; therefore, the frequency, number, and extent of testing where historical data exists should be made by informed judgment. The owner/operator assumes the risk of using data from tables and historical data. A person or team performing a process hazard analysis should scrutinize and make informed judgments about historical and published data and its applicability to the process.

**Statement of Problem and Substantiation for Public Comment**

This proposed change presupposes that Public Comment 114-NFPA 652-2013 has been adopted.

Old A.5.2.1 has been edited to make it suitable to be the annex material for A.5.4.4.1

Content from old A.5.2.6 (proposed for deletion under another public comment) has been relocated and incorporated.

Content from old A.5.4.3.2 and A.5.4.3.5 have been incorporated into the revised annex material.

**Submitter Information Verification**
Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-20-NFPA 652-2014
Statement: The changes in section 5.4 are proposed in conjunction with the changes proposed in Public Comment 113-NFPA 652-2013.

The subsections in Sections 5.4.1 and 5.4.3 were reordered to provide a more logical sequence for the requirements in these sections.

Section 5.4.4 was added to receive content relocated from other sections in 5.2 and 5.4. The new structure reinforces the concept that 5.4.1 and 5.4.3 address screening testing to determine whether dusts are, respectively, combustible or explosible. The new 5.4.4 then established the requirement that, if a dust is determined to be combustible or explosible, additional testing will be required to quantify the combustibility or explosibility, as required to support implementation of other portions of the standard.

Annex A: The proposed change to combine annex section text presupposes that Public Comment 114-NFPA 652-2013 has been adopted. Old A.5.2.1 has been edited to make it suitable to be the annex material for A.5.4.4.1. Content from old A.5.2.6 (proposed for deletion under another public comment) has been relocated and incorporated. Content from old A.5.4.3.2 and A.5.4.3.5 have been incorporated into the revised annex material.

The entire annex item to 5.4.1 is unnecessary. Section 5.4.1.1 points to the necessary testing requirement and anyone who decides that this is needed can go directly to the source and by doing so would be sure the criteria for the test is up to date. In fact, by 5.4.1.1.1 most folks will not even need to do this test. The goal should be to simply rather than complicate as this material does. Therefore, it will be deleted.

The revised text for A.5.4.3.1 is more consistent with recommendations contained in ASTM standards like ASTM E1226. Additionally, it includes language explaining that sieving and drying a sample does not always produce a dust with higher hazard than the as-received material.

This explanatory information in A.5.4.3.2 is incomplete and not universally true. A previous annex item provides greater detail about this issue. The fine fraction of a sample does not always present the greatest hazard.

Assuming public comments 114 and 116 are adopted, the material in A.5.4.3.5 has been incorporated into A.5.4.4.1.
A.5.2.2(g)

Comment: Insert a new table designated A.5.2.2(g), which we have inserted in the window for material that is entered through an upload, re-number proposed Table A.5.2.2(g) as Table A.5.2.2(h) and re-number the following tables accordingly.

Additional Proposed Changes

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<td>VI PVC Dust Combustibility Tests Data Selection</td>
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Statement of Problem and Substantiation for Public Comment

Substantiation: The data provided for PVC polymers is limited and is not characterized as to the type of polymer.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 10:37:15 EST 2013

Committee Statement
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<td>Resolution</td>
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<td>Statement</td>
<td>The proposed change presupposed that public comment 113-NFPA 653=2-2013 has been adopted. The text have been edited to make it suitable annex material for 5.2.1 under public comment 113. New table: The data provided for PVC polymers is limited and is not characterized as to the type of polymer.</td>
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**Table A.5.2.2(g) 20 l and 1 m³ Vessel Test Data, PVC and Copolymer Plastic Resins and Dusts**

*Sponsored by the Vinyl Institute, 1737 King Street Suite 390, Alexandria, VA 22314*

<table>
<thead>
<tr>
<th>PVC Resin Sample</th>
<th>GP(2) Dispersion</th>
<th>VA(3) Copolymer</th>
<th>Baghouse Dust from GP Pipe (as received)</th>
<th>GP Pipe Resin (1)</th>
<th>Baghouse Dust from GP Pipe (as received)</th>
<th>GP Pipe Resin (as received)</th>
<th>High Molecular Weight Resin (as received)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Polymerization Process</td>
<td>Emulsion</td>
<td>Emulsion</td>
<td>Suspension</td>
<td>Suspension</td>
<td>Suspension</td>
<td>Suspension</td>
<td>Suspension</td>
</tr>
<tr>
<td>Plant Designator</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>C</td>
<td>D</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Test Lab</td>
<td>Chilworth</td>
<td>Chilworth</td>
<td>Chilworth</td>
<td>Fike</td>
<td>Chilworth</td>
<td>Chilworth (20L), Fike (1 m³)</td>
<td>Fike</td>
</tr>
<tr>
<td>Minimum Ignition Energy (MIE), Joules</td>
<td>&gt; 10 J</td>
<td>&gt; 10 J</td>
<td>&gt; 500 mili-Joules</td>
<td>&gt; 4,653 mili-Joules</td>
<td>&gt; 10 J</td>
<td>&gt; 10 J</td>
<td>&gt; 4,468 mili-Joules</td>
</tr>
<tr>
<td>Explosion Severity, Kst (bar.m/s), 20 liter test chamber</td>
<td>91</td>
<td>68</td>
<td>84</td>
<td>18</td>
<td>54</td>
<td>9</td>
<td>81</td>
</tr>
<tr>
<td>Dust Explosion Class in 20 liter test chamber</td>
<td>ST 1</td>
<td>ST 1</td>
<td>ST 1</td>
<td>ST 1</td>
<td>ST 1</td>
<td>ST 1</td>
<td>ST 1</td>
</tr>
<tr>
<td>Explosion Severity, Kst (bar.m/s), 1 m³ test chamber</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>0</td>
<td>Not Tested</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dust Explosion Class in 1 m³ test chamber</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>ST 0</td>
<td>Not Tested</td>
<td>ST 0</td>
<td>ST 0</td>
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<tr>
<td>Particle Size, Avg (microns)</td>
<td>1 (est.)</td>
<td>N.A.</td>
<td>N.A.</td>
<td>162</td>
<td>N.A.</td>
<td>158</td>
<td>128</td>
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<tr>
<td>Dust Fraction (&lt;75 micron, %)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>0.1</td>
<td>97</td>
<td>0</td>
<td>0.6</td>
</tr>
</tbody>
</table>

**Notes**

(1) Data for MIE and 20 liter test were performed by Fike on sample screened to <150 micron, and data for 1 m³ tests were performed by Fike on "as-received" sample.

(2) GP - General Purpose

(3) VA - Vinyl Acetate

Data Reference: Krock, R., et. al., "OSHA’s COMBUSTILE DUST NATIONAL EMPHASIS PROGRAM AND COMBUSTIBILITY CHARACTERISTICS TESTING OF PVC RESINS and PVC DUSTS", SPE ANTEC, April 2, 2012
A.5.2.2

This is an assessment to determine whether the dust is a combustible dust and if further assessment is necessary. Data can be from samples within the facility that have been tested or data can be based on whether the material is known to be combustible or not. There are some published data of commonly known materials, and the use of this data is adequate to determine whether the dust is a combustible dust. For well-known commodities, published data are usually acceptable. Generally, such data can be considered conservative if they are obtained from a reliable source, such as other NFPA documents. A perusal of published data illuminates that there is often a significant spread in values. It is useful, therefore, to compare attributes (such as particle distribution and moisture content) for published data with the actual material being handled in the system whenever possible. Doing so would help to verify that the data are pertinent to the hazard under assessment.

This section does not require the user to know all these items for the assessment but to review the important items in order to determine whether the material data are representative of the material in the facility. Even test data of material can be different from the actual conditions. The users should review the conditions of the test method as well to ensure that it is representative of the conditions of the facility. When that is not possible, the use of the worst-case values should be selected.

Composition and particle size are two parameters that are useful to identify the number and location of representative samples to be collected and tested. (See Section 5.5 for information on sampling.)

Refer to Tables A.5.2.2(a) through A.5.2.2(j) for guidance only and not as substitutes for actual test data. These tables are not all inclusive of all combustible dusts and noncombustible dusts. Additionally, material properties and testing methods can provide varied results than those presented in these tables.

Table A.5.2.2(a) 20-L Sphere Test Data – Agricultural Dusts
<table>
<thead>
<tr>
<th>Dust Name</th>
<th>$P_{\text{max}}$ (bar g)</th>
<th>$K_{\text{St}}$ (bar m/sec)</th>
<th>Percent Moisture</th>
<th>Particle Size ($\mu$m)</th>
<th>Minimum Explosive Concentration (g/m³)</th>
<th>Percent Greater Than 200 Mesh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>6.7 94</td>
<td>2.1</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apple</td>
<td>6.7 34</td>
<td>155</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beet root</td>
<td>6.1 30</td>
<td>108</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrageen</td>
<td>8.5 140</td>
<td>3.8</td>
<td></td>
<td></td>
<td></td>
<td>98</td>
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<tr>
<td>Carrot</td>
<td>6.9 65</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Cocoa bean dust</td>
<td>7.5 152</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cocoa powder</td>
<td>7.3 128</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Coconut shell dust</td>
<td>6.8 111</td>
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<td></td>
<td></td>
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<td>Coffee dust</td>
<td>6.9 55</td>
<td>4.8</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Corn meal</td>
<td>6.2 47</td>
<td>8.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Cornstarch</td>
<td>7.8 163</td>
<td>11.2</td>
<td></td>
<td></td>
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<td></td>
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<td>Cotton</td>
<td>7.2 24</td>
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<td>Cottonseed</td>
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<td>Gluten</td>
<td>7.7 110</td>
<td>150</td>
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<tr>
<td>Grass dust</td>
<td>8.0 47</td>
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<td>Green coffee</td>
<td>7.8 116</td>
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<td></td>
<td></td>
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<tr>
<td>Hops (malted)</td>
<td>8.2 90</td>
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<td></td>
<td></td>
<td></td>
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<td>Lemon peel dust</td>
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<td>Lemon pulp</td>
<td>6.7 74</td>
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<td>Locust bean gum</td>
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<td>Malt</td>
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<td>Oat flour</td>
<td>6.4 81</td>
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<td></td>
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<td></td>
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<td>Oat grain dust</td>
<td>6.0 14</td>
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<tr>
<td>Olive pellets</td>
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<td></td>
<td></td>
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<td>125</td>
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<td>Onion powder</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td>Parsley (dehydrated)</td>
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<td>Peach</td>
<td>8.4 81</td>
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<td>Peanut meal and skins</td>
<td>6.4 45</td>
<td>3.8</td>
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<td></td>
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<td>Dust Name</td>
<td>$P_{max}$ (bar)</td>
<td>$K_{St}$ (bar m/sec)</td>
<td>Percent Moisture</td>
<td>Particle Size (μm)</td>
<td>Minimum Explosive Concentration (g/m$^3$)</td>
<td>Percent Greater Than 200 Mesh</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------</td>
<td>----------------------</td>
<td>------------------</td>
<td>-------------------</td>
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<td>Peat</td>
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<td>74</td>
<td>125</td>
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<td></td>
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<td>Potato</td>
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<td>20</td>
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<td>Raw yucca seed dust</td>
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<td>Soybean dust</td>
<td>7.5</td>
<td>125</td>
<td>2.1</td>
<td></td>
<td>59</td>
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<tr>
<td>Spice dust</td>
<td>6.9</td>
<td>65</td>
<td>10.0</td>
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<tr>
<td>Spice powder</td>
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<td>172</td>
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<td>Sugar (10×)</td>
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<td>154</td>
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<td>Sunflower</td>
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<td>44</td>
<td>420</td>
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<td>Tea</td>
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<td>6.3</td>
<td>77</td>
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<td>Tobacco blend</td>
<td>8.8</td>
<td>124</td>
<td>1.0</td>
<td>120</td>
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<td>Tomato</td>
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<td>200</td>
<td>100</td>
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<td>Walnut dust</td>
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<td>Wheat flour</td>
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<td>87</td>
<td>12.9</td>
<td>57</td>
<td>60</td>
<td>6</td>
</tr>
<tr>
<td>Wheat grain dust</td>
<td>9.3</td>
<td>112</td>
<td>80</td>
<td></td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Wheat starch</td>
<td>9.8</td>
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<td>20</td>
<td></td>
<td>60</td>
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<td>Xanthan gum</td>
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<td>61</td>
<td>8.6</td>
<td>45</td>
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<td></td>
</tr>
</tbody>
</table>

Notes:

(1) Normalized to 1 m$^3$ test vessel pressures, per ASTM E 1226, *Standard Test Method for Explosibility of Dust Clouds.*

(2) See also Table F.1(a) in NFPA 68, *Standard on Explosion Protection by Deflagration Venting,* for additional information on agricultural dusts with known explosion hazards.

(3) For those agricultural dusts without known explosion data, the dust should be tested in accordance with ASTM E 1226, *Standard Test Method for Explosibility of Dust Clouds.*

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Table A.5.2.2(b) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Agricultural Dusts

<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>$P_{\text{max}}$ (bar)</th>
<th>$K_{St}$ (bar·m/s)</th>
<th>Dust HazardClass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellulose</td>
<td>33</td>
<td>60</td>
<td>9.7</td>
<td>229</td>
<td>2</td>
</tr>
<tr>
<td>Cellulose pulp</td>
<td>42</td>
<td>30</td>
<td>9.9</td>
<td>62</td>
<td>1</td>
</tr>
<tr>
<td>Cork</td>
<td>42</td>
<td>30</td>
<td>9.6</td>
<td>202</td>
<td>2</td>
</tr>
<tr>
<td>Corn</td>
<td>28</td>
<td>60</td>
<td>9.4</td>
<td>75</td>
<td>1</td>
</tr>
<tr>
<td>Egg white</td>
<td>17</td>
<td>125</td>
<td>8.3</td>
<td>38</td>
<td>1</td>
</tr>
<tr>
<td>Milk, powdered</td>
<td>83</td>
<td>60</td>
<td>5.8</td>
<td>28</td>
<td>1</td>
</tr>
<tr>
<td>Milk, nonfat, dry</td>
<td>60</td>
<td>—</td>
<td>8.8</td>
<td>125</td>
<td>1</td>
</tr>
<tr>
<td>Soy flour</td>
<td>20</td>
<td>200</td>
<td>9.2</td>
<td>110</td>
<td>1</td>
</tr>
<tr>
<td>Starch, corn</td>
<td>7</td>
<td>—</td>
<td>10.3</td>
<td>202</td>
<td>2</td>
</tr>
<tr>
<td>Starch, rice</td>
<td>18</td>
<td>60</td>
<td>9.2</td>
<td>101</td>
<td>1</td>
</tr>
<tr>
<td>Starch, wheat</td>
<td>22</td>
<td>30</td>
<td>9.9</td>
<td>115</td>
<td>1</td>
</tr>
<tr>
<td>Sugar</td>
<td>30</td>
<td>200</td>
<td>8.5</td>
<td>138</td>
<td>1</td>
</tr>
<tr>
<td>Sugar, milk</td>
<td>27</td>
<td>60</td>
<td>8.3</td>
<td>82</td>
<td>1</td>
</tr>
<tr>
<td>Sugar, beet</td>
<td>29</td>
<td>60</td>
<td>8.2</td>
<td>59</td>
<td>1</td>
</tr>
<tr>
<td>Tapioca</td>
<td>22</td>
<td>125</td>
<td>9.4</td>
<td>62</td>
<td>1</td>
</tr>
<tr>
<td>Whey</td>
<td>41</td>
<td>125</td>
<td>9.8</td>
<td>140</td>
<td>1</td>
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<tr>
<td>Wood flour</td>
<td>29</td>
<td>—</td>
<td>10.5</td>
<td>205</td>
<td>2</td>
</tr>
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</table>

Table A.5.2.2(c) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Carbonaceous Dusts
<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>P_{max} (bar)</th>
<th>K_{St} (bar·m/s)</th>
<th>Dust Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charcoal, activated</td>
<td>28</td>
<td>60</td>
<td>7.7</td>
<td>14</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Charcoal, wood</td>
<td>14</td>
<td>60</td>
<td>9.0</td>
<td>10</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Coal, bituminous</td>
<td>24</td>
<td>60</td>
<td>9.2</td>
<td>129</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Coke, petroleum</td>
<td>15</td>
<td>125</td>
<td>7.6</td>
<td>47</td>
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<td>1</td>
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<tr>
<td>Lampblack</td>
<td>&lt;10</td>
<td>60</td>
<td>8.4</td>
<td>121</td>
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<td>1</td>
</tr>
<tr>
<td>Lignite</td>
<td>32</td>
<td>60</td>
<td>10.0</td>
<td>151</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Peat, 22% H2O</td>
<td>—</td>
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<tr>
<td>Soot, pine</td>
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<td>—</td>
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<td>26</td>
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<td>1</td>
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</table>

[68: Table F.1(b)]

Table A.5.2.2(d) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Chemical Dusts

<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>P_{max} (bar)</th>
<th>K_{St} (bar·m/s)</th>
<th>Dust Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adipic acid</td>
<td>&lt;10</td>
<td>60</td>
<td>8.0</td>
<td>97</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Anthraquinone</td>
<td>&lt;10</td>
<td>—</td>
<td>10.6</td>
<td>364</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ascorbic acid</td>
<td>39</td>
<td>60</td>
<td>9.0</td>
<td>111</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Calcium acetate</td>
<td>92</td>
<td>500</td>
<td>5.2</td>
<td>9</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Calcium acetate</td>
<td>85</td>
<td>250</td>
<td>6.5</td>
<td>21</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Calcium stearate</td>
<td>12</td>
<td>30</td>
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<td>132</td>
<td>1</td>
<td>1</td>
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<tr>
<td>Carboxy- methyl-cellulose</td>
<td>24</td>
<td>125</td>
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<td>136</td>
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<td>1</td>
</tr>
<tr>
<td>Dextrin</td>
<td>41</td>
<td>60</td>
<td>8.8</td>
<td>106</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lactose</td>
<td>23</td>
<td>60</td>
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<td>81</td>
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<td>1</td>
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<td>Lead stearate</td>
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<td>1</td>
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<td>Methyl-cellulose</td>
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<td>1</td>
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<tr>
<td>Paraformaldehyde</td>
<td>23</td>
<td>60</td>
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<td>1</td>
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<tr>
<td>Sodium ascorbate</td>
<td>23</td>
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<td>119</td>
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<td>1</td>
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<tr>
<td>Sodium stearate</td>
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<td>30</td>
<td>8.8</td>
<td>123</td>
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<td>1</td>
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<tr>
<td>Sulfur</td>
<td>20</td>
<td>30</td>
<td>6.8</td>
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[68: Table F.1(c)]

Table A.5.2.2(e) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Metal Dusts
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<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>$P_{\text{max}}$ (bar)</th>
<th>$K_{St}$ (bar·m/s)</th>
<th>Dust Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>29</td>
<td>30</td>
<td>12.4</td>
<td>415</td>
<td>3</td>
</tr>
<tr>
<td>Bronze</td>
<td>18</td>
<td>750</td>
<td>4.1</td>
<td>31</td>
<td>1</td>
</tr>
<tr>
<td>Iron carbonyl</td>
<td>&lt;10</td>
<td>125</td>
<td>6.1</td>
<td>111</td>
<td>1</td>
</tr>
<tr>
<td>Magnesium</td>
<td>28</td>
<td>30</td>
<td>17.5</td>
<td>508</td>
<td>3</td>
</tr>
<tr>
<td>Phenolic resin</td>
<td>55</td>
<td>—</td>
<td>7.9</td>
<td>269</td>
<td>2</td>
</tr>
<tr>
<td>Zinc</td>
<td>10</td>
<td>250</td>
<td>6.7</td>
<td>125</td>
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</tr>
<tr>
<td>Zinc</td>
<td>&lt;10</td>
<td>125</td>
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[68: Table F.1(d)]

Table A.5.2.2(f) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Plastic Dusts
<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>$P_{\text{max}}$ (bar)</th>
<th>$K_{St}$ (bar·m/s)</th>
<th>Dust Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>(poly) Acrylamide</td>
<td>10</td>
<td>250</td>
<td>5.9</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Acrylonitrile</td>
<td>25</td>
<td>—</td>
<td>8.5</td>
<td>121</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Ethylene (low-pressure process)</td>
<td>&lt;10</td>
<td>30</td>
<td>8.0</td>
<td>156</td>
<td>1</td>
</tr>
<tr>
<td>Epoxy resin</td>
<td>26</td>
<td>30</td>
<td>7.9</td>
<td>129</td>
<td>1</td>
</tr>
<tr>
<td>Melamine resin</td>
<td>18</td>
<td>125</td>
<td>10.2</td>
<td>110</td>
<td>1</td>
</tr>
<tr>
<td>Melamine, molded (wood flour and mineral filled phenol-formaldehyde)</td>
<td>15</td>
<td>60</td>
<td>7.5</td>
<td>41</td>
<td>1</td>
</tr>
<tr>
<td>Melamine, molded (phenol-cellulose)</td>
<td>12</td>
<td>60</td>
<td>10.0</td>
<td>127</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Methyl acrylate</td>
<td>21</td>
<td>30</td>
<td>9.4</td>
<td>269</td>
<td>2</td>
</tr>
<tr>
<td>(poly) Methyl acrylate, emulsion polymer</td>
<td>18</td>
<td>30</td>
<td>10.1</td>
<td>202</td>
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</tr>
<tr>
<td>Phenolic resin</td>
<td>&lt;10</td>
<td>15</td>
<td>9.3</td>
<td>129</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Propylene</td>
<td>25</td>
<td>30</td>
<td>8.4</td>
<td>101</td>
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<tr>
<td>Terpene-phenol resin</td>
<td>10</td>
<td>15</td>
<td>8.7</td>
<td>143</td>
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</tr>
<tr>
<td>Urea-formaldehyde/cellulose, molded</td>
<td>13</td>
<td>60</td>
<td>10.2</td>
<td>136</td>
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</tr>
<tr>
<td>(poly) Vinyl acetate/ethylene copolymer</td>
<td>32</td>
<td>30</td>
<td>8.6</td>
<td>119</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Vinyl alcohol</td>
<td>26</td>
<td>60</td>
<td>8.9</td>
<td>128</td>
<td>1</td>
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<tr>
<td>(poly) Vinyl butyral</td>
<td>65</td>
<td>30</td>
<td>8.9</td>
<td>147</td>
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<tr>
<td>(poly) Vinyl chloride</td>
<td>107</td>
<td>200</td>
<td>7.6</td>
<td>46</td>
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<tr>
<td>(poly) Vinyl chloride/vinyl acetylene emulsion copolymer</td>
<td>35</td>
<td>60</td>
<td>8.2</td>
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<tr>
<td>(poly) Vinyl chloride/ethylene/vinyl acetylene suspension copolymer</td>
<td>60</td>
<td>60</td>
<td>8.3</td>
<td>98</td>
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[68: Table F.1(e)]

Table A.5.2.2(g) Explosibility Properties of Metals
<table>
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<tr>
<th>Material</th>
<th>Median Diameter (μm)</th>
<th>K&lt;sub&gt;st&lt;/sub&gt; (bar·m/s)</th>
<th>P&lt;sub&gt;max&lt;/sub&gt; (bar)</th>
<th>Cloud Ign Temp (°C)</th>
<th>MIE (mJ)</th>
<th>MEC (g/m³)</th>
<th>UN Combustibility Category&lt;sup&gt;2&lt;/sup&gt;</th>
<th>LOC&lt;sup&gt;1&lt;/sup&gt; (v%)</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>7</td>
<td>—</td>
<td>8</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>90</td>
<td>Cashdollar &amp; Zlochower&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>Aluminum</td>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>5 (N)</td>
<td>—</td>
<td>BGIA&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Aluminum</td>
<td>&lt;44</td>
<td>—</td>
<td>5.8</td>
<td>650</td>
<td>50</td>
<td>45</td>
<td>2 (C)</td>
<td>—</td>
<td>BuMines RI 6516</td>
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<tr>
<td>Aluminum flake</td>
<td>&lt;44</td>
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<td>6.1</td>
<td>650</td>
<td>20</td>
<td>45</td>
<td>&lt;3 (C)</td>
<td>—</td>
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<td>515</td>
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<td>560</td>
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<td>60</td>
<td>—</td>
<td>—</td>
<td>BGIA&lt;sup&gt;3&lt;/sup&gt;</td>
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<tr>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>BGIA&lt;sup&gt;3&lt;/sup&gt;</td>
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<td>Boron</td>
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<td>60</td>
<td>&lt;100</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<tr>
<td>Boron</td>
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<td>—</td>
<td>6.0</td>
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<td>—</td>
<td>20</td>
<td>—</td>
<td>—</td>
<td>Cashdollar &amp; Zlochower&lt;sup&gt;4&lt;/sup&gt;</td>
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<tr>
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<td>18</td>
<td>31</td>
<td>4.1</td>
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<td>—</td>
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<td>—</td>
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<td>660</td>
<td>5120</td>
<td>770</td>
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<td>—</td>
<td>3.9</td>
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<td>140</td>
<td>230</td>
<td>—</td>
<td>—</td>
<td>BuMines RI 6517</td>
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<tr>
<td>Copper</td>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Cashdollar &amp; Zlochower&lt;sup&gt;4&lt;/sup&gt;</td>
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<td>180</td>
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<td>—</td>
<td>Cashdollar &amp; Zlochower&lt;sup&gt;4&lt;/sup&gt;</td>
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<td>580</td>
<td>500</td>
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<td>—</td>
<td>—</td>
<td>Cashdollar &amp; Zlochower&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
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<td>500</td>
<td>—</td>
<td>—</td>
<td>Cashdollar &amp; Zlochower&lt;sup&gt;4&lt;/sup&gt;</td>
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<td>170</td>
<td>—</td>
<td>13 (C)</td>
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<td>125</td>
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<td>—</td>
<td>—</td>
<td>Eckhoff</td>
</tr>
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</tr>
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<td>508</td>
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<td>—</td>
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<td>Eckhoff</td>
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<td>760</td>
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<td>BZ 5</td>
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<td>Eckhoff</td>
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<td>Median Diameter (μm)</td>
<td>$K_{st}$ (bar·m/s)</td>
<td>$P_{max}$ (bar)</td>
<td>Cloud Ign Temp (°C)</td>
<td>MIE (mJ)</td>
<td>MEC (g/m³)</td>
<td>UN Combustibility Category</td>
<td>LOC¹ (v%)</td>
<td>Data Source</td>
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<td>30</td>
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<td>—</td>
<td>Cashdollar &amp; Zlochower</td>
</tr>
<tr>
<td>Molybdenum</td>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Eckhoff</td>
</tr>
<tr>
<td>Nickel</td>
<td>~6</td>
<td>Not Ignited</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Cashdollar &amp; Zlochower</td>
</tr>
<tr>
<td>Niobium</td>
<td>80</td>
<td>238</td>
<td>6.3</td>
<td>560</td>
<td>3</td>
<td>70</td>
<td>6 (Ar) Industry</td>
<td>5 (Ar)</td>
<td>Industry</td>
</tr>
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<td>Niobium</td>
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<td>591</td>
<td>3</td>
<td>50</td>
<td>5 (Ar) Industry</td>
<td>—</td>
<td>Industry</td>
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<td>Silicon</td>
<td>&lt;10</td>
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<td>10.2</td>
<td>&gt;850</td>
<td>54</td>
<td>125</td>
<td>BZ 3</td>
<td>—</td>
<td>Eckhoff</td>
</tr>
<tr>
<td>Silicon, from dust collector</td>
<td>16</td>
<td>100</td>
<td>9.4</td>
<td>800</td>
<td>—</td>
<td>60</td>
<td>—</td>
<td>—</td>
<td>Eckhoff</td>
</tr>
<tr>
<td>Silicon, from filter</td>
<td>&lt;10</td>
<td>116</td>
<td>9.5</td>
<td>&gt;850</td>
<td>250</td>
<td>60</td>
<td>BZ 1</td>
<td>—</td>
<td>Eckhoff</td>
</tr>
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<td>Tantalum</td>
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<td>—</td>
<td>630</td>
<td>120</td>
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<td>3 (Ar) BuMines RI 6516</td>
<td>—</td>
<td>Cashdollar &amp; Zlochower</td>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Tantalum</td>
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<td>149</td>
<td>6.0</td>
<td>460</td>
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<td>160</td>
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<td>160</td>
<td>Industry</td>
</tr>
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<td>80</td>
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<td>&lt;3</td>
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<td>2 (Ar) Industry</td>
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<td>2 (Ar) Industry</td>
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<td>2 (Ar) Industry</td>
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<td>430</td>
<td>&lt;3</td>
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<td>&lt;2 (Ar) Industry</td>
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<td>Industry</td>
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<td>25</td>
<td>400</td>
<td>&gt;1&lt;3</td>
<td>30</td>
<td>—</td>
<td>—</td>
<td>&lt;2 (Ar) Industry</td>
<td>—</td>
<td>Industry</td>
</tr>
<tr>
<td>Tin</td>
<td>~8</td>
<td>—</td>
<td>3.3</td>
<td>—</td>
<td>—</td>
<td>~450</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Titanium</td>
<td>36</td>
<td>Not Ignited</td>
<td>BZ 2</td>
<td>—</td>
<td>—</td>
<td>BZ 2</td>
<td>—</td>
<td>—</td>
<td>BGIA</td>
</tr>
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<td>Titanium</td>
<td>30</td>
<td>—</td>
<td>—</td>
<td>450</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Eckhoff</td>
</tr>
<tr>
<td>Titanium</td>
<td>~25</td>
<td>4.7</td>
<td>—</td>
<td>—</td>
<td>70</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Cashdollar &amp; Zlochower</td>
</tr>
<tr>
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<td>10</td>
<td>—</td>
<td>4.8</td>
<td>330</td>
<td>25</td>
<td>45</td>
<td>6 (N) BuMines RI 6515</td>
<td>4 (Ar)</td>
<td>Cashdollar &amp; Zlochower</td>
</tr>
<tr>
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<td>≤1</td>
<td>—</td>
<td>~2.3</td>
<td>—</td>
<td>~700</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Cashdollar &amp; Zlochower</td>
</tr>
<tr>
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<td>~10</td>
<td>Not Ignited</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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</tr>
<tr>
<td>Material</td>
<td>Median Diameter ($\mu$m)</td>
<td>$K_{st}$ (bar $\cdot$ m/s)</td>
<td>$P_{\text{max}}$ (bar g)</td>
<td>Cloud Ign Temp ($^\circ$C)</td>
<td>MIE (mJ)</td>
<td>MEC (g/m$^3$)</td>
<td>UN Combustibility Category$^2$</td>
<td>LOC$^1$ (v%)</td>
<td>Data Source</td>
</tr>
<tr>
<td>----------</td>
<td>-------------------------</td>
<td>-----------------------------</td>
<td>---------------------------</td>
<td>---------------------------</td>
<td>---------</td>
<td>---------------</td>
<td>-----------------------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Zinc (from collector)</td>
<td>&lt;10</td>
<td>125</td>
<td>6.7</td>
<td>570</td>
<td>—</td>
<td>250</td>
<td>BZ 3</td>
<td></td>
<td>Eckhoff</td>
</tr>
<tr>
<td>Zinc (from collector)</td>
<td>10</td>
<td>176</td>
<td>7.3</td>
<td>—</td>
<td>—</td>
<td>125</td>
<td>BZ 2</td>
<td></td>
<td>Eckhoff</td>
</tr>
<tr>
<td>Zinc (from Zn coating)</td>
<td>19</td>
<td>85</td>
<td>6</td>
<td>800</td>
<td>—</td>
<td>—</td>
<td>BZ 2</td>
<td></td>
<td>Eckhoff</td>
</tr>
<tr>
<td>Zinc (from Zn coating)</td>
<td>21</td>
<td>93</td>
<td>6.8</td>
<td>790</td>
<td>—</td>
<td>250</td>
<td>—</td>
<td></td>
<td>Eckhoff</td>
</tr>
<tr>
<td>Zirconium</td>
<td>&lt;44</td>
<td>—</td>
<td>5.2</td>
<td>20</td>
<td>5</td>
<td>45</td>
<td>—</td>
<td>Ignites in N$_2$ &amp; CO$_2$</td>
<td>BuMines RI 6516</td>
</tr>
<tr>
<td>Zirconium (Zircalloy-2)</td>
<td>50</td>
<td>—</td>
<td>3.0</td>
<td>420</td>
<td>30</td>
<td>—</td>
<td>—</td>
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<td>BuMines RI 6516</td>
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</tbody>
</table>

(1) Limiting Oxygen Concentration. The letter in parenthesis in the LOC column denotes the inert gas used to reduce the oxygen concentration as follows: Ar = argon, C = carbon dioxide, N = nitrogen

(2) UN Dust Layer Combustibility Categories are as follows:

- BZ1 No self-sustained combustion;
- BZ2 Local combustion of short duration;
- BZ3 Local sustained combustion, but no propagation;
- BZ4 Propagating smoldering combustion;
- BZ5 Propagating open flame;
- BZ6 Explosive combustion.

(3) BGIA is the GESTIS-DUST-EX database maintained by BGIA-online.hvbg.de


[484: Table A.1.1.3(b)]

Table A.5.2.2(h) Atomized Aluminum Particle Ignition and Explosion Data
<table>
<thead>
<tr>
<th>Particle Size $(d_{50})$ (μm)</th>
<th>BET (m$^2$/g)</th>
<th>MEC (g/m$^3$)</th>
<th>$P_{\text{max}}$ (psi)</th>
<th>$dP/dt_{\text{max}}$ (psi/sec)</th>
<th>$K_{St}$ (bar·m/sec)</th>
<th>Sample Concentration That Corresponds to $P_{\text{max}}$ and $dP/dt_{\text{max}}$</th>
<th>MIE (mJ)</th>
<th>LOC (%)</th>
<th>Ign</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nonspherical, Nodular, or Irregular Powders</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53 0.18</td>
<td>170</td>
<td>123</td>
<td>3,130</td>
<td>59</td>
<td>1,250</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42 0.19</td>
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<td>133</td>
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<td>107</td>
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<td>1,000, 1,250</td>
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<td></td>
<td>11</td>
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<td>142</td>
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<td>149</td>
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<td></td>
</tr>
<tr>
<td>32 0.58</td>
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<td>133</td>
<td>8,880</td>
<td>167</td>
<td>750</td>
<td>1,500</td>
<td></td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>30 0.10</td>
<td>60</td>
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<td></td>
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<tr>
<td>28 0.11</td>
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<td>119</td>
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<td>1,250</td>
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<tr>
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<td>157</td>
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<td>11</td>
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<td>9 0.90</td>
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<td>165</td>
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<td>7 0.74</td>
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<td>153</td>
<td>17,702</td>
<td>332</td>
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<td>292</td>
<td>750</td>
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<td>6 0.70</td>
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<td>1,000</td>
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<td>5 1.00</td>
<td>70</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4 0.78</td>
<td>75</td>
<td>167</td>
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<td>291</td>
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<td>750</td>
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<td><strong>Spherical Powders</strong></td>
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<tr>
<td>63 0.15</td>
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<td>101</td>
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<td>1,000</td>
<td></td>
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<tr>
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<td>90</td>
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<tr>
<td>15 0.50</td>
<td>45</td>
<td>148</td>
<td>10,812</td>
<td>203</td>
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<td>7</td>
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<tr>
<td>15 0.30</td>
<td>55</td>
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<td></td>
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<tr>
<td>6 0.53</td>
<td>75</td>
<td>174</td>
<td>16,324</td>
<td>306</td>
<td>750</td>
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<td></td>
<td></td>
<td>6</td>
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<tr>
<td>5 1.30</td>
<td>167</td>
<td>14,310</td>
<td>269</td>
<td></td>
<td>750</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 1.00</td>
<td>70</td>
<td>155</td>
<td>14,730</td>
<td>276</td>
<td>1,250</td>
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<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>3 2.50</td>
<td>95</td>
<td>165</td>
<td>15,900</td>
<td>298</td>
<td>1,250</td>
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<td></td>
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<td>4</td>
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<tr>
<td>2 3.00</td>
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<td></td>
<td></td>
<td></td>
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</tbody>
</table>
For U.S. conversions: 1 m²/g = 4884 ft²/lb; 1 g/m² = 0.000062 lb/ft²; 1 bar/sec = 14.5 psi/sec; 1 bar·m/sec = 0.226 psi·ft/sec.

BET: surface area per unit mass; MEC: minimum explosible concentration; MIE: minimum ignition energy; LOC: limiting oxygen (O₂) concentration.

Notes:

(1) The powders tested are representative samples produced by various manufacturers utilizing a variety of methods of manufacture, submitted for testing to a single, nationally recognized testing laboratory, at the same time.


(3) Particle size data represent the d₅₀ measurement determined by the laser light–scattering technique.

(4) Test results represent only the characteristics of those samples tested and should not be considered to be universally applicable. Users are encouraged to test samples of powders obtained from their individual process.

**Table A.5.2.2(i)** Explosion Characteristics of Unalloyed Magnesium Dust in Air (200 mesh (75μm))

<table>
<thead>
<tr>
<th>Explosion Characteristics</th>
<th>Values</th>
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<tbody>
<tr>
<td>Explosibility index</td>
<td>10 Kₛₜ</td>
</tr>
<tr>
<td>Ignition sensitivity</td>
<td>3.0 Kₛₜ</td>
</tr>
<tr>
<td>Explosion severity</td>
<td>7.4 Kₛₜ</td>
</tr>
<tr>
<td>Maximum explosion pressure (gauge)</td>
<td>793 kPa (115 psi)</td>
</tr>
<tr>
<td>Maximum rate of pressure rise (gauge)</td>
<td>793 kPa/sec (15,000 psi/sec)</td>
</tr>
<tr>
<td>Ignition temperature cloud</td>
<td>1040°F (560°C)</td>
</tr>
<tr>
<td>Minimum cloud ignition energy</td>
<td>0.04 J (26.4 W/sec)</td>
</tr>
<tr>
<td>Minimum explosion concentration</td>
<td>0.328 kg/m³ (0.03 oz/ft³)</td>
</tr>
<tr>
<td>Limiting oxygen percent for spark ignition</td>
<td>—</td>
</tr>
</tbody>
</table>

Note: Kₛₜ values vary for specific particle sizes.

Explosibility index = ignition sensitivity × explosion severity.

Ignition sensitivity = [Ignition temp. cloud × min. cloud-ignition energy] × min. explosion concentration (LEL)

Pittsburgh coal dust

Ignition temp. cloud × min. cloud ignition energy

Sample dust x min. explosion concentration

Explosion severity =
Burns in carbon dioxide, nitrogen, and halons.

\[484: \text{Table D.2}\]

Table A.5.2.2(j) Selected Combustible Dusts Layer or Cloud Ignition Temperature
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>NEC Group</th>
<th>Code</th>
<th>Ignition Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetal, linear</td>
<td></td>
<td>G</td>
<td>NL</td>
<td>440</td>
</tr>
<tr>
<td>Acetoacet-p-phenetidide</td>
<td>122-82-7</td>
<td>G</td>
<td>NL</td>
<td>560</td>
</tr>
<tr>
<td>Acetoacetanilide</td>
<td>102-01-2</td>
<td>G</td>
<td>M</td>
<td>440</td>
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<tr>
<td>Acetylamino-t-nitrothiazole</td>
<td></td>
<td>G</td>
<td></td>
<td>450</td>
</tr>
<tr>
<td>Acrylamide polymer</td>
<td></td>
<td>G</td>
<td></td>
<td>240</td>
</tr>
<tr>
<td>Acrylonitrile polymer</td>
<td></td>
<td>G</td>
<td></td>
<td>460</td>
</tr>
<tr>
<td>Acrylonitrile-vinyl chloride-vinylidenechloride copolymer (70-20-10)</td>
<td></td>
<td>G</td>
<td></td>
<td>210</td>
</tr>
<tr>
<td>Acrylonitrile-vinyl pyridine copolymer</td>
<td></td>
<td>G</td>
<td></td>
<td>240</td>
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<tr>
<td>Adipic acid</td>
<td>124-04-9</td>
<td>G</td>
<td>M</td>
<td>550</td>
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<tr>
<td>Alfalfa meal</td>
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<td>G</td>
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<td>200</td>
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<td>Alkyl ketone dimer sizing compound</td>
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<td>160</td>
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<tr>
<td>Allyl alcohol derivative (CR-39)</td>
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<td>NL</td>
<td>500</td>
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<td>Almond shell</td>
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<td>Aluminum, A422 flake</td>
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<td>E</td>
<td></td>
<td>320</td>
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<tr>
<td>Aluminum, atomized collector fines</td>
<td></td>
<td>E</td>
<td>CL</td>
<td>550</td>
</tr>
<tr>
<td>Aluminum—cobalt alloy (60-40)</td>
<td></td>
<td>E</td>
<td></td>
<td>570</td>
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<tr>
<td>Aluminum—copper alloy (50-50)</td>
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<td>E</td>
<td></td>
<td>830</td>
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<tr>
<td>Aluminum—lithium alloy (15% Li)</td>
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<td>E</td>
<td></td>
<td>400</td>
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<tr>
<td>Aluminum—magnesium alloy (dowmetal)</td>
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<td>E</td>
<td>CL</td>
<td>430</td>
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<td>Aluminum—nickel alloy (58-42)</td>
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<td>E</td>
<td></td>
<td>540</td>
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<td>Aluminum—silicon alloy (12% Si)</td>
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<td>NL</td>
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<td>Amino-5-nitrothiazole</td>
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<td>G</td>
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<td>Anthranilic acid</td>
<td>118-92-3</td>
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<td>580</td>
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<tr>
<td>Apricot pit</td>
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<td>G</td>
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<td>230</td>
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<td>Aryl-nitrosomethylamide</td>
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<td>510</td>
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<td>660</td>
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<td>Azelaic acid</td>
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<td>M</td>
<td>610</td>
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<td>Azo-bis-butronitrile</td>
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<td>G</td>
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<td>Benzethonium chloride</td>
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<td>CL</td>
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</tr>
<tr>
<td>Chemical Name</td>
<td>CAS No.</td>
<td>NEC Group</td>
<td>Code</td>
<td>Layer or Cloud</td>
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<td>-----------</td>
<td>------</td>
<td>----------------</td>
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<td>Benzoic acid</td>
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<td>Benzotriazole</td>
<td>95-14-7</td>
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<td>M</td>
<td></td>
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<tr>
<td>Beta-naphthalene-axo-dimethylaniline</td>
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<td>Bis(2-hydroxy- 5-chlorophenyl) methane</td>
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<td>Boron, commercial amorphous (85% B)</td>
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<td>Calcium silicide</td>
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<td>Carbon black (more than 8% total entrapped volatiles)</td>
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<td>Carboxymethyl cellulose</td>
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<td>Cellulose</td>
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<td>Cellulose triacetate</td>
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<td>Charcoal (more than 8% total entrapped volatiles)</td>
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<td>Cherry pit</td>
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<td>Coal, Wyoming</td>
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<td>Cocoa bean shell</td>
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<td>Cocoa, natural, 19% fat</td>
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<td>Polyvinyl acetate</td>
<td>9003-20-7</td>
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<td>NL</td>
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<tr>
<td>Polyvinyl acetate/alcohol</td>
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<td>Polyvinyl butyral</td>
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<tr>
<td>Polyvinyl chloride-dioctyl phthalate</td>
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<td>9005-25-8</td>
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<td>Pyrethrum</td>
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<td>Rayon (viscose) flock</td>
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<td>Red dye intermediate</td>
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<td>Rice bran</td>
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<td>Rice hull</td>
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<td>Rubber, crude, hard</td>
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<td>Shale, oil</td>
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<td>Chemical Name</td>
<td>CAS No.</td>
<td>NEC Group</td>
<td>Code</td>
<td>Layer or Cloud Ignition Temperature (°C)</td>
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<td>---------------------------------------------------</td>
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<td>Sorbic acid (copper sorbate or potash)</td>
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<td>Sulfur</td>
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<td>Tantalum</td>
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<td>Terephthalic acid</td>
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<td>Thorium (contains 1.2% O)</td>
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<td>Tin, 96%, atomized (2% Pb)</td>
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<td>Titanium, 99% Ti</td>
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<tr>
<td>Titanium hydride (95% Ti, 3.8% H)</td>
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<td>Trithiobisdimethylthio-formamide</td>
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<tr>
<td>Tung, kernels, oil-free</td>
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<td>Urea formaldehyde molding compound</td>
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<td>Urea formaldehyde-phenol formaldehyde</td>
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<td>Vanadium, 86.4%</td>
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<tr>
<td>Chemical Name</td>
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<td>NEC Group</td>
<td>Code</td>
<td>Cloud Ignition Temperature (°C)</td>
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<td>---------------------------------------------------</td>
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<tr>
<td>Vinyl chloride-acrylonitrile copolymer</td>
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<tr>
<td>Vinyl toluene-acrylonitrile butadiene</td>
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<td>Violet 200 dye</td>
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<td>175</td>
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<tr>
<td>Vitamin C</td>
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<td>Walnut shell, black</td>
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<td>Wheat</td>
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<td>Wheat flour</td>
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<tr>
<td>Wheat gluten, gum</td>
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<td>NL</td>
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<tr>
<td>Wheat starch</td>
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<td>NL</td>
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<td>Woodbark, ground</td>
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<td>250</td>
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<td>Yeast, torula</td>
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<tr>
<td>Zirconium hydride</td>
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<tr>
<td>Zirconium (contains 0.3% O)</td>
<td>7440-67-7</td>
<td>E</td>
<td>CL</td>
<td>330</td>
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</tbody>
</table>

**Notes:**

1. Normally, the minimum ignition temperature of a layer of a specific dust is lower than the minimum ignition temperature of a cloud of that dust. Since this is not universally true, the lower of the two minimum ignition temperatures is listed. If no symbol appears in the “Code” column, then the layer ignition temperature is shown. “CL” means the cloud ignition temperature is shown. “NL” means that no layer ignition temperature is available, and the cloud ignition temperature is shown. “M” signifies that the dust layer melts before it ignites; the cloud ignition temperature is shown. “S” signifies that the dust layer sublimes before it ignites; the cloud ignition temperature is shown.

2. Certain metal dusts might have characteristics that require safeguards beyond those required for atmospheres containing the dusts of aluminum, magnesium, and their commercial alloys. For example, zirconium and thorium dusts can ignite spontaneously in air, especially at elevated temperatures.

3. Due to the impurities found in coal, its ignition temperatures vary regionally, and ignition temperatures are not available for all regions in which coal is mined.

[499: Table 5.2.2]

**Additional Proposed Changes**
<table>
<thead>
<tr>
<th>File Name</th>
<th>Description Approved</th>
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</thead>
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<td></td>
</tr>
</tbody>
</table>

**Statement of Problem and Substantiation for Public Comment**

The proposed change presupposed that public comment 113-NFPA 653=2-2013 has been adopted.

The text have been edited to make it suitable annex material for 5.2.1 under public comment 113.

**Submitter Information Verification**

Submitter Full Name: Walter Frank  
Organization: Frank Risk Solutions, Inc.  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Fri Nov 08 23:09:53 EST 2013

**Committee Statement**

Committee Action: Rejected but see related SR  
Resolution: SR-117-NFPA 652-2014  
Statement: The proposed change presupposed that public comment 113-NFPA 653=2-2013 has been adopted. The text have been edited to make it suitable annex material for 5.2.1 under public comment 113.

New table: The data provided for PVC polymers is limited and is not characterized as to the type of polymer.
A.5.2.12
This is an assessment to determine whether the dust is a combustible or explosive dust and if further assessment is necessary. Data can be from analysis of recent samples taken within the facility, historical test data for facility samples, that have been tested or data can be based on whether the material is known to be combustible or not obtained from published sources.

There are some published data of commonly known handled materials, and the use of this data may be adequate to determine whether the dust is a combustible or explosive dust. For well-known commodities, published data are usually acceptable. Generally, such data can be considered conservative if they are obtained from a reliable source, such as other NFPA documents. A review of published data illuminates suggests that there is often a significant spread in values. It is useful, therefore, to compare attributes (such as particle distribution and moisture content) for published data with the actual material being handled in the system whenever possible. Doing so would help verify that the data are pertinent to the hazard under assessment.

This section does not require the user to know all these items for the assessment but to review the important items in order to determine whether the material data are representative of the material in the facility. Even test data of material can be different from the actual conditions. The users should review the conditions of the test method as well to ensure that it is representative of the conditions of the facility. When that is not possible, the use of the worst-case values should be selected.

Composition and particle size are two parameters that are useful to identify the number and location of representative samples to be collected and tested. (See Section 5.3 for information on sampling.) Refer to Tables A.5.2.2 through A.5.2.12 for guidance only and not as substitutes for actual test data for assessment purposes. These tables are not all inclusive of all combustible and explosive dust and noncombustible dust. Additionally, material properties and testing methods can provide varied results that vary from those presented in these tables.

[Renumber the tables accordingly... i.e. A.5.2.1(x) rather than 5.2.2(x)]
A.5.2.2
This is an assessment to determine whether the dust is a combustible dust and if further assessment is necessary. Data can be from samples within the facility that have been tested or data can be based on whether the material is known to be combustible or not. There are some published data of commonly known materials, and the use of this data is adequate to determine whether the dust is a combustible dust. For well-known commodities, published data are usually acceptable. Generally, such data can be considered conservative if they are obtained from a reliable source, such as other NFPA documents. A perusal of published data illuminates that there is often a significant spread in values. It is useful, therefore, to compare attributes (such as particle distribution and moisture content) for published data with the actual material being handled in the system whenever possible. Doing so would help to verify that the data are pertinent to the hazard under assessment.

This section does not require the user to know all these items for the assessment but to review the important items in order to determine whether the material data are representative of the material in the facility. Even test data of material can be different from the actual conditions. The users should review the conditions of the test method as well to ensure that it is representative of the conditions of the facility. When that is not possible, the use of the worst-case values should be selected.

Composition and particle size are two parameters that are useful to identify the number and location of representative samples to be collected and tested. (See Section 5.5 for information on sampling.)

Refer to Tables A.5.2.2(a) through A.5.2.2(j) for guidance only and not as substitutes for actual test data. These tables are not all inclusive of all combustible dusts and noncombustible dusts. Additionally, material properties and testing methods can provide varied results than those presented in these tables.

Table A.5.2.2(a) 20-L Sphere Test Data – Agricultural Dusts
<table>
<thead>
<tr>
<th>Dust Name</th>
<th>$P_{\text{max}}$ (bar g)</th>
<th>$K_{St}$ (bar m/sec)</th>
<th>Percent Moisture</th>
<th>Particle Size (μm)</th>
<th>Minimum Explosive Concentration (g/m³)</th>
<th>Percent Greater Than 200 Mesh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
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<td>94</td>
<td>2.1</td>
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<td>Apple</td>
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<td>155</td>
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<td>Beet root</td>
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<td>Carrageen</td>
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<td>Carrot</td>
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<td>Dust Name</td>
<td>$P_{\text{max}}$ (bar)</td>
<td>$K_S$ (bars m/sec)</td>
<td>Percent Moisture</td>
<td>Particle Size ($\mu$m)</td>
<td>Minimum Explosive Concentration (g/m³)</td>
<td>Percent Greater Than 200 Mesh</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Raw yucca seed dust</td>
<td>6.2</td>
<td>65</td>
<td>12.7</td>
<td>403</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice dust</td>
<td>7.7</td>
<td>118</td>
<td>2.5</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Rice flour</td>
<td>7.4</td>
<td>57</td>
<td></td>
<td></td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Rice starch</td>
<td>10.0</td>
<td>190</td>
<td>18</td>
<td></td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Rye flour</td>
<td>8.9</td>
<td>79</td>
<td></td>
<td></td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Semolina</td>
<td>7.6</td>
<td>79</td>
<td></td>
<td></td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Soybean dust</td>
<td>7.5</td>
<td>125</td>
<td>2.1</td>
<td></td>
<td>59</td>
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</tr>
<tr>
<td>Spice dust</td>
<td>6.9</td>
<td>65</td>
<td>10.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spice powder</td>
<td>7.8</td>
<td>172</td>
<td>10.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sugar (10×)</td>
<td>8.4</td>
<td>154</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunflower</td>
<td>7.9</td>
<td>44</td>
<td>420</td>
<td>125</td>
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<tr>
<td>Tea</td>
<td>7.6</td>
<td>102</td>
<td>6.3</td>
<td>77</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>Tobacco blend</td>
<td>8.8</td>
<td>124</td>
<td>1.0</td>
<td>120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tomato</td>
<td></td>
<td>200</td>
<td></td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Walnut dust</td>
<td>8.4</td>
<td>174</td>
<td>6.0</td>
<td></td>
<td>31</td>
<td></td>
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<tr>
<td>Wheat flour</td>
<td>8.3</td>
<td>87</td>
<td>12.9</td>
<td>57</td>
<td>60</td>
<td>6</td>
</tr>
<tr>
<td>Wheat grain dust</td>
<td>9.3</td>
<td>112</td>
<td>80</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat starch</td>
<td>9.8</td>
<td>132</td>
<td>20</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Xanthan gum</td>
<td>7.5</td>
<td>61</td>
<td>8.6</td>
<td>45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:

(1) Normalized to 1 m³ test vessel pressures, per ASTM E 1226, *Standard Test Method for Explosibility of Dust Clouds.*

(2) See also Table F.1(a) in NFPA 68, *Standard on Explosion Protection by Deflagration Venting,* for additional information on agricultural dusts with known explosion hazards.

(3) For those agricultural dusts without known explosion data, the dust should be tested in accordance with ASTM E 1226, *Standard Test Method for Explosibility of Dust Clouds.*
### Table A.6.2.1

Table A.5.2.2(b) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Agricultural Dusts

<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter (µm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>$P_{\text{max}}$ (bar)</th>
<th>$K_{\text{St}}$ (bar-m/s)</th>
<th>Dust Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellulose</td>
<td>33</td>
<td>60</td>
<td>9.7</td>
<td>229</td>
<td>2</td>
</tr>
<tr>
<td>Cellulose pulp</td>
<td>42</td>
<td>30</td>
<td>9.9</td>
<td>62</td>
<td>1</td>
</tr>
<tr>
<td>Cork</td>
<td>42</td>
<td>30</td>
<td>9.6</td>
<td>202</td>
<td>2</td>
</tr>
<tr>
<td>Corn</td>
<td>28</td>
<td>60</td>
<td>9.4</td>
<td>75</td>
<td>1</td>
</tr>
<tr>
<td>Egg white</td>
<td>17</td>
<td>125</td>
<td>8.3</td>
<td>38</td>
<td>1</td>
</tr>
<tr>
<td>Milk, powdered</td>
<td>83</td>
<td>60</td>
<td>5.8</td>
<td>28</td>
<td>1</td>
</tr>
<tr>
<td>Milk, nonfat, dry</td>
<td>60</td>
<td>—</td>
<td>8.8</td>
<td>125</td>
<td>1</td>
</tr>
<tr>
<td>Soy flour</td>
<td>20</td>
<td>200</td>
<td>9.2</td>
<td>110</td>
<td>1</td>
</tr>
<tr>
<td>Starch, corn</td>
<td>7</td>
<td>—</td>
<td>10.3</td>
<td>202</td>
<td>2</td>
</tr>
<tr>
<td>Starch, rice</td>
<td>18</td>
<td>60</td>
<td>9.2</td>
<td>101</td>
<td>1</td>
</tr>
<tr>
<td>Starch, wheat</td>
<td>22</td>
<td>30</td>
<td>9.9</td>
<td>115</td>
<td>1</td>
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<tr>
<td>Sugar</td>
<td>30</td>
<td>200</td>
<td>8.5</td>
<td>138</td>
<td>1</td>
</tr>
<tr>
<td>Sugar, milk</td>
<td>27</td>
<td>60</td>
<td>8.3</td>
<td>82</td>
<td>1</td>
</tr>
<tr>
<td>Sugar, beet</td>
<td>29</td>
<td>60</td>
<td>8.2</td>
<td>59</td>
<td>1</td>
</tr>
<tr>
<td>Tapioca</td>
<td>22</td>
<td>125</td>
<td>9.4</td>
<td>62</td>
<td>1</td>
</tr>
<tr>
<td>Whey</td>
<td>41</td>
<td>125</td>
<td>9.8</td>
<td>140</td>
<td>1</td>
</tr>
<tr>
<td>Wood flour</td>
<td>29</td>
<td>—</td>
<td>10.5</td>
<td>205</td>
<td>2</td>
</tr>
</tbody>
</table>

### Table A.5.2.2(c) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Carbonaceous Dusts

[68: Table F.1(a)]
### Table A.5.2.2(d) 1 m³ Vessel Test Data from Forschungsbericht Staubexposionen – Chemical Dusts

<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>P&lt;sub&gt;max&lt;/sub&gt; (bar)</th>
<th>K&lt;sub&gt;St&lt;/sub&gt; (bar·m/s)</th>
<th>Dust Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charcoal, activated</td>
<td>28</td>
<td>60</td>
<td>7.7</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Charcoal, wood</td>
<td>14</td>
<td>60</td>
<td>9.0</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Coal, bituminous</td>
<td>24</td>
<td>60</td>
<td>9.2</td>
<td>129</td>
<td>1</td>
</tr>
<tr>
<td>Coke, petroleum</td>
<td>15</td>
<td>125</td>
<td>7.6</td>
<td>47</td>
<td>1</td>
</tr>
<tr>
<td>Lampblack</td>
<td>&lt;10</td>
<td>60</td>
<td>8.4</td>
<td>121</td>
<td>1</td>
</tr>
<tr>
<td>Lignite</td>
<td>32</td>
<td>60</td>
<td>10.0</td>
<td>151</td>
<td>1</td>
</tr>
<tr>
<td>Peat, 22% H₂O</td>
<td>—</td>
<td>125</td>
<td>84.0</td>
<td>67</td>
<td>1</td>
</tr>
<tr>
<td>Soot, pine</td>
<td>&lt;10</td>
<td>—</td>
<td>7.9</td>
<td>26</td>
<td>1</td>
</tr>
</tbody>
</table>

[68: Table F.1(b)]

### Table A.5.2.2(e) 1 m³ Vessel Test Data from Forschungsbericht Staubexposionen – Metal Dusts

<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>P&lt;sub&gt;max&lt;/sub&gt; (bar)</th>
<th>K&lt;sub&gt;St&lt;/sub&gt; (bar·m/s)</th>
<th>Dust Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adipic acid</td>
<td>&lt;10</td>
<td>60</td>
<td>8.0</td>
<td>97</td>
<td>1</td>
</tr>
<tr>
<td>Anthraquinone</td>
<td>&lt;10</td>
<td>—</td>
<td>10.6</td>
<td>364</td>
<td>3</td>
</tr>
<tr>
<td>Ascorbic acid</td>
<td>39</td>
<td>60</td>
<td>9.0</td>
<td>111</td>
<td>1</td>
</tr>
<tr>
<td>Calcium acetate</td>
<td>92</td>
<td>500</td>
<td>5.2</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Calcium acetate</td>
<td>85</td>
<td>250</td>
<td>6.5</td>
<td>21</td>
<td>1</td>
</tr>
<tr>
<td>Calcium stearate</td>
<td>12</td>
<td>30</td>
<td>9.1</td>
<td>132</td>
<td>1</td>
</tr>
<tr>
<td>Carboxy- methyl-cellulose</td>
<td>24</td>
<td>125</td>
<td>9.2</td>
<td>136</td>
<td>1</td>
</tr>
<tr>
<td>Dextrin</td>
<td>41</td>
<td>60</td>
<td>8.8</td>
<td>106</td>
<td>1</td>
</tr>
<tr>
<td>Lactose</td>
<td>23</td>
<td>60</td>
<td>7.7</td>
<td>81</td>
<td>1</td>
</tr>
<tr>
<td>Lead stearate</td>
<td>12</td>
<td>30</td>
<td>9.2</td>
<td>152</td>
<td>1</td>
</tr>
<tr>
<td>Methyl-cellulose</td>
<td>75</td>
<td>60</td>
<td>9.5</td>
<td>134</td>
<td>1</td>
</tr>
<tr>
<td>Paraformaldehyde</td>
<td>23</td>
<td>60</td>
<td>9.9</td>
<td>178</td>
<td>1</td>
</tr>
<tr>
<td>Sodium ascorbate</td>
<td>23</td>
<td>60</td>
<td>8.4</td>
<td>119</td>
<td>1</td>
</tr>
<tr>
<td>Sodium stearate</td>
<td>22</td>
<td>30</td>
<td>8.8</td>
<td>123</td>
<td>1</td>
</tr>
<tr>
<td>Sulfur</td>
<td>20</td>
<td>30</td>
<td>6.8</td>
<td>151</td>
<td>1</td>
</tr>
</tbody>
</table>

[68: Table F.1(c)]
<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>$P_{\text{max}}$ (bar)</th>
<th>$K_{\text{St}}$ (bar·m/s)</th>
<th>Dust Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>29</td>
<td>30</td>
<td>12.4</td>
<td>415</td>
<td>3</td>
</tr>
<tr>
<td>Bronze</td>
<td>18</td>
<td>750</td>
<td>4.1</td>
<td>31</td>
<td>1</td>
</tr>
<tr>
<td>Iron carbonyl</td>
<td>&lt;10</td>
<td>125</td>
<td>6.1</td>
<td>111</td>
<td>1</td>
</tr>
<tr>
<td>Magnesium</td>
<td>28</td>
<td>30</td>
<td>17.5</td>
<td>508</td>
<td>3</td>
</tr>
<tr>
<td>Phenolic resin</td>
<td>55</td>
<td>—</td>
<td>7.9</td>
<td>269</td>
<td>2</td>
</tr>
<tr>
<td>Zinc</td>
<td>10</td>
<td>250</td>
<td>6.7</td>
<td>125</td>
<td>1</td>
</tr>
<tr>
<td>Zinc</td>
<td>&lt;10</td>
<td>125</td>
<td>7.3</td>
<td>176</td>
<td>1</td>
</tr>
</tbody>
</table>

[68: Table F.1(d)]

Table A.5.2.2(f) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Plastic Dusts
<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>Pₘₐₓ (bar)</th>
<th>Kₛₜ (bar·m/s)</th>
<th>Dust Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>(poly) Acrylamide</td>
<td>10</td>
<td>250</td>
<td>5.9</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Acrylonitrile</td>
<td>25</td>
<td>—</td>
<td>8.5</td>
<td>121</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Ethylene (low-pressure process)</td>
<td>&lt;10</td>
<td>30</td>
<td>8.0</td>
<td>156</td>
<td>1</td>
</tr>
<tr>
<td>Epoxy resin</td>
<td>26</td>
<td>30</td>
<td>7.9</td>
<td>129</td>
<td>1</td>
</tr>
<tr>
<td>Melamine resin</td>
<td>18</td>
<td>125</td>
<td>10.2</td>
<td>110</td>
<td>1</td>
</tr>
<tr>
<td>Melamine, molded (wood flour and mineral filled phenol-formaldehyde)</td>
<td>15</td>
<td>60</td>
<td>7.5</td>
<td>41</td>
<td>1</td>
</tr>
<tr>
<td>Melamine, molded (phenol-cellulose)</td>
<td>12</td>
<td>60</td>
<td>10.0</td>
<td>127</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Methyl acrylate</td>
<td>21</td>
<td>30</td>
<td>9.4</td>
<td>269</td>
<td>2</td>
</tr>
<tr>
<td>(poly) Methyl acrylate, emulsion polymer</td>
<td>18</td>
<td>30</td>
<td>10.1</td>
<td>202</td>
<td>2</td>
</tr>
<tr>
<td>Phenolic resin</td>
<td>&lt;10</td>
<td>15</td>
<td>9.3</td>
<td>129</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Propylene</td>
<td>25</td>
<td>30</td>
<td>8.4</td>
<td>101</td>
<td>1</td>
</tr>
<tr>
<td>Terpene-phenol resin</td>
<td>10</td>
<td>15</td>
<td>8.7</td>
<td>143</td>
<td>1</td>
</tr>
<tr>
<td>Urea-formaldehyde/cellulose, molded</td>
<td>13</td>
<td>60</td>
<td>10.2</td>
<td>136</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Vinyl acetate/ethylene copolymer</td>
<td>32</td>
<td>30</td>
<td>8.6</td>
<td>119</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Vinyl alcohol</td>
<td>26</td>
<td>60</td>
<td>8.9</td>
<td>128</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Vinyl butyral</td>
<td>65</td>
<td>30</td>
<td>8.9</td>
<td>147</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Vinyl chloride</td>
<td>107</td>
<td>200</td>
<td>7.6</td>
<td>46</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Vinyl chloride/vinyl acetylene emulsion copolymer</td>
<td>35</td>
<td>60</td>
<td>8.2</td>
<td>95</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Vinyl chloride/ethylene/vinyl acetylene suspension copolymer</td>
<td>60</td>
<td>60</td>
<td>8.3</td>
<td>98</td>
<td>1</td>
</tr>
</tbody>
</table>

[68: Table F.1(e)]

Table A.5.2.2(g) Explosibility Properties of Metals
<table>
<thead>
<tr>
<th>Material</th>
<th>Median Diameter ($\mu$m)</th>
<th>$K_{st}$ (bar-m/s)</th>
<th>$P_{max}$ (bar g)</th>
<th>Cloud Ign Temp (°C)</th>
<th>MIE (mJ)</th>
<th>MEC (g/m³)</th>
<th>UN Combustibility Category</th>
<th>LOC1 (v%)</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>~7</td>
<td>8</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>90</td>
<td>Cashdollar &amp; Zlochower4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>22</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>BGIA3</td>
<td>5 (N)</td>
<td>BuMines RI 6516</td>
</tr>
<tr>
<td>Aluminum</td>
<td>&lt;44</td>
<td>—</td>
<td>5.8</td>
<td>650</td>
<td>50</td>
<td>45</td>
<td>BuMines RI 6516</td>
<td>2 (C)</td>
<td>BuMines RI 6516</td>
</tr>
<tr>
<td>Aluminum flake</td>
<td>&lt;44</td>
<td>—</td>
<td>6.1</td>
<td>650</td>
<td>20</td>
<td>45</td>
<td>&lt;3</td>
<td>&lt;3 (C)</td>
<td>BuMines RI 6516</td>
</tr>
<tr>
<td>Aluminum</td>
<td>&lt;10</td>
<td>515</td>
<td>11.2</td>
<td>560</td>
<td>—</td>
<td>—</td>
<td>BGIA3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>580</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>BGIA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beryllium</td>
<td>4</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>BuMines RI 6516</td>
<td></td>
<td>BuMines RI 6516</td>
</tr>
<tr>
<td>Boron</td>
<td>&lt;44</td>
<td>—</td>
<td>—</td>
<td>470</td>
<td>60</td>
<td>&lt;100</td>
<td>Cashdollar &amp; Zlochower</td>
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<td>LOC$^1$ (v%)</td>
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(1) Limiting Oxygen Concentration. The letter in parenthesis in the LOC column denotes the inert gas used to reduce the oxygen concentration as follows: Ar = argon, C = carbon dioxide, N = nitrogen

(2) UN Dust Layer Combustibility Categories are as follows:

- BZ1 No self-sustained combustion;
- BZ2 Local combustion of short duration;
- BZ3 Local sustained combustion, but no propagation;
- BZ4 Propagating smoldering combustion;
- BZ5 Propagating open flame;
- BZ6 Explosive combustion.

(3) BGIA is the GESTIS-DUST-EX database maintained by BGIA-online.hvbg.de


[484: Table A.1.1.3(b)]

Table A.5.2.2(h) Atomized Aluminum Particle Ignition and Explosion Data
<table>
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<tr>
<th>Particle Size $(d_{50})$ (μm)</th>
<th>BET (m$^2$/g)</th>
<th>MEC (g/m$^3$)</th>
<th>$P_{max}$ (psi)</th>
<th>$dP/dt_{max}$ (psi/sec)</th>
<th>$K_{St}$ (bar·m/sec)</th>
<th>Sample Concentration That Corresponds to $P_{max}$ and $dP/dt_{max}$</th>
<th>MIE (mJ)</th>
<th>LOC (%)</th>
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<td>53</td>
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<td>167</td>
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<td>3.5</td>
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</table>

| **Spherical Powders** | | | | | | | | | |
| 63                          | 0.15         | 120          | 101            | 1,220                    | 23                  | 1,250 $(P_{max})$, 1,000 $(dP/dt_{max})$                      |          |        |     |
| 36                          | 0.25         | 60           | 124            | 4,770                    | 90                  | 1,250                                                         |          |        | 13  |
| 30                          | 0.10         | 60           | 140            | 5,940                    | 111                 | 1,000                                                         |          |        | 13  |
| 15                          | 0.50         | 45           | 148            | 10,812                   | 203                 | 1,000                                                         |          |        | 7   |
| 15                          | 0.30         | 55           |                |                          |                     |                                                                |          |        | 8   |
| 6                           | 0.53         | 75           | 174            | 16,324                   | 306                 | 750                                                            |          |        | 6   |
| 5                           | 1.30         | 167          | 14,310         | 269                      | 750                 |                                                                |          |        |     |
| 5                           | 1.00         | 70           | 155            | 14,730                   | 276                 | 1,250                                                         |          |        | 6   |
| 3                           | 2.50         | 95           | 165            | 15,900                   | 298                 | 1,250                                                         |          |        | 4   |
| 2                           | 3.00         | 130          |                |                          |                     |                                                                |          |        |     |
For U.S. conversions: 1 m²/g = 4884 ft²/lb; 1 g/m² = 0.000062 lb/ft²; 1 bar/sec = 14.5 psi/sec; 1 bar·m/sec = 0.226 psi·ft/sec.

BET: surface area per unit mass; MEC: minimum explosible concentration; MIE: minimum ignition energy; LOC: limiting oxygen (O₂) concentration.

Notes:

(1) The powders tested are representative samples produced by various manufacturers utilizing a variety of methods of manufacture, submitted for testing to a single, nationally recognized testing laboratory, at the same time.

(2) Data for each characteristic were obtained using the following ASTM methods:

(3) Particle size data represent the d₅₀ measurement determined by the laser light–scattering technique.

(4) Test results represent only the characteristics of those samples tested and should not be considered to be universally applicable. Users are encouraged to test samples of powders obtained from their individual process.

[484: Table A.4.3.1]

Table A.5.2.2(i) Explosion Characteristics of Unalloyed Magnesium Dust in Air (200 mesh (75µm))

<table>
<thead>
<tr>
<th>Explosion Characteristics</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosibility index</td>
<td>10 Kₜ</td>
</tr>
<tr>
<td>Ignition sensitivity</td>
<td>3.0 Kₜ</td>
</tr>
<tr>
<td>Explosion severity</td>
<td>7.4 Kₜ</td>
</tr>
<tr>
<td>Maximum explosion pressure (gauge)</td>
<td>793 kPa (115 psi)</td>
</tr>
<tr>
<td>Maximum rate of pressure rise (gauge)</td>
<td>793 kPa/sec (15,000 psi/sec)</td>
</tr>
<tr>
<td>Ignition temperature cloud</td>
<td>1040°F (560°C)</td>
</tr>
<tr>
<td>Minimum cloud ignition energy</td>
<td>0.04 J (26.4 W/sec)</td>
</tr>
<tr>
<td>Minimum explosion concentration</td>
<td>0.328 kg/m³ (0.03 oz/ft³)</td>
</tr>
<tr>
<td>Limiting oxygen percent for spark ignition</td>
<td>—</td>
</tr>
</tbody>
</table>

Note: Kₜ values vary for specific particle sizes.

ₐExplosibility index = ignition sensitivity × explosion severity.

₉Ignition sensitivity =

\[
\text{Ignition temp. cloud} \times \frac{\text{min. cloud-ignition energy}}{\text{min. explosion concentration (LEL)}}
\]

Pittsburgh coal dust

\[
\text{Ignition temp. cloud} \times \frac{\text{min. cloud-ignition energy}}{\text{min. explosion concentration}}
\]

Sample dust

₉Explosion severity = cExplosion severity =
Burns in carbon dioxide, nitrogen, and halons.

Table A.5.2.2(j) Selected Combustible Dusts Layer or Cloud Ignition Temperature
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>NEC Group</th>
<th>Code</th>
<th>Ignition Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetal, linear</td>
<td></td>
<td>G</td>
<td>NL</td>
<td>440</td>
</tr>
<tr>
<td>Acetoacet-p-phenetidide</td>
<td>122-82-7</td>
<td>G</td>
<td>NL</td>
<td>560</td>
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<tr>
<td>Acetoacetanilide</td>
<td>102-01-2</td>
<td>G</td>
<td>M</td>
<td>440</td>
</tr>
<tr>
<td>Acetylamino-t-nitrothiazole</td>
<td></td>
<td>G</td>
<td></td>
<td>450</td>
</tr>
<tr>
<td>Acrylamide polymer</td>
<td></td>
<td>G</td>
<td></td>
<td>240</td>
</tr>
<tr>
<td>Acrylonitrile polymer</td>
<td></td>
<td>G</td>
<td></td>
<td>460</td>
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<tr>
<td>Acrylonitrile-vinyl chloride-vinylidenechloride copolymer (70-20-10)</td>
<td>G</td>
<td>210</td>
<td></td>
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</tr>
<tr>
<td>Acrylonitrile-vinyl pyridine copolymer</td>
<td></td>
<td>G</td>
<td></td>
<td>240</td>
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<tr>
<td>Adipic acid</td>
<td>124-04-9</td>
<td>G</td>
<td>M</td>
<td>550</td>
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<tr>
<td>Alkyl ketone dimer sizing compound</td>
<td></td>
<td>G</td>
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<td>160</td>
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<tr>
<td>Allyl alcohol derivative (CR-39)</td>
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<td>NL</td>
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<tr>
<td>Almond shell</td>
<td></td>
<td>G</td>
<td></td>
<td>200</td>
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<tr>
<td>Aluminum, A422 flake</td>
<td>7429-90-5</td>
<td>E</td>
<td></td>
<td>320</td>
</tr>
<tr>
<td>Aluminum, atomized collector fines</td>
<td></td>
<td>E</td>
<td>CL</td>
<td>550</td>
</tr>
<tr>
<td>Aluminum—cobalt alloy (60-40)</td>
<td></td>
<td>E</td>
<td></td>
<td>570</td>
</tr>
<tr>
<td>Aluminum—copper alloy (50-50)</td>
<td></td>
<td>E</td>
<td></td>
<td>830</td>
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<tr>
<td>Aluminum—lithium alloy (15% Li)</td>
<td></td>
<td>E</td>
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<td>400</td>
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<tr>
<td>Aluminum—magnesium alloy (dowmetal)</td>
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<td>E</td>
<td>CL</td>
<td>430</td>
</tr>
<tr>
<td>Aluminum—nickel alloy (58-42)</td>
<td></td>
<td>E</td>
<td></td>
<td>540</td>
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<tr>
<td>Aluminum—silicon alloy (12% Si)</td>
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<td>NL</td>
<td>670</td>
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<td>Amino-5-nitrothiazole</td>
<td>121-66-4</td>
<td>G</td>
<td></td>
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<tr>
<td>Anthranilic acid</td>
<td>118-92-3</td>
<td>G</td>
<td>M</td>
<td>580</td>
</tr>
<tr>
<td>Apricot pit</td>
<td></td>
<td>G</td>
<td></td>
<td>230</td>
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<tr>
<td>Aryl-nitrosomethylamide</td>
<td></td>
<td>G</td>
<td>NL</td>
<td>490</td>
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<tr>
<td>Asphalt</td>
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<td>F</td>
<td></td>
<td>510</td>
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<tr>
<td>Aspirin [acetol (2)]</td>
<td>50-78-2</td>
<td>G</td>
<td>M</td>
<td>660</td>
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<tr>
<td>Azelaic acid</td>
<td>109-31-9</td>
<td>G</td>
<td>M</td>
<td>610</td>
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<tr>
<td>Azo-bis-butynitrile</td>
<td>78-67-1</td>
<td>G</td>
<td></td>
<td>350</td>
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<tr>
<td>Benzethonium chloride</td>
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<td>G</td>
<td>CL</td>
<td>380</td>
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<tr>
<td>Chemical Name</td>
<td>CAS No.</td>
<td>NEC Group</td>
<td>Code</td>
<td>Ignition Temperature (°C)</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------</td>
<td>---------</td>
<td>-----------</td>
<td>------</td>
<td>--------------------------</td>
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<tr>
<td>Benzoic acid</td>
<td>65-85-0</td>
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<td>M</td>
<td>620</td>
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<tr>
<td>Benzoitrizole</td>
<td>95-14-7</td>
<td>G</td>
<td>M</td>
<td>440</td>
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<tr>
<td>Beta-naphthalene-axo-dimethylaniline</td>
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<td>G</td>
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<td>175</td>
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<tr>
<td>Bis(2-hydroxy- 5-chlorophenyl) methane</td>
<td>97-23-4</td>
<td>G</td>
<td>NL</td>
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<tr>
<td>Bisphenol-A</td>
<td>80-05-7</td>
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<td>M</td>
<td>570</td>
</tr>
<tr>
<td>Boron, commercial amorphous (85% B)</td>
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<td></td>
<td>400</td>
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<tr>
<td>Calcium silicide</td>
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<td>E</td>
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<td>540</td>
</tr>
<tr>
<td>Carbon black (more than 8% total entrapped volatiles)</td>
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<td>F</td>
<td></td>
<td></td>
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<tr>
<td>Carboxymethyl cellulose</td>
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<td>Carboxypolymethylene</td>
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<tr>
<td>Cashew oil, phenolic, hard</td>
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<td>G</td>
<td></td>
<td>180</td>
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<tr>
<td>Cellulose</td>
<td></td>
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<tr>
<td>Cellulose acetate</td>
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<td>Cellulose acetate butyrate</td>
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<td>Cellulose triacetate</td>
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<td>Charcoal (activated)</td>
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<tr>
<td>Charcoal (more than 8% total entrapped volatiles)</td>
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<td>F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cherry pit</td>
<td></td>
<td>G</td>
<td></td>
<td>220</td>
</tr>
<tr>
<td>Chlorinated phenol</td>
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<td>G</td>
<td>NL</td>
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<tr>
<td>Chlorinated polyether alcohol</td>
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<td>460</td>
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<tr>
<td>Chloroacetoacetanilide</td>
<td>101-92-8</td>
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<td>M</td>
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<tr>
<td>Chromium (97%) electrolytic, milled</td>
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<tr>
<td>Cinnamon</td>
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<td>G</td>
<td></td>
<td>230</td>
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<tr>
<td>Citrus peel</td>
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<td>G</td>
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<td>270</td>
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<tr>
<td>Coal, Kentucky bituminous</td>
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<td>F</td>
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<td>180</td>
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<tr>
<td>Coal, Pittsburgh experimental</td>
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<td>Coal, Wyoming</td>
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<td>180</td>
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<tr>
<td>Cocoa bean shell</td>
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<td>G</td>
<td></td>
<td>370</td>
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<tr>
<td>Cocoa, natural, 19% fat</td>
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<td>G</td>
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<tr>
<td>Coconut shell</td>
<td></td>
<td>G</td>
<td></td>
<td>220</td>
</tr>
<tr>
<td>Coke (more than 8% total entrapped volatiles)</td>
<td></td>
<td>F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cork</td>
<td></td>
<td>G</td>
<td></td>
<td>210</td>
</tr>
<tr>
<td>Corn</td>
<td></td>
<td>G</td>
<td></td>
<td>250</td>
</tr>
<tr>
<td>Chemical Name</td>
<td>CAS No.</td>
<td>NEC Group</td>
<td>Code</td>
<td>Ignition Temperature (°C)</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>-----------------</td>
<td>-----------</td>
<td>------</td>
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</tr>
<tr>
<td>Corn dextrine</td>
<td>533-74-4</td>
<td>G</td>
<td>CL</td>
<td>310</td>
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<td>Corn cob grit</td>
<td>83-79-4</td>
<td>G</td>
<td>M</td>
<td>230</td>
</tr>
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<td>Cornstarch, commercial</td>
<td>80-43-3</td>
<td>G</td>
<td>M</td>
<td>180</td>
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<tr>
<td>Cornstarch, modified</td>
<td>131-17-9</td>
<td>G</td>
<td>M</td>
<td>480</td>
</tr>
<tr>
<td>Cottonseed meal</td>
<td>60-57-1</td>
<td>G</td>
<td>NL</td>
<td>420</td>
</tr>
<tr>
<td>Coumarone-indene, hard</td>
<td>1459-93-4</td>
<td>G</td>
<td>NL</td>
<td>430</td>
</tr>
<tr>
<td>Crag No. 974</td>
<td>148-01-6</td>
<td>G</td>
<td>NL</td>
<td>500</td>
</tr>
<tr>
<td>Cube root, South America</td>
<td>120-61-6</td>
<td>G</td>
<td>M</td>
<td>570</td>
</tr>
<tr>
<td>Diallyl phthalate</td>
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<td>G</td>
<td>M</td>
<td>580</td>
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<tr>
<td>Dicyclopentadiene dioxide</td>
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<td>G</td>
<td>NL</td>
<td>420</td>
</tr>
<tr>
<td>Dihydroacetic acid</td>
<td>8018-01-7</td>
<td>G</td>
<td>NL</td>
<td>180</td>
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<tr>
<td>Dinitro-o-toluamide</td>
<td>92-52-4</td>
<td>G</td>
<td>M</td>
<td>630</td>
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<tr>
<td>Dinitrobenzoic acid</td>
<td>128-37-0</td>
<td>G</td>
<td>NL</td>
<td>420</td>
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<tr>
<td>Diphene</td>
<td>533-74-4</td>
<td>G</td>
<td>CL</td>
<td>310</td>
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<tr>
<td>Ditertiary-butyl-paracresol</td>
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<td>G</td>
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<tr>
<td>Dithane m-45</td>
<td>92-52-4</td>
<td>G</td>
<td>M</td>
<td>630</td>
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<tr>
<td>Epoxy</td>
<td>128-37-0</td>
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<td>NL</td>
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<td>Epoxy-bisphenol A</td>
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<td>180</td>
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<td>Ethyl cellulose</td>
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<td>M</td>
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<tr>
<td>Ethyl hydroxyethyl cellulose</td>
<td>12604-53-4</td>
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<td>CL</td>
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<tr>
<td>Ethylene oxide polymer</td>
<td>8049-17-0</td>
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<td>M</td>
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<tr>
<td>Ethylene-maleic anhydride copolymer</td>
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<td>E</td>
<td>CL</td>
<td>380</td>
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<td>Ferbam™</td>
<td>128-37-0</td>
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<td>CL</td>
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<td>Ferromanganese, medium carbon</td>
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<tr>
<td>Ferrosilicon (88% Si, 9% Fe)</td>
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<tr>
<td>Ferroalloy (19% Ti, 74.1% Fe, 0.06% C)</td>
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<td>NL</td>
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<tr>
<td>Chemical Name</td>
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<td>NEC Group</td>
<td>Code</td>
<td>Ignition Temperature (°C)</td>
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<td>---------------------------------------------------</td>
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<td>520</td>
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<td>Garlic, dehydrated</td>
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<td>Gilsonite</td>
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<td>Green base harmo dye</td>
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<td>Guar seed</td>
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<td>G</td>
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<td>175</td>
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<td>Gulasonic acid, diacetone</td>
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<td>Gum, karaya</td>
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<tr>
<td>Gum, manila</td>
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<td>Hydroxyethyl cellulose</td>
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<td>410</td>
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<td>Iron, 98% H2 reduced</td>
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<td>Iron, 99% carbonyl</td>
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<td>Isotoic anhydride</td>
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<td>L-sorbose</td>
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<td>G</td>
<td>M</td>
<td>370</td>
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<td>Lignin, hydrolized, wood-type, fine</td>
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<td>G</td>
<td>NL</td>
<td>450</td>
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<tr>
<td>Lignite, California</td>
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<td>G</td>
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<td>250</td>
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<td>Manganese</td>
<td>7439-96-5</td>
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<td></td>
<td>240</td>
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<tr>
<td>Magnesium, grade B, milled</td>
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<td>E</td>
<td></td>
<td>430</td>
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<tr>
<td>Manganese vancide</td>
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<td>G</td>
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<td>120</td>
</tr>
<tr>
<td>Mannitol</td>
<td>69-65-8</td>
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<td>M</td>
<td>460</td>
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<tr>
<td>Methacrylic acid polymer</td>
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<td>G</td>
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<td>290</td>
</tr>
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<td>Methionine (L-methionine)</td>
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<td>360</td>
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<td>Methyl cellulose</td>
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<td>9011-14-7</td>
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<td>Methyl methacrylate-ethyl acrylate</td>
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<td>Methyl methacrylate-styrene-butadiene</td>
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<td>Milk, skimmed</td>
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<td>N,N-dimethylthio- formamide</td>
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<td>Ignition Temperature °C</td>
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<tr>
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<td>Nitrosamine</td>
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<td>Para-oxy-benzaldehyde</td>
<td>123-08-0</td>
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<td>Peach pit shell</td>
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<td>94114-14-4</td>
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<td>8002-03-7</td>
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<td>Petrin acrylate monomer</td>
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<td>Petroleum coke (more than 8% total entrapped volatiles)</td>
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<td>Phenol fufural</td>
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<td>Polyethylene, low pressure process</td>
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<td>Ignition Temperature (°C)</td>
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<td>68441-04-8</td>
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<tr>
<td>Polypropylene (no antioxidant)</td>
<td>9003-07-0</td>
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<td>NL</td>
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<td>Polystyrene latex</td>
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<td>Polystyrene molding compound</td>
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<td>NL</td>
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<td>Polyurethane foam, fire retardant</td>
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<td>G</td>
<td>NL</td>
<td>390</td>
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<tr>
<td>Polyurethane foam, no fire retardant</td>
<td>9009-54-5</td>
<td>G</td>
<td>NL</td>
<td>440</td>
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<tr>
<td>Polyvinyl acetate</td>
<td>9003-20-7</td>
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<td>NL</td>
<td>550</td>
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<tr>
<td>Polyvinyl acetate/alcohol</td>
<td>9002-89-5</td>
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<td>Polyvinyl butyral</td>
<td>63148-65-2</td>
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<td>NL</td>
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<td>Polyvinyl chloride-dioctyl phthalate</td>
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<td>NL</td>
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<td>Potato starch, dextrinated</td>
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<td>Pyrethrum</td>
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<td>Rayon (viscose) flock</td>
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<tr>
<td>Red dye intermediate</td>
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<td>Rice</td>
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<td>Rice bran</td>
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<td>Rice hull</td>
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<td>Rosin, DK</td>
<td>8050-09-7</td>
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<td>Rubber, crude, hard</td>
<td>9006-04-6</td>
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<td>Rubber, synthetic, hard (33% S)</td>
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<td>Safflower meal</td>
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<td>Salicylanilide</td>
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<td>Sevin</td>
<td>63-25-2</td>
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<td>Shale, oil</td>
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<td>Chemical Name</td>
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<td>NEC Group</td>
<td>Code</td>
<td>Ignition Temperature (°C)</td>
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<td>Sodium resinate</td>
<td>61790-51-0</td>
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<td>220</td>
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<td>Sorbic acid (copper sorbate or potash)</td>
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<td>Soy flour</td>
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<td>Stearic acid, aluminum salt</td>
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<td>Stearic acid, zinc salt</td>
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<td>Styrene modified polyester-glass fiber</td>
<td>100-42-5</td>
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<td>Styrene-acrylonitrile (70-30)</td>
<td>9003-54-7</td>
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<td>NL</td>
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<tr>
<td>Styrene-butadiene latex (&gt;75% styrene)</td>
<td>903-55-8</td>
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<td>Styrene-maleic anhydride copolymer</td>
<td>9011-13-6</td>
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<td>Sucrose</td>
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<td>Sugar, powdered</td>
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<td>Sulfur</td>
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<td>Tantalum</td>
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<td>Terephthalic acid</td>
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<td>NL</td>
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<td>Thorium (contains 1.2% O)</td>
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<td>CL</td>
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<td>Tin, 96%, atomized (2% Pb)</td>
<td>7440-31-5</td>
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<td>Titanium, 99% Ti</td>
<td>7440-32-6</td>
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<td>CL</td>
<td>330</td>
</tr>
<tr>
<td>Titanium hydride (95% Ti, 3.8% H)</td>
<td>7704-98-5</td>
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<td>CL</td>
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<td>Trithiobisdimethylthio- formamide</td>
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<tr>
<td>Tung, kernels, oil-free</td>
<td>8001-20-5</td>
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<tr>
<td>Urea formaldehyde molding compound</td>
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<td>Urea formaldehyde-phenol formaldehyde</td>
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<td>Vanadium, 86.4%</td>
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<tr>
<td>Chemical Name</td>
<td>CAS No.</td>
<td>NEC Group</td>
<td>Code</td>
<td>Layer or Cloud Ignition Temperature (°C)</td>
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<td>Vinyl chloride-acrylonitrile copolymer</td>
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<td>Vinyl toluene-acrylonitrile butadiene</td>
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<td>Violet 200 dye</td>
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<td>175</td>
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<td>Vitamin B1, mononitrate</td>
<td>59-43-8</td>
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<td>Vitamin C</td>
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<td>Walnut shell, black</td>
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<td>Wheat flour</td>
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<td>360</td>
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<tr>
<td>Wheat gluten, gum</td>
<td>100684-25-1</td>
<td>G</td>
<td>NL</td>
<td>520</td>
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<tr>
<td>Wheat starch</td>
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<td>NL</td>
<td>380</td>
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<td>Wheat straw</td>
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<td>Wood flour</td>
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<td>Woodbark, ground</td>
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<td>250</td>
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<td>Yeast, torula</td>
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<td>Zirconium hydride</td>
<td>7704-99-6</td>
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<tr>
<td>Zirconium (contains 0.3% O)</td>
<td>7440-67-7</td>
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<td>CL</td>
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</tbody>
</table>

Notes:

(1) Normally, the minimum ignition temperature of a layer of a specific dust is lower than the minimum ignition temperature of a cloud of that dust. Since this is not universally true, the lower of the two minimum ignition temperatures is listed. If no symbol appears in the “Code” column, then the layer ignition temperature is shown. “CL” means the cloud ignition temperature is shown. “NL” means that no layer ignition temperature is available, and the cloud ignition temperature is shown. “M” signifies that the dust layer melts before it ignites; the cloud ignition temperature is shown. “S” signifies that the dust layer sublimes before it ignites; the cloud ignition temperature is shown.

(2) Certain metal dusts might have characteristics that require safeguards beyond those required for atmospheres containing the dusts of aluminum, magnesium, and their commercial alloys. For example, zirconium and thorium dusts can ignite spontaneously in air, especially at elevated temperatures.

(3) Due to the impurities found in coal, its ignition temperatures vary regionally, and ignition temperatures are not available for all regions in which coal is mined.

[499: Table 5.2.2]

Statement of Problem and Substantiation for Public Comment
This Annex section (Table A.5.2.2(a)201, "Sphere Test Agricultural Dusts") contains a long list of agricultural dusts. The Annex says that these commodity tables are for guidance and the actual test data should be utilized. That statement, however, undermines the comment that published data, rather than testing may be utilized. The use of the language that published data may "often" or "generally" be utilized also undermines the use of such data. We remain confused about the extent of the literature search and testing that may be necessary to determine whether particular commodity dusts should be deemed to be combustible or explosive. It will be burdensome, if not impossible, for individual businesses to make such determinations based upon their own workplaces. See also Table A.5.2.2.(j), "Selected Combustible Dusts Layer or Cloud Ignition Temperature." This table appears to presume conclusively that all items listed meet the definition of "combustible dust." If so, this is inappropriate. We assume that agricultural dusts not included in this table are presumed to be non-combustible.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER  
Organization: ARENT FOX LLP  
Affiliation: NOP, NGFA, IOSMA  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Wed Nov 13 16:43:41 EST 2013

Committee Statement

Committee Action: Rejected  
Resolution: The Committee notes that the issue identified in the substantiation is already addressed in the introductory text to the table in the annex; therefore, the proposed changes described are not necessary the Committee believes.
A.5.2.2
This is an assessment to determine whether the dust is a combustible dust and if further assessment is necessary. Data can be from samples within the facility that have been tested or data can be based on whether the material is known to be combustible or not. There are some published data of commonly known materials, and the use of this data is adequate to determine whether the dust is a combustible dust. For well-known commodities, published data are usually acceptable. Generally, such data can be considered conservative if they are obtained from a reliable source, such as other NFPA documents. A perusal of published data illuminates that there is often a significant spread in values. It is useful, therefore, to compare attributes (such as particle distribution and moisture content) for published data with the actual material being handled in the system whenever possible. Doing so would help to verify that the data are pertinent to the hazard under assessment.

This section does not require the user to know all these items for the assessment but to review the important items in order to determine whether the material data are representative of the material in the facility. Even test data of material can be different from the actual conditions. The users should review the conditions of the test method as well to ensure that it is representative of the conditions of the facility. When that is not possible, the use of the worst-case values should be selected.

Composition and particle size are two parameters that are useful to identify the number and location of representative samples to be collected and tested. (See Section 5.5 for information on sampling.)

Refer to Tables A.5.2.2(a) through A.5.2.2(j) for guidance only and not as substitutes for actual test data. These tables are not all inclusive of all combustible dusts and noncombustible dusts. Additionally, material properties and testing methods can provide varied results than those presented in these tables.

Table A.5.2.2(a) 20-L Sphere Test Data – Agricultural Dusts
<table>
<thead>
<tr>
<th>Dust Name</th>
<th>$P_{\text{max}}$ (bar g)</th>
<th>$K_{\text{St}}$ (bar m/sec)</th>
<th>Percent Moisture</th>
<th>Particle Size (μm)</th>
<th>Minimum Explosive Concentration (g/m³)</th>
<th>Percent Greater Than 200 Mesh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>6.7</td>
<td>94</td>
<td>2.1</td>
<td>36</td>
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<td>Apple</td>
<td>6.7</td>
<td>34</td>
<td>155</td>
<td>125</td>
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<td>Beet root</td>
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<td>Carrageen</td>
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Notes:

(1) Normalized to 1 m$^3$ test vessel pressures, per ASTM E 1226, *Standard Test Method for Explosibility of Dust Clouds.*

(2) See also Table F.1(a) in NFPA 68, *Standard on Explosion Protection by Deflagration Venting,* for additional information on agricultural dusts with known explosion hazards.

(3) For those agricultural dusts without known explosion data, the dust should be tested in accordance with ASTM E 1226, *Standard Test Method for Explosibility of Dust Clouds.*

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<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>$P_{\text{max}}$ (bar)</th>
<th>$K_{St}$ (bar·m/s)</th>
<th>Dust Hazard Class</th>
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<td>Mass Median Diameter (μm)</td>
<td>Minimum Flammable Concentration (g/m³)</td>
<td>P&lt;sub&gt;max&lt;/sub&gt; (bar)</td>
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<td>Dust Hazard Class</td>
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[68: Table F.1(b)]

Table A.5.2.2(d) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Chemical Dusts

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<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>P&lt;sub&gt;max&lt;/sub&gt; (bar)</th>
<th>K&lt;sub&gt;St&lt;/sub&gt; (bar·m/s)</th>
<th>Dust Hazard Class</th>
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<td>Lactose</td>
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[68: Table F.1(c)]

Table A.5.2.2(e) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Metal Dusts
<table>
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<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>$P_{\text{max}}$ (bar)</th>
<th>$K_{\text{St}}$ (bar·m/s)</th>
<th>Dust Hazard Class</th>
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<tr>
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<td>Bronze</td>
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<td>31</td>
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<td>111</td>
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<td>Phenolic resin</td>
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[68: Table F.1(d)]

Table A.5.2.2(f) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Plastic Dusts
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<th>Minimum Flammable Concentration (g/m³)</th>
<th>$P_{\text{max}}$ (bar)</th>
<th>$K_{\text{St}}$ (bar·m/s)</th>
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<td>(poly) Acrylonitrile</td>
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<td>121</td>
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[68: Table F.1(e)]
Table A.5.2.2(g) Explosibility Properties of Metals
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<th>Median Diameter (μm)</th>
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<th>MEC (g/m³)</th>
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<td>$P_{\text{max}}$ (bar g)</td>
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1. Limiting Oxygen Concentration. The letter in parenthesis in the LOC column denotes the inert gas used to reduce the oxygen concentration as follows: Ar = argon, C = carbon dioxide, N = nitrogen

2. UN Dust Layer Combustibility Categories are as follows:
   - BZ1 No self-sustained combustion;
   - BZ2 Local combustion of short duration;
   - BZ3 Local sustained combustion, but no propagation;
   - BZ4 Propagating smoldering combustion;
   - BZ5 Propagating open flame;
   - BZ6 Explosive combustion.

3. BGIA is the GESTIS-DUST-EX database maintained by BGIA-online.hvbg.de


[484: Table A.1.1.3(b)]

Table A.5.2.2(h) Atomized Aluminum Particle Ignition and Explosion Data
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<th>Particle Size $(d_{50})$ (μm)</th>
<th>BET (m$^2$/g)</th>
<th>MEC (g/m$^3$)</th>
<th>$P_{\text{max}}$ (psi)</th>
<th>$dP/dt_{\text{max}}$ (psi/sec)</th>
<th>$K_{St}$ (bar·m/sec)</th>
<th>Sample Concentration That Correlates to $P_{\text{max}}$ and $dP/dt_{\text{max}}$</th>
<th>MIE (mJ)</th>
<th>LOC (%)</th>
<th>Ign</th>
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<tbody>
<tr>
<td><strong>Nonspherical, Nodular, or Irregular Powders</strong></td>
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<td>75</td>
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<td><strong>Spherical Powders</strong></td>
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<td>120</td>
<td>101</td>
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<td>6.0%</td>
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<td>0.53</td>
<td>75</td>
<td>174</td>
<td>16,324</td>
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<td>167</td>
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</tr>
</tbody>
</table>
For U.S. conversions: 1 m²/g = 4884 ft²/lb; 1 g/m² = 0.000062 lb/ft²; 1 bar/sec = 14.5 psi/sec; 1 bar·m/sec = 0.226 psi·ft/sec.

BET: surface area per unit mass; MEC: minimum explosible concentration; MIE: minimum ignition energy; LOC: limiting oxygen (O₂) concentration.

Notes:

1. The powders tested are representative samples produced by various manufacturers utilizing a variety of methods of manufacture, submitted for testing to a single, nationally recognized testing laboratory, at the same time.

2. Data for each characteristic were obtained using the following ASTM methods:

3. Particle size data represent the \( d_{50} \) measurement determined by the laser light–scattering technique.

4. Test results represent only the characteristics of those samples tested and should not be considered to be universally applicable. Users are encouraged to test samples of powders obtained from their individual process.

[484: Table A.4.3.1]

Table A.5.2.2(i) Explosion Characteristics of Unalloyed Magnesium Dust in Air (200 mesh (75μm))

<table>
<thead>
<tr>
<th>Explosion Characteristics</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosibility index(^a)</td>
<td>10 ( K_{\text{St}} )</td>
</tr>
<tr>
<td>Ignition sensitivity(^b)</td>
<td>3.0 ( K_{\text{St}} )</td>
</tr>
<tr>
<td>Explosion severity(^c)</td>
<td>7.4 ( K_{\text{St}} )</td>
</tr>
<tr>
<td>Maximum explosion pressure (gauge)</td>
<td>793 kPa (115 psi)</td>
</tr>
<tr>
<td>Maximum rate of pressure rise (gauge)</td>
<td>793 kPa/sec (15,000 psi/sec)</td>
</tr>
<tr>
<td>Ignition temperature cloud</td>
<td>1040°F (560°C)</td>
</tr>
<tr>
<td>Minimum cloud ignition energy</td>
<td>0.04 J (26.4 W/sec)</td>
</tr>
<tr>
<td>Minimum explosion concentration</td>
<td>0.328 kg/m³ (0.03 oz/ft³)</td>
</tr>
<tr>
<td>Limiting oxygen percent for spark ignition(^d)</td>
<td>—</td>
</tr>
</tbody>
</table>

Note: \( K_{\text{St}} \) values vary for specific particle sizes.

\(^a\)Explosibility index = ignition sensitivity × explosion severity.

\(^b\)Ignition sensitivity = \[
\left( \frac{\text{Ignition temp. cloud} \times \text{min. cloud-ignition energy}}{\times \text{min. explosion concentration (LEL)}} \right) \]
Pittsburgh coal dust

\(^c\)Explosion severity =...
 Burns in carbon dioxide, nitrogen, and halons.

[484: Table D.2]

Table A.5.2.2(j) Selected Combustible Dusts Layer or Cloud Ignition Temperature
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>NEC Group</th>
<th>Code</th>
<th>Layer or Cloud</th>
<th>Ignition Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetal, linear</td>
<td></td>
<td>NL</td>
<td>G</td>
<td></td>
<td>440</td>
</tr>
<tr>
<td>Acetoacet-p-phenetidide</td>
<td>122-82-7</td>
<td>NL</td>
<td>G</td>
<td></td>
<td>560</td>
</tr>
<tr>
<td>Acetoacetanilide</td>
<td>102-01-2</td>
<td>M</td>
<td>G</td>
<td></td>
<td>440</td>
</tr>
<tr>
<td>Acetylamino-t-nitrothiazole</td>
<td></td>
<td></td>
<td>G</td>
<td></td>
<td>450</td>
</tr>
<tr>
<td>Acrylamide polymer</td>
<td></td>
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<tr>
<td>Acrylonitrile polymer</td>
<td></td>
<td></td>
<td>G</td>
<td></td>
<td>460</td>
</tr>
<tr>
<td>Acrylonitrile-vinyl chloride-vinylidenechloride copolymer (70-20-10)</td>
<td></td>
<td></td>
<td>G</td>
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<td>210</td>
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<tr>
<td>Acrylonitrile-vinyl pyridine copolymer</td>
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<td>G</td>
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<tr>
<td>Adipic acid</td>
<td>124-04-9</td>
<td>M</td>
<td>G</td>
<td></td>
<td>550</td>
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<td>Alfalfa meal</td>
<td></td>
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<td>G</td>
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<td>G</td>
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<td>160</td>
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<tr>
<td>Allyl alcohol derivative (CR-39)</td>
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<td>G</td>
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<td>Almond shell</td>
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<td></td>
<td>G</td>
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<td>200</td>
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<tr>
<td>Aluminum, A422 flake</td>
<td>7429-90-5</td>
<td>E</td>
<td>E</td>
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<td>320</td>
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<tr>
<td>Aluminum, atomized collector fines</td>
<td></td>
<td></td>
<td>E</td>
<td>CL</td>
<td>550</td>
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<tr>
<td>Aluminum—cobalt alloy (60-40)</td>
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<td></td>
<td>E</td>
<td></td>
<td>570</td>
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<tr>
<td>Aluminum—copper alloy (50-50)</td>
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<td>Aluminum—lithium alloy (15% Li)</td>
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<td>Aluminum—magnesium alloy (dowmetal)</td>
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<td>CL</td>
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<td>Aluminum—nickel alloy (58-42)</td>
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<td>Aluminum—silicon alloy (12% Si)</td>
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<td>Anthranilic acid</td>
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<td>G</td>
<td></td>
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<td>Aryl-nitrosomethylamide</td>
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<td>G</td>
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<td>Benzethonium chloride</td>
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<td>Code</td>
<td>Ignition Temperature (°C)</td>
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<td>Charcoal (more than 8% total entrapped volatiles)</td>
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<tr>
<td>Cherry pit</td>
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<td>Chromium (97%) electrolytic, milled</td>
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<td>Citrus peel</td>
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<td>Coal, Pittsburgh experimental</td>
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<td>Cocoa, natural, 19% fat</td>
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<td>Coke (more than 8% total entrapped volatiles)</td>
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<td>Cork</td>
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<td>Chemical Name</td>
<td>CAS No.</td>
<td>NEC Group</td>
<td>NEC Code</td>
<td>Ignition Temperature (°C)</td>
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<td>-----------</td>
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<tr>
<td>Corn dextrine</td>
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<td>68308-34-9</td>
<td>F</td>
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<tr>
<td>Shellac</td>
<td>9000-59-3</td>
<td>G</td>
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<td>Chemical Name</td>
<td>CAS No.</td>
<td>NEC Group</td>
<td>Code</td>
<td>IgnitionTemperature (°C)</td>
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<td>-------------------------------------------</td>
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<td>Sodium resinate</td>
<td>61790-51-0</td>
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<td></td>
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</tr>
<tr>
<td>Sorbic acid (copper sorbate or potash)</td>
<td>110-44-1</td>
<td>G</td>
<td></td>
<td>460</td>
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<tr>
<td>Soy flour</td>
<td>68513-95-1</td>
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<td>Soy protein</td>
<td>9010-10-0</td>
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<td>260</td>
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<td>Stearic acid, aluminum salt</td>
<td>637-12-7</td>
<td>G</td>
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<tr>
<td>Stearic acid, zinc salt</td>
<td>557-05-1</td>
<td>G M</td>
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<tr>
<td>Styrene modified polyester-glass fiber</td>
<td>100-42-5</td>
<td>G</td>
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<td>Styrene-acrylonitrile (70-30)</td>
<td>9003-54-7</td>
<td>G NL</td>
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<td>500</td>
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<tr>
<td>Styrene-butadiene latex (&gt;75% styrene)</td>
<td>903-55-8</td>
<td>G NL</td>
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<td>Styrene-maleic anhydride copolymer</td>
<td>9011-13-6</td>
<td>G CL</td>
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<td>Sucrose</td>
<td>57-50-1</td>
<td>G CL</td>
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<td>Sugar, powdered</td>
<td>57-50-1</td>
<td>G CL</td>
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<td>Sulfur</td>
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<tr>
<td>Tantalum</td>
<td>7440-25-7</td>
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<td>Terephthalic acid</td>
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<td>Thorium (contains 1.2% O)</td>
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<tr>
<td>Tin, 96%, atomized (2% Pb)</td>
<td>7440-31-5</td>
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<tr>
<td>Titanium, 99% Ti</td>
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</tr>
<tr>
<td>Titanium hydride (95% Ti, 3.8% H)</td>
<td>7704-98-5</td>
<td>E CL</td>
<td></td>
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</tr>
<tr>
<td>Trithiobisdimethylthio- formamide</td>
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<td>G</td>
<td></td>
<td>230</td>
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<tr>
<td>Tung, kernels, oil-free</td>
<td>8001-20-5</td>
<td>G</td>
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<tr>
<td>Urea formaldehyde molding compound</td>
<td>9011-05-6</td>
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<tr>
<td>Urea formaldehyde-phenol formaldehyde</td>
<td>25104-55-6</td>
<td>G</td>
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<tr>
<td>Vanadium, 86.4%</td>
<td>7440-62-2</td>
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<td>Chemical Name</td>
<td>CAS No.</td>
<td>NEC Group</td>
<td>Code</td>
<td>Layer or Cloud Ignition Temperature °C</td>
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<tr>
<td>---------------------------------------</td>
<td>---------------</td>
<td>-----------</td>
<td>------</td>
<td>---------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Vinyl chloride-acrylonitrile copolymer</td>
<td>9003-00-3</td>
<td>G</td>
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<td>470</td>
<td></td>
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<tr>
<td>Vinyl toluene-acrylonitrile butadiene</td>
<td>76404-69-8</td>
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<td>NL</td>
<td>530</td>
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<td>Violet 200 dye</td>
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<td>Vitamin B1, mononitrate</td>
<td>59-43-8</td>
<td>G</td>
<td>NL</td>
<td>360</td>
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<td>Vitamin C</td>
<td>50-81-7</td>
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<td>280</td>
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</tr>
<tr>
<td>Walnut shell, black</td>
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<td>G</td>
<td></td>
<td>220</td>
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<tr>
<td>Wheat</td>
<td></td>
<td>G</td>
<td></td>
<td>220</td>
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</tr>
<tr>
<td>Wheat flour</td>
<td>130498-22-5</td>
<td>G</td>
<td></td>
<td>360</td>
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</tr>
<tr>
<td>Wheat gluten, gum</td>
<td>100684-25-1</td>
<td>G</td>
<td>NL</td>
<td>520</td>
<td></td>
</tr>
<tr>
<td>Wheat starch</td>
<td></td>
<td>G</td>
<td>NL</td>
<td>380</td>
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</tr>
<tr>
<td>Wheat straw</td>
<td></td>
<td>G</td>
<td></td>
<td>220</td>
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</tr>
<tr>
<td>Wood flour</td>
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<td>260</td>
<td></td>
</tr>
<tr>
<td>Woodbark, ground</td>
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<td>G</td>
<td></td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>Yeast, torula</td>
<td>68602-94-8</td>
<td>G</td>
<td></td>
<td>260</td>
<td></td>
</tr>
<tr>
<td>Zirconium hydride</td>
<td>7704-99-6</td>
<td>E</td>
<td></td>
<td>270</td>
<td></td>
</tr>
<tr>
<td>Zirconium (contains 0.3% O)</td>
<td>7440-67-7</td>
<td>E</td>
<td>CL</td>
<td>330</td>
<td></td>
</tr>
</tbody>
</table>

Notes:

1. Normally, the minimum ignition temperature of a layer of a specific dust is lower than the minimum ignition temperature of a cloud of that dust. Since this is not universally true, the lower of the two minimum ignition temperatures is listed. If no symbol appears in the “Code” column, then the layer ignition temperature is shown. “CL” means the cloud ignition temperature is shown. “NL” means that no layer ignition temperature is available, and the cloud ignition temperature is shown. “M” signifies that the dust layer melts before it ignites; the cloud ignition temperature is shown. “S” signifies that the dust layer sublimes before it ignites; the cloud ignition temperature is shown.

2. Certain metal dusts might have characteristics that require safeguards beyond those required for atmospheres containing the dusts of aluminum, magnesium, and their commercial alloys. For example, zirconium and thorium dusts can ignite spontaneously in air, especially at elevated temperatures.

3. Due to the impurities found in coal, its ignition temperatures vary regionally, and ignition temperatures are not available for all regions in which coal is mined.

[499: Table 5.2.2]
Statement of Problem and Substantiation for Public Comment

Substantiation: The test data presented for PVC and PVC copolymer dusts is incomplete and potentially misleading in not distinguishing between the many primary types of PVC resins and misleading from the perspective that the 1 m³ data from VI's tests confirms that certain PVC resins are not combustible. See cited reference and include the Vinyl Institute data table. In general, PVC resins are not significantly abraded through conveyance and the small amount of dust particles that are created by abrasion generally adhere to the larger resin pellets rather than dropping off and accumulating. PVC resins are typically dried in a fluidized bed dry and practically all fine dust is collected at the point of manufacture prior to shipping the product.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-117-NFPA 652-2014
Statement: The proposed change presupposed that public comment 113-NFPA 652-2013 has been adopted. The text have been edited to make it suitable annex material for 5.2.1 under public comment 113.

New table: The data provided for PVC polymers is limited and is not characterized as to the type of polymer.
Comment: Table A.5.2.2(f) should be revised as follows:

In general, PVC resins are not significantly abraded through conveyance and the small amount of dust particles that are created by abrasion generally adhere to the larger resin pellets rather than dropping off and accumulating.

* Data Reference: Krock, R., et. al., "OSHA’s COMBUSTIBLE DUST NATIONAL EMPHASIS PROGRAM AND COMBUSTIBILITY CHARACTERISTICS TESTING OF PVC RESINS and PVC DUSTS", SPE ANTEC, April 2, 2012

Substantiation: The test data presented for PVC and PVC copolymer dusts is incomplete and potentially misleading in not distinguishing between the many primary types of PVC resins and misleading from the perspective that the 1 m³ data from VI’s tests confirms that certain PVC resins are not combustible. See cited reference and include the Vinyl Institute data table.

<table>
<thead>
<tr>
<th>PVC Resin Sample</th>
<th>GP(2) Dispersion</th>
<th>VA(3) Copolymer</th>
<th>Baghouse Dust from GP Pipe (as received)</th>
<th>GP Pipe Resin (1)</th>
<th>Baghouse Dust from GP Pipe (as received)</th>
<th>GP Pipe Resin (as received)</th>
<th>High Molecular Weight Resin (as received)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Polymerization Process</td>
<td>Emulsion</td>
<td>Emulsion</td>
<td>Suspension</td>
<td>Suspension</td>
<td>Suspension</td>
<td>Suspension</td>
<td>Suspension</td>
</tr>
<tr>
<td>Plant Designator</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>C</td>
<td>D</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Test Lab</td>
<td>Chilworth</td>
<td>Chilworth</td>
<td>Chilworth</td>
<td>Fike</td>
<td>Chilworth</td>
<td>Chilworth (20L), Fike (1 m³)</td>
<td>Fike</td>
</tr>
<tr>
<td>Minimum Ignition Energy (MIE), Joules</td>
<td>&gt; 10 J</td>
<td>&gt; 10 J</td>
<td>&gt; 500 mili-Joules</td>
<td>&gt; 4,653 mili-Joules</td>
<td>&gt; 10 J</td>
<td>&gt; 10 J</td>
<td>&gt; 4,468 mili-Joules</td>
</tr>
<tr>
<td>Explosion Severity, Kst (bar.m/s), 20 liter test chamber</td>
<td>91</td>
<td>68</td>
<td>84</td>
<td>18</td>
<td>54</td>
<td>9</td>
<td>81</td>
</tr>
<tr>
<td>Dust Explosion Class in 20 liter test chamber</td>
<td>ST 1</td>
<td>ST 1</td>
<td>ST 1</td>
<td>ST 1</td>
<td>ST 1</td>
<td>ST 1</td>
<td>ST 1</td>
</tr>
<tr>
<td>Explosion Severity, Kst (bar.m/s), 1 m³ test chamber</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>0</td>
<td>Not Tested</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dust Explosion Class in 1 m³ test chamber</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>Not Tested</td>
<td>ST 0</td>
<td>Not Tested</td>
<td>ST 0</td>
<td>ST 0</td>
</tr>
<tr>
<td>Particle Size, Avg (microns)</td>
<td>1 (est.)</td>
<td>N.A.</td>
<td>N.A.</td>
<td>162</td>
<td>N.A.</td>
<td>158</td>
<td>128</td>
</tr>
<tr>
<td>Dust Fraction (&lt;75 micron, %)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>0.1</td>
<td>97</td>
<td>0</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Notes:
(1) Data for MIE and 20 liter test were performed by Fike on sample screened to <150 micron, and data for 1 m³ tests were performed by Fike on "as-received" sample.
(2) GP - General Purpose
(3) VA - Vinyl Acetate

Data Reference: Krock, R., et. al., "OSHA’s COMBUSTIBLE DUST NATIONAL EMPHASIS PROGRAM AND COMBUSTIBILITY CHARACTERISTICS TESTING OF PVC RESINS and PVC DUSTS", SPE ANTEC, April 2, 2012
Public Comment No. 42-NFPA 652-2013 [ Section No. A.5.2.2 ]

**A.5.2.2**
This is an assessment to determine whether the dust is a combustible dust and if further assessment is necessary. Data can be from samples within the facility that have been tested or data can be based on whether the material is known to be combustible or not. There are some published data of commonly known materials, and the use of this data is adequate to determine whether the dust is a combustible dust. For well-known commodities, published data are usually acceptable. Generally, such data can be considered conservative if they are obtained from a reliable source, such as other NFPA documents. A perusal of published data illuminates that there is often a significant spread in values. It is useful, therefore, to compare attributes (such as particle distribution and moisture content) for published data with the actual material being handled in the system whenever possible. Doing so would help to verify that the data are pertinent to the hazard under assessment.

This section does not require the user to know all these items for the assessment but to review the important items in order to determine whether the material data are representative of the material in the facility. Even test data of material can be different from the actual conditions. The users should review the conditions of the test method as well to ensure that it is representative of the conditions of the facility. When that is not possible, the use of the worst-case values should be selected.

Composition and particle size are two parameters that are useful to identify the number and location of representative samples to be collected and tested. (See Section 5.5 for information on sampling.) Refer to Tables A.5.2.2(a) through A.5.2.2(j) for guidance only and not as substitutes for actual test data. These tables are not all inclusive of all combustible dusts and noncombustible dusts. Additionally, material properties and testing methods can provide varied results than those presented in these tables.

Table A.5.2.2(a) 20-L Sphere Test Data – Agricultural Dusts
<table>
<thead>
<tr>
<th>Dust Name</th>
<th>$P_{max}$ (bar g)</th>
<th>$K_{St}$ (bar m/sec)</th>
<th>Percent Moisture</th>
<th>Particle Size (μm)</th>
<th>Minimum Explosive Concentration (g/m³)</th>
<th>Percent Greater Than 200 Mesh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa</td>
<td>6.7</td>
<td>94</td>
<td>2.1</td>
<td>36</td>
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<tr>
<td>Apple</td>
<td>6.7</td>
<td>34</td>
<td>155</td>
<td>125</td>
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<tr>
<td>Beet root</td>
<td>6.1</td>
<td>30</td>
<td>108</td>
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<tr>
<td>Carrageen</td>
<td>8.5</td>
<td>140</td>
<td>3.8</td>
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<td>Carrot</td>
<td>6.9</td>
<td>65</td>
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<tr>
<td>Cocoa bean dust</td>
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<td>Cocoa powder</td>
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<td>Coconut shell dust</td>
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<td>Coffee dust</td>
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<td>Garlic powder</td>
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<td>150</td>
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<td>Green coffee</td>
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<td>125</td>
<td>9.5</td>
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<td>8.6</td>
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<td>Onion powder</td>
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</tr>
<tr>
<td>Parsley (dehydrated)</td>
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</tr>
<tr>
<td>Dust Name</td>
<td>(P_{\text{max}}) (bar)</td>
<td>(K_{\text{St}}) (bar m/sec)</td>
<td>Percent Moisture</td>
<td>Particle Size (μm)</td>
<td>Minimum Explosive Concentration (g/m³)</td>
<td>Percent Greater Than 200 Mesh</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------</td>
<td>---------------------------------</td>
<td>------------------</td>
<td>-------------------</td>
<td>----------------------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>Peat</td>
<td>8.3</td>
<td>51</td>
<td>74</td>
<td>125</td>
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<td></td>
</tr>
<tr>
<td>Potato</td>
<td>6.0</td>
<td>20</td>
<td>82</td>
<td>250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potato flour</td>
<td>9.1</td>
<td>69</td>
<td>65</td>
<td>125</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potato starch</td>
<td>9.4</td>
<td>89</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw yucca seed dust</td>
<td>6.2</td>
<td>65</td>
<td>12.7</td>
<td>403</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice dust</td>
<td>7.7</td>
<td>118</td>
<td>2.5</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Rice flour</td>
<td>7.4</td>
<td>57</td>
<td></td>
<td></td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Rice starch</td>
<td>10.0</td>
<td>190</td>
<td>18</td>
<td></td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Rye flour</td>
<td>8.9</td>
<td>79</td>
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<td></td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Semolina</td>
<td>7.6</td>
<td>79</td>
<td></td>
<td></td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Soybean dust</td>
<td>7.5</td>
<td>125</td>
<td>2.1</td>
<td></td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>Spice dust</td>
<td>6.9</td>
<td>65</td>
<td>10.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spice powder</td>
<td>7.8</td>
<td>172</td>
<td>10.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sugar (10×)</td>
<td>8.4</td>
<td>154</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunflower</td>
<td>7.9</td>
<td>44</td>
<td></td>
<td>420</td>
<td>125</td>
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<tr>
<td>Tea</td>
<td>7.6</td>
<td>102</td>
<td>6.3</td>
<td>77</td>
<td>125</td>
<td></td>
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<tr>
<td>Tobacco blend</td>
<td>8.8</td>
<td>124</td>
<td>1.0</td>
<td>120</td>
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<td></td>
</tr>
<tr>
<td>Tomato</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>200</td>
<td>100</td>
</tr>
<tr>
<td>Walnut dust</td>
<td>8.4</td>
<td>174</td>
<td>6.0</td>
<td></td>
<td>31</td>
<td></td>
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<tr>
<td>Wheat flour</td>
<td>8.3</td>
<td>87</td>
<td>12.9</td>
<td>57</td>
<td>60</td>
<td>6</td>
</tr>
<tr>
<td>Wheat grain dust</td>
<td>9.3</td>
<td>112</td>
<td></td>
<td>80</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Wheat starch</td>
<td>9.8</td>
<td>132</td>
<td></td>
<td>20</td>
<td>60</td>
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<td>Xanthan gum</td>
<td>7.5</td>
<td>61</td>
<td>8.6</td>
<td>45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:

(1) Normalized to 1 m³ test vessel pressures, per ASTM E 1226, *Standard Test Method for Explosibility of Dust Clouds.*

(2) See also Table F.1(a) in NFPA 68, *Standard on Explosion Protection by Deflagration Venting,* for additional information on agricultural dusts with known explosion hazards.

(3) For those agricultural dusts without known explosion data, the dust should be tested in accordance with ASTM E 1226, *Standard Test Method for Explosibility of Dust Clouds.*

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### Table A.5.2.2(b) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Agricultural Dusts

<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>$P_{\text{max}}$ (bar)</th>
<th>$K_{\text{St}}$ (bar-m/s)</th>
<th>Dust Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellulose</td>
<td>33</td>
<td>60</td>
<td>9.7</td>
<td>229</td>
<td>2</td>
</tr>
<tr>
<td>Cellulose pulp</td>
<td>42</td>
<td>30</td>
<td>9.9</td>
<td>62</td>
<td>1</td>
</tr>
<tr>
<td>Cork</td>
<td>42</td>
<td>30</td>
<td>9.6</td>
<td>202</td>
<td>2</td>
</tr>
<tr>
<td>Corn</td>
<td>28</td>
<td>60</td>
<td>9.4</td>
<td>75</td>
<td>1</td>
</tr>
<tr>
<td>Egg white</td>
<td>17</td>
<td>125</td>
<td>8.3</td>
<td>38</td>
<td>1</td>
</tr>
<tr>
<td>Milk, powdered</td>
<td>83</td>
<td>60</td>
<td>5.8</td>
<td>28</td>
<td>1</td>
</tr>
<tr>
<td>Milk, nonfat, dry</td>
<td>60</td>
<td>—</td>
<td>8.8</td>
<td>125</td>
<td>1</td>
</tr>
<tr>
<td>Soy flour</td>
<td>20</td>
<td>200</td>
<td>9.2</td>
<td>110</td>
<td>1</td>
</tr>
<tr>
<td>Starch, corn</td>
<td>7</td>
<td>—</td>
<td>10.3</td>
<td>202</td>
<td>2</td>
</tr>
<tr>
<td>Starch, rice</td>
<td>18</td>
<td>60</td>
<td>9.2</td>
<td>101</td>
<td>1</td>
</tr>
<tr>
<td>Starch, wheat</td>
<td>22</td>
<td>30</td>
<td>9.9</td>
<td>115</td>
<td>1</td>
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<tr>
<td>Sugar</td>
<td>30</td>
<td>200</td>
<td>8.5</td>
<td>138</td>
<td>1</td>
</tr>
<tr>
<td>Sugar, milk</td>
<td>27</td>
<td>60</td>
<td>8.3</td>
<td>82</td>
<td>1</td>
</tr>
<tr>
<td>Sugar, beet</td>
<td>29</td>
<td>60</td>
<td>8.2</td>
<td>59</td>
<td>1</td>
</tr>
<tr>
<td>Tapioca</td>
<td>22</td>
<td>125</td>
<td>9.4</td>
<td>62</td>
<td>1</td>
</tr>
<tr>
<td>Whey</td>
<td>41</td>
<td>125</td>
<td>9.8</td>
<td>140</td>
<td>1</td>
</tr>
<tr>
<td>Wood flour</td>
<td>29</td>
<td>—</td>
<td>10.5</td>
<td>205</td>
<td>2</td>
</tr>
</tbody>
</table>

### Table A.5.2.2(c) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Carbonaceous Dusts
<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>P&lt;sub&gt;max&lt;/sub&gt; (bar)</th>
<th>K&lt;sub&gt;St&lt;/sub&gt; (bar·m/s)</th>
<th>Dust Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charcoal, activated</td>
<td>28</td>
<td>60</td>
<td>7.7</td>
<td>14</td>
<td>1</td>
</tr>
<tr>
<td>Charcoal, wood</td>
<td>14</td>
<td>60</td>
<td>9.0</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Coal, bituminous</td>
<td>24</td>
<td>60</td>
<td>9.2</td>
<td>129</td>
<td>1</td>
</tr>
<tr>
<td>Coke, petroleum</td>
<td>15</td>
<td>125</td>
<td>7.6</td>
<td>47</td>
<td>1</td>
</tr>
<tr>
<td>Lamplblack</td>
<td>&lt;10</td>
<td>60</td>
<td>8.4</td>
<td>121</td>
<td>1</td>
</tr>
<tr>
<td>Lignite</td>
<td>32</td>
<td>60</td>
<td>10.0</td>
<td>151</td>
<td>1</td>
</tr>
<tr>
<td>Peat, 22% H2O</td>
<td>—</td>
<td>125</td>
<td>84.0</td>
<td>67</td>
<td>1</td>
</tr>
<tr>
<td>Soot, pine</td>
<td>&lt;10</td>
<td>—</td>
<td>7.9</td>
<td>26</td>
<td>1</td>
</tr>
</tbody>
</table>

[68: Table F.1(b)]

Table A.5.2.2(d) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Chemical Dusts

<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>P&lt;sub&gt;max&lt;/sub&gt; (bar)</th>
<th>K&lt;sub&gt;St&lt;/sub&gt; (bar·m/s)</th>
<th>Dust Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adipic acid</td>
<td>&lt;10</td>
<td>60</td>
<td>8.0</td>
<td>97</td>
<td>1</td>
</tr>
<tr>
<td>Anthraquinone</td>
<td>&lt;10</td>
<td>—</td>
<td>10.6</td>
<td>364</td>
<td>3</td>
</tr>
<tr>
<td>Ascorbic acid</td>
<td>39</td>
<td>60</td>
<td>9.0</td>
<td>111</td>
<td>1</td>
</tr>
<tr>
<td>Calcium acetate</td>
<td>92</td>
<td>500</td>
<td>5.2</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>Calcium acetate</td>
<td>85</td>
<td>250</td>
<td>6.5</td>
<td>21</td>
<td>1</td>
</tr>
<tr>
<td>Calcium stearate</td>
<td>12</td>
<td>30</td>
<td>9.1</td>
<td>132</td>
<td>1</td>
</tr>
<tr>
<td>Carboxy- methylcellulose</td>
<td>24</td>
<td>125</td>
<td>9.2</td>
<td>136</td>
<td>1</td>
</tr>
<tr>
<td>Dextrin</td>
<td>41</td>
<td>60</td>
<td>8.8</td>
<td>106</td>
<td>1</td>
</tr>
<tr>
<td>Lactose</td>
<td>23</td>
<td>60</td>
<td>7.7</td>
<td>81</td>
<td>1</td>
</tr>
<tr>
<td>Lead stearate</td>
<td>12</td>
<td>30</td>
<td>9.2</td>
<td>152</td>
<td>1</td>
</tr>
<tr>
<td>Methylcellulose</td>
<td>75</td>
<td>60</td>
<td>9.5</td>
<td>134</td>
<td>1</td>
</tr>
<tr>
<td>Paraformaldehyde</td>
<td>23</td>
<td>60</td>
<td>9.9</td>
<td>178</td>
<td>1</td>
</tr>
<tr>
<td>Sodium ascorbate</td>
<td>23</td>
<td>60</td>
<td>8.4</td>
<td>119</td>
<td>1</td>
</tr>
<tr>
<td>Sodium stearate</td>
<td>22</td>
<td>30</td>
<td>8.8</td>
<td>123</td>
<td>1</td>
</tr>
<tr>
<td>Sulfur</td>
<td>20</td>
<td>30</td>
<td>6.8</td>
<td>151</td>
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[68: Table F.1(c)]

Table A.5.2.2(e) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Metal Dusts
<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter ($\mu$m)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>$P_{\text{max}}$ (bar)</th>
<th>$K_{St}$ (bar·m/s)</th>
<th>Dust Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>29</td>
<td>30</td>
<td>12.4</td>
<td>415</td>
<td>3</td>
</tr>
<tr>
<td>Bronze</td>
<td>18</td>
<td>750</td>
<td>4.1</td>
<td>31</td>
<td>1</td>
</tr>
<tr>
<td>Iron carbonyl</td>
<td>&lt;10</td>
<td>125</td>
<td>6.1</td>
<td>111</td>
<td>1</td>
</tr>
<tr>
<td>Magnesium</td>
<td>28</td>
<td>30</td>
<td>17.5</td>
<td>508</td>
<td>3</td>
</tr>
<tr>
<td>Phenolic resin</td>
<td>55</td>
<td>—</td>
<td>7.9</td>
<td>269</td>
<td>2</td>
</tr>
<tr>
<td>Zinc</td>
<td>10</td>
<td>250</td>
<td>6.7</td>
<td>125</td>
<td>1</td>
</tr>
<tr>
<td>Zinc</td>
<td>&lt;10</td>
<td>125</td>
<td>7.3</td>
<td>176</td>
<td>1</td>
</tr>
</tbody>
</table>

[68: Table F.1(d)]

Table A.5.2.2(f) 1 m³ Vessel Test Data from Forschungsbericht Staubexpositionen – Plastic Dusts
<table>
<thead>
<tr>
<th>Material</th>
<th>Mass Median Diameter (μm)</th>
<th>Minimum Flammable Concentration (g/m³)</th>
<th>$P_{\text{max}}$ (bar)</th>
<th>$K_{St}$ (bar·m/s)</th>
<th>Dust Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>(poly) Acrylamide</td>
<td>10</td>
<td>250</td>
<td>5.9</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Acrylonitrile</td>
<td>25</td>
<td>—</td>
<td>8.5</td>
<td>121</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Ethylene (low-pressure process)</td>
<td>&lt;10</td>
<td>30</td>
<td>8.0</td>
<td>156</td>
<td>1</td>
</tr>
<tr>
<td>Epoxy resin</td>
<td>26</td>
<td>30</td>
<td>7.9</td>
<td>129</td>
<td>1</td>
</tr>
<tr>
<td>Melamine resin</td>
<td>18</td>
<td>125</td>
<td>10.2</td>
<td>110</td>
<td>1</td>
</tr>
<tr>
<td>Melamine, molded (wood flour and mineral filled phenol-formaldehyde)</td>
<td>15</td>
<td>60</td>
<td>7.5</td>
<td>41</td>
<td>1</td>
</tr>
<tr>
<td>Melamine, molded (phenol-cellulose)</td>
<td>12</td>
<td>60</td>
<td>10.0</td>
<td>127</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Methyl acrylate</td>
<td>21</td>
<td>30</td>
<td>9.4</td>
<td>269</td>
<td>2</td>
</tr>
<tr>
<td>(poly) Methyl acrylate, emulsion polymer</td>
<td>18</td>
<td>30</td>
<td>10.1</td>
<td>202</td>
<td>2</td>
</tr>
<tr>
<td>Phenolic resin</td>
<td>&lt;10</td>
<td>15</td>
<td>9.3</td>
<td>129</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Propylene</td>
<td>25</td>
<td>30</td>
<td>8.4</td>
<td>101</td>
<td>1</td>
</tr>
<tr>
<td>Terpene-phenol resin</td>
<td>10</td>
<td>15</td>
<td>8.7</td>
<td>143</td>
<td>1</td>
</tr>
<tr>
<td>Urea-formaldehyde/cellulose, molded</td>
<td>13</td>
<td>60</td>
<td>10.2</td>
<td>136</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Vinyl acetate/ethylene copolymer</td>
<td>32</td>
<td>30</td>
<td>8.6</td>
<td>119</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Vinyl alcohol</td>
<td>26</td>
<td>60</td>
<td>8.9</td>
<td>128</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Vinyl butyral</td>
<td>65</td>
<td>30</td>
<td>8.9</td>
<td>147</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Vinyl chloride</td>
<td>107</td>
<td>200</td>
<td>7.6</td>
<td>46</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Vinyl chloride/vinyl acetylene emulsion copolymer</td>
<td>35</td>
<td>60</td>
<td>8.2</td>
<td>95</td>
<td>1</td>
</tr>
<tr>
<td>(poly) Vinyl chloride/ethylene/vinyl acetylene suspension copolymer</td>
<td>60</td>
<td>60</td>
<td>8.3</td>
<td>98</td>
<td>1</td>
</tr>
</tbody>
</table>

[68: Table F.1(e)]

Table A.5.2.2(g) Explosibility Properties of Metals
<table>
<thead>
<tr>
<th>Material</th>
<th>Median Diameter (μm)</th>
<th>$K_{st} \text{ (bar-m/s)}$</th>
<th>$P_{\text{max}} \text{ (bar g)}$</th>
<th>Cloud Ign Temp (°C)</th>
<th>MIE (mJ)</th>
<th>MEC (g/m³)</th>
<th>UN Combustibility Category</th>
<th>LOC¹ (v%)</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>~7</td>
<td>—</td>
<td>8</td>
<td>—</td>
<td>—</td>
<td>90</td>
<td></td>
<td></td>
<td>Cashdollar &amp; Zlochower4</td>
</tr>
<tr>
<td>Aluminum</td>
<td>22</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
<td>BGIA3</td>
</tr>
<tr>
<td>Aluminum</td>
<td>&lt;44</td>
<td>—</td>
<td>5.8</td>
<td>650</td>
<td>50</td>
<td>45</td>
<td>2 (C)</td>
<td></td>
<td>BuMines RI 6516</td>
</tr>
<tr>
<td>Aluminum flake</td>
<td>&lt;44</td>
<td>—</td>
<td>6.1</td>
<td>650</td>
<td>20</td>
<td>45</td>
<td>&lt;3 (C)</td>
<td></td>
<td>BuMines RI 6516</td>
</tr>
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1. Limiting Oxygen Concentration. The letter in parenthesis in the LOC column denotes the inert gas used to reduce the oxygen concentration as follows: Ar = argon, C = carbon dioxide, N = nitrogen

2. UN Dust Layer Combustibility Categories are as follows:
   - BZ1 No self-sustained combustion;
   - BZ2 Local combustion of short duration;
   - BZ3 Local sustained combustion, but no propagation;
   - BZ4 Propagating smoldering combustion;
   - BZ5 Propagating open flame;
   - BZ6 Explosive combustion.

3. BGIA is the GESTIS-DUST-EX database maintained by BGIA-online.hvbg.de


[484: Table A.1.1.3(b)]

Table A.5.2.2(h) Atomized Aluminum Particle Ignition and Explosion Data
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<th>dP/dt max (psi/sec)</th>
<th>K_{st} (bar·m/sec)</th>
<th>Sample Concentration That Corresponds to P max and dP/dt max</th>
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<tr>
<td>6</td>
<td>0.53</td>
<td>75</td>
<td>174</td>
<td>16,324</td>
<td>306</td>
<td>750</td>
<td>6</td>
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</tr>
<tr>
<td>5</td>
<td>1.30</td>
<td>167</td>
<td>14,310</td>
<td>269</td>
<td></td>
<td>750</td>
<td>4</td>
<td></td>
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<tr>
<td>5</td>
<td>1.00</td>
<td>70</td>
<td>155</td>
<td>14,730</td>
<td>276</td>
<td>1,250</td>
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<tr>
<td>3</td>
<td>2.50</td>
<td>95</td>
<td>165</td>
<td>15,900</td>
<td>298</td>
<td>1,250</td>
<td>4</td>
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</tr>
<tr>
<td>2</td>
<td>3.00</td>
<td>130</td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>
For U.S. conversions: 1 m²/g = 4884 ft²/lb; 1 g/m² = 0.000062 lb/ft²; 1 bar/sec = 14.5 psi/sec; 1 bar·m/sec = 0.226 psi·ft/sec.

BET: surface area per unit mass; MEC: minimum explosible concentration; MIE: minimum ignition energy; LOC: limiting oxygen (O₂) concentration.

Notes:

(1) The powders tested are representative samples produced by various manufacturers utilizing a variety of methods of manufacture, submitted for testing to a single, nationally recognized testing laboratory, at the same time.


(3) Particle size data represent the \(d_{50}\) measurement determined by the laser light–scattering technique.

(4) Test results represent only the characteristics of those samples tested and should not be considered to be universally applicable. Users are encouraged to test samples of powders obtained from their individual process.

\[484: \text{Table A.4.3.1}\]

Table A.5.2.2(i) Explosion Characteristics of Unalloyed Magnesium Dust in Air (200 mesh (75μm))

<table>
<thead>
<tr>
<th>Explosion Characteristics</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosibility index(^a)</td>
<td>10 KSt</td>
</tr>
<tr>
<td>Ignition sensitivity(^b)</td>
<td>3.0 KSt</td>
</tr>
<tr>
<td>Explosion severity(^c)</td>
<td>7.4 KSt</td>
</tr>
<tr>
<td>Maximum explosion pressure (gauge)</td>
<td>793 kPa (115 psi)</td>
</tr>
<tr>
<td>Maximum rate of pressure rise (gauge)</td>
<td>793 kPa/sec (15,000 psi/sec)</td>
</tr>
<tr>
<td>Ignition temperature cloud</td>
<td>1040°F (560°C)</td>
</tr>
<tr>
<td>Minimum cloud ignition energy</td>
<td>0.04 J (26.4 W/sec)</td>
</tr>
<tr>
<td>Minimum explosion concentration</td>
<td>0.328 kg/m³ (0.03 oz/ft³)</td>
</tr>
<tr>
<td>Limiting oxygen percent for spark ignition(^d)</td>
<td>—</td>
</tr>
</tbody>
</table>

Note: KSt values vary for specific particle sizes.

\(^a\)Explosibility index = ignition sensitivity \times explosion severity.

\(^b\)Ignition sensitivity =

\[
\frac{\text{Ignition temp. cloud} \times \text{min. cloud-ignition energy}}{\text{min. explosion concentration (LEL)}}
\]

Pittsburgh coal dust

\[
\frac{\text{Ignition temp. cloud} \times \text{min. cloud ignition energy}}{\text{min. explosion concentration}}
\]

Sample dust

\(^c\)Explosion severity =
dBurns in carbon dioxide, nitrogen, and halons.

[484: Table D.2]

Table A.5.2.2(j) Selected Combustible Dusts Layer or Cloud Ignition Temperature
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>NEC Group</th>
<th>Code</th>
<th>Ignition Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetal, linear</td>
<td></td>
<td>G NL 440</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acetoacet-p-phenetidide</td>
<td>122-82-7</td>
<td>G NL</td>
<td></td>
<td>560</td>
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<tr>
<td>Acetoacetanilide</td>
<td>102-01-2</td>
<td>G M</td>
<td></td>
<td>440</td>
</tr>
<tr>
<td>Acetylamino-t-nitrothiazole</td>
<td></td>
<td>G</td>
<td></td>
<td>450</td>
</tr>
<tr>
<td>Acrylamide polymer</td>
<td></td>
<td>G</td>
<td></td>
<td>240</td>
</tr>
<tr>
<td>Acrylonitrile polymer</td>
<td></td>
<td>G</td>
<td></td>
<td>460</td>
</tr>
<tr>
<td>Acrylonitrile-vinyl chloride-vinylidenechloride copolymer (70-20-10)</td>
<td>G</td>
<td>210</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acrylonitrile-vinyl pyridine copolymer</td>
<td></td>
<td>G</td>
<td></td>
<td>240</td>
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<tr>
<td>Adipic acid</td>
<td>124-04-9</td>
<td>G M</td>
<td></td>
<td>550</td>
</tr>
<tr>
<td>Alfalfa meal</td>
<td></td>
<td>G</td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>Alkyl ketone dimer sizing compound</td>
<td></td>
<td>G</td>
<td></td>
<td>160</td>
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<tr>
<td>Allyl alcohol derivative (CR-39)</td>
<td></td>
<td>G NL</td>
<td></td>
<td>500</td>
</tr>
<tr>
<td>Almond shell</td>
<td></td>
<td>G</td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>Aluminum, A422 flake</td>
<td>7429-90-5</td>
<td>E CL</td>
<td></td>
<td>320</td>
</tr>
<tr>
<td>Aluminum, atomized collector fines</td>
<td></td>
<td>E CL</td>
<td></td>
<td>550</td>
</tr>
<tr>
<td>Aluminum—cobalt alloy (60-40)</td>
<td></td>
<td>E</td>
<td></td>
<td>570</td>
</tr>
<tr>
<td>Aluminum—copper alloy (50-50)</td>
<td></td>
<td>E</td>
<td></td>
<td>830</td>
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<tr>
<td>Aluminum—lithium alloy (15% Li)</td>
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<td>E</td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Aluminum—magnesium alloy (dowmetal)</td>
<td></td>
<td>E CL</td>
<td></td>
<td>430</td>
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<tr>
<td>Aluminum—nickel alloy (58-42)</td>
<td></td>
<td>E</td>
<td></td>
<td>540</td>
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<tr>
<td>Aluminum—silicon alloy (12% Si)</td>
<td></td>
<td>E NL 670</td>
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<tr>
<td>Amino-5-nitrothiazole</td>
<td>121-66-4</td>
<td>G</td>
<td></td>
<td>460</td>
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<tr>
<td>Anthranilic acid</td>
<td>118-92-3</td>
<td>G M</td>
<td></td>
<td>580</td>
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<tr>
<td>Apricot pit</td>
<td></td>
<td>G</td>
<td></td>
<td>230</td>
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<tr>
<td>Aryl-nitrosomethylamide</td>
<td></td>
<td>G NL 490</td>
<td></td>
<td></td>
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<tr>
<td>Asphalt</td>
<td>8052-42-4</td>
<td>F</td>
<td></td>
<td>510</td>
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<tr>
<td>Aspirin [acetol (2)]</td>
<td>50-78-2</td>
<td>G M</td>
<td></td>
<td>660</td>
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<tr>
<td>Azelaic acid</td>
<td>109-31-9</td>
<td>G M</td>
<td></td>
<td>610</td>
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<tr>
<td>Azo-bis-butynitrile</td>
<td>78-67-1</td>
<td>G</td>
<td></td>
<td>350</td>
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<tr>
<td>Benzethonium chloride</td>
<td></td>
<td>G CL 380</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical Name</td>
<td>CAS No.</td>
<td>NEC Group</td>
<td>NEC Code</td>
<td>Layer or Cloud Ignition Temperature (°C)</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>----------</td>
<td>-----------</td>
<td>----------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>Benzoic acid</td>
<td>65-85-0</td>
<td>G</td>
<td>M</td>
<td>620</td>
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<tr>
<td>Benzotriazole</td>
<td>95-14-7</td>
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<td>M</td>
<td>440</td>
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<tr>
<td>Beta-naphthalene-axo-dimethylaniline</td>
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<td></td>
<td></td>
<td>175</td>
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<tr>
<td>Bis(2-hydroxy- 5-chlorophenyl) methylene</td>
<td>97-23-4</td>
<td>G</td>
<td>NL</td>
<td>570</td>
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<tr>
<td>Bisphenol-A</td>
<td>80-05-7</td>
<td>G</td>
<td>M</td>
<td>570</td>
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<tr>
<td>Boron, commercial amorphous (85% B)</td>
<td>7440-42-8</td>
<td>E</td>
<td>M</td>
<td>400</td>
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<tr>
<td>Calcium silicide</td>
<td>E</td>
<td></td>
<td></td>
<td>540</td>
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<tr>
<td>Carbon black (more than 8% total entrapped volatiles)</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carboxymethyl cellulose</td>
<td>9000-11-7</td>
<td>G</td>
<td></td>
<td>290</td>
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<tr>
<td>Carboxypolymethylene</td>
<td>G</td>
<td>NL</td>
<td></td>
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</tr>
<tr>
<td>Cashew oil, phenolic, hard</td>
<td>G</td>
<td></td>
<td></td>
<td>180</td>
</tr>
<tr>
<td>Cellulose</td>
<td>G</td>
<td></td>
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<tr>
<td>Cellulose acetate</td>
<td>G</td>
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<td></td>
<td>340</td>
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<tr>
<td>Cellulose acetate butyrate</td>
<td>G</td>
<td>NL</td>
<td></td>
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<td>Cellulose tricatate</td>
<td>G</td>
<td>NL</td>
<td></td>
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<tr>
<td>Charcoal (activated)</td>
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<td>F</td>
<td></td>
<td>180</td>
</tr>
<tr>
<td>Charcoal (more than 8% total entrapped volatiles)</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cherry pit</td>
<td>G</td>
<td></td>
<td></td>
<td>220</td>
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<tr>
<td>Chlorinated phenol</td>
<td>G</td>
<td>NL</td>
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<tr>
<td>Chlorinated polyether alcohol</td>
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<td></td>
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<td>Chloroacetoacetanilide</td>
<td>101-92-8</td>
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<td>640</td>
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<tr>
<td>Chromium (97%) electrolytic, milled</td>
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<td>M</td>
<td>400</td>
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<tr>
<td>Cinnamon</td>
<td>G</td>
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<td></td>
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<tr>
<td>Citrus peel</td>
<td>G</td>
<td></td>
<td></td>
<td>270</td>
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<tr>
<td>Coal, Kentucky bituminous</td>
<td>F</td>
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<tr>
<td>Coal, Pittsburgh experimental</td>
<td>F</td>
<td></td>
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<td>170</td>
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<tr>
<td>Coal, Wyoming</td>
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<tr>
<td>Cocoa bean shell</td>
<td>G</td>
<td></td>
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<tr>
<td>Cocoa, natural, 19% fat</td>
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<td>Coconut shell</td>
<td>G</td>
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<td></td>
<td>220</td>
</tr>
<tr>
<td>Coke (more than 8% total entrapped volatiles)</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Cork</td>
<td>G</td>
<td></td>
<td></td>
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<tr>
<td>Corn</td>
<td>G</td>
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<tr>
<td>Chemical Name</td>
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<td>NEC Group Code</td>
<td>Ignition Temperature (°C)</td>
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<tr>
<td>Corn dextrine</td>
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<tr>
<td>Corn cob grit</td>
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<td>G</td>
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</tr>
<tr>
<td>Cornstarch, commercial</td>
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<tr>
<td>Cornstarch, modified</td>
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<tr>
<td>Cottonseed meal</td>
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<td>G</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Coumarone-indene, hard</td>
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<tr>
<td>Crag No. 974</td>
<td>533-74-4</td>
<td>G CL</td>
<td>310</td>
<td></td>
</tr>
<tr>
<td>Cube root, South America</td>
<td>83-79-4</td>
<td>G</td>
<td>230</td>
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</tr>
<tr>
<td>Di-alphacumyl peroxide, 40-60 on CA</td>
<td>80-43-3</td>
<td>G</td>
<td>180</td>
<td></td>
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<tr>
<td>Diallyl phthalate</td>
<td>131-17-9</td>
<td>G M</td>
<td>480</td>
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<tr>
<td>Dicyclopentadiene dioxide</td>
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<td>G NL</td>
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<tr>
<td>Dieldrin (20%)</td>
<td>60-57-1</td>
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<tr>
<td>Dihydroacetic acid</td>
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<td>Dimethyl isophthalate</td>
<td>1459-93-4</td>
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<tr>
<td>Dimethyl terephthalate</td>
<td>120-61-6</td>
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<td>Dinitro-o-toluamide</td>
<td>148-01-6</td>
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<tr>
<td>Dinitrobenzoic acid</td>
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<td>G NL</td>
<td>460</td>
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<tr>
<td>Diphenyl</td>
<td>92-52-4</td>
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<tr>
<td>Ditertiary-butyl-paracresol</td>
<td>128-37-0</td>
<td>G NL</td>
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<tr>
<td>Dithane m-45</td>
<td>8018-01-7</td>
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<tr>
<td>Epoxy</td>
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<td>G NL</td>
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<tr>
<td>Epoxy-bisphenol A</td>
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<td>G NL</td>
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</tr>
<tr>
<td>Ethyl cellulose</td>
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<td>320</td>
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<tr>
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<td>390</td>
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<td>Ethylene oxide polymer</td>
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<td>Ethylene-maleic anhydride copolymer</td>
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<td>Ferbam™</td>
<td>14484-64-1</td>
<td>G</td>
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<tr>
<td>Ferromanganese, medium carbon</td>
<td>12604-53-4</td>
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<td>290</td>
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<tr>
<td>Ferrosilicon (88% Si, 9% Fe)</td>
<td>8049-17-0</td>
<td>E</td>
<td>800</td>
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<tr>
<td>Ferrotitanium (19% Ti, 74.1% Fe, 0.06% C)</td>
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<td>380</td>
<td></td>
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<tr>
<td>Flax shive</td>
<td></td>
<td>G</td>
<td>230</td>
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</tr>
<tr>
<td>Chemical Name</td>
<td>CAS No.</td>
<td>NEC Group</td>
<td>Code</td>
<td>Layer or Cloud IgnitionTemperature (°C)</td>
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<td>Fumaric acid</td>
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<td>M</td>
<td>520</td>
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<tr>
<td>Garlic, dehydrated</td>
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<td>G</td>
<td>NL</td>
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<td>Gilsonite</td>
<td>12002-43-6</td>
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<td>500</td>
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<tr>
<td>Green base harman dye</td>
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<td>NL</td>
<td>175</td>
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<tr>
<td>Guar seed</td>
<td></td>
<td>G</td>
<td>NL</td>
<td>500</td>
</tr>
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<td>Gulasonic acid, diacetone</td>
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<td>420</td>
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<td>Gum, arabic</td>
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<td>260</td>
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<tr>
<td>Gum, karaya</td>
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<td></td>
<td>240</td>
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<tr>
<td>Gum, manila</td>
<td></td>
<td>G</td>
<td>CL</td>
<td>360</td>
</tr>
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<td>Gum, tragacanth</td>
<td>9000-65-1</td>
<td>G</td>
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<tr>
<td>Hemp hurd</td>
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<td>G</td>
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<td>220</td>
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<td>Hexamethylene tetramine</td>
<td>100-97-0</td>
<td>G</td>
<td>S</td>
<td>410</td>
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<tr>
<td>Hydroxyethyl cellulose</td>
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<td>NL</td>
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<td>Manganese</td>
<td>7439-96-5</td>
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<td>9011-14-7</td>
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<td>N,N-dimethylthio- formamide</td>
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<td>Layer or Cloud Ignition Temperature (°C)</td>
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<td>Peach pit shell</td>
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<td>7659-34-9</td>
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<td>Petroleum coke (more than 8% total entrapped volatiles)</td>
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<td>Phthalimide</td>
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<td>Pitch, coal tar</td>
<td>65966-93-2</td>
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<td>Polyethylene, high pressure process</td>
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<td>Polyethylene, low pressure process</td>
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<td>Polyurethane foam, no fire retardant</td>
<td>9009-54-5</td>
<td>G</td>
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<td>9003-20-7</td>
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<td>Polyvinyl acetate/alcohol</td>
<td>9002-89-5</td>
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<td>Polyvinyl butyral</td>
<td>63148-65-2</td>
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<td>Polyvinyl chloride-dioctyl phthalate</td>
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<td>Potato starch, dextrinated</td>
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<td>Pyrethrum</td>
<td>8003-34-7</td>
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<td>Rayon (viscose) flock</td>
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<td>Red dye intermediate</td>
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<td>NEC Group</td>
<td>Code</td>
<td>Ignition Temperature (°C)</td>
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<td>61790-51-0</td>
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<td>Sorbic acid (copper sorbate or potash)</td>
<td>110-44-1</td>
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<td>Stearic acid, aluminum salt</td>
<td>637-12-7</td>
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<td>Stearic acid, zinc salt</td>
<td>557-05-1</td>
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<td>100-42-5</td>
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<td>Sulfur</td>
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<td>Tung, kernels, oil-free</td>
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<td>Urea formaldehyde-phenol formaldehyde</td>
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<td>Vanadium, 86.4%</td>
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<td>Code</td>
<td>Ignition Temperature (°C)</td>
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<td>Vinyl chloride-acrylonitrile copolymer</td>
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<td>Vitamin B1, mononitrate</td>
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<td>Vitamin C</td>
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<td>Wheat starch</td>
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<td>Wheat straw</td>
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<td>Wood flour</td>
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<td>Yeast, torula</td>
<td>68602-94-8</td>
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<td>Zirconium (contains 0.3% O)</td>
<td>7440-67-7</td>
<td>E CL</td>
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</table>

Notes:

(1) Normally, the minimum ignition temperature of a layer of a specific dust is lower than the minimum ignition temperature of a cloud of that dust. Since this is not universally true, the lower of the two minimum ignition temperatures is listed. If no symbol appears in the “Code” column, then the layer ignition temperature is shown. "CL" means the cloud ignition temperature is shown. "NL" means that no layer ignition temperature is available, and the cloud ignition temperature is shown. "M" signifies that the dust layer melts before it ignites; the cloud ignition temperature is shown. "S" signifies that the dust layer sublimes before it ignites; the cloud ignition temperature is shown.

(2) Certain metal dusts might have characteristics that require safeguards beyond those required for atmospheres containing the dusts of aluminum, magnesium, and their commercial alloys. For example, zirconium and thorium dusts can ignite spontaneously in air, especially at elevated temperatures.

(3) Due to the impurities found in coal, its ignition temperatures vary regionally, and ignition temperatures are not available for all regions in which coal is mined.

[499: Table 5.2.2]
Statement of Problem and Substantiation for Public Comment

The statement is ambiguous because the term conservative does not indicate whether the values are conservatively high or conservatively low. Additionally, there is no basis to say whether sources such as the NFPA provide conservatively high or low values.

Submitter Information Verification

Submitter Full Name: Timothy Myers  
Organization: Exponent, Inc.

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-117-NFPA 652-2014
Statement: The proposed change presupposed that public comment 113-NFPA 653=2-2013 has been adopted. The text have been edited to make it suitable annex material for 5.2.1 under public comment 113.

New table: The data provided for PVC polymers is limited and is not characterized as to the type of polymer.
Remove the statement:

“Generally, such data can be considered conservative if they are obtained from a reliable source, such as other NFPA documents.”

I received an error "Unable to save content Details: Internal Server Error" when I tried to delete this sentence.
A.5.2.3

Particle size and size distribution analyses, including polydispersity, are preliminary measures to assess the potential hazard of material. One instance in which it would not be clear whether a material is combustible or explosible is in a sample including mixtures. Chemical analyses can be used to identify the composition of the finest fraction.

Tests of representative samples are preferred. Historical and published data can also be used, but they require an assessment of data to determine if the historical or published data are truly representative of the material being analyzed. (See 5.2.2.)

Statement of Problem and Substantiation for Public Comment

It is proposed to delete this entire annex item.

The second paragraph is duplicative of content in other annex items.

The first paragraph is not germane to the subject matter.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address: [Street Address]
City: [City]
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Submittal Date: Fri Nov 08 23:25:42 EST 2013

Committee Statement
<table>
<thead>
<tr>
<th><strong>Committee Action:</strong></th>
<th>Rejected but see related SR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resolution:</strong></td>
<td>SR-25-NFPA 652-2014</td>
</tr>
<tr>
<td><strong>Statement:</strong></td>
<td>This is one of series of public comments intended to improve the organization and focus of chapter 5. The revisions to section 5.2 seek to better focus the section on its intended goal, to screen materials to determine whether they are combustible or explosible. Content extraneous to the that focus has been proposed for deletion or was moved to other sections of Chapter 5. See subsequent public comments. Section 5.1 was revised in keeping with proposed changes to section 5.2 and other sections addressed in subsequent public comments. One or more of the Public Comments linked with this SR recommended deleting some of the requirements; the Committee is not accepting those proposed changes and believes that the changes made in sections 5.1 and 5.2 address the various issues raised in the numerous public comments recommending changes to these requirements. Annex A: It is proposed that the entire annex item for 5.1 be deleted. Some of the basic content is covered by the annex material proposed for 5.4.4.1 per public comment 116-NFPA 652-2013. Further, much of the content is not related to common analytical testing for screening for or quantifying combustibility or explosibility. The Committee is recommending that annex be relocated from A.5.1 to A.5.2 with no other changes.</td>
</tr>
</tbody>
</table>
A.5.3

Some materials have multiple potential physical hazards such as combustibility, explosibility, reactivity, and propensity to self-heat. This standard does not specifically address reactivity hazards of solid particulate materials. Users should consult Safety Data Sheet (SDS) for specific information and guidance on safe handling, personal protective equipment, and storage and transportation of chemicals.

Statement of Problem and Substantiation for Public Comment

Annex material should not be included for sections that are Reserved. There are no regulatory requirements; therefore, there should be no need to explain process or other matters.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER  
Organization: ARENT FOX LLP  
Affiliation: NOPA, NGFA, IOMSA  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Wed Nov 13 13:56:19 EST 2013

Committee Statement

Committee Action: Rejected  
Resolution: It is not the intent of the Committee that the "reserved" sections be used to develop any new requirements at this stage in the development of NFPA 652, and "reserved" sections have no mandatory element to them at this stage. The Committee is using the "reserved" sections (like other NFPA committees) to establish a draft structure at this initial document stage indicating through the use of the reserved sections where future content might be developed in subsequent revisions. So, the Committee does not intend to accept the proposed deletion of these sections where they exist and where Public Comments have proposed deletion as part of this Second Draft. Based on NFPA Manual of Style, it is permissible to include annex in support of sections that are designated as "reserved" in the mandatory portion of the standard.
A.5.4.1.2

Even if the sample is not determined to be combustible through the combustibility tests conducted, explosibility testing must also be conducted because some dusts (such as powdered sugar, corn starch, wheat flour, etc.) may not propagate combustion or eject sparks during the combustibility tests yet will explode when dispersed in the right concentration.

Statement of Problem and Substantiation for Public Comment

For a science fair project I conducted with my daughter, we tried to follow the UN powder train combustibility test for several common food ingredients (powdered sugar, corn starch, wheat flour) and none of them would propagate on their own when the ignition source was removed. Yet we know these items are, in fact, explosible. The existing statement that says, “the material shall be considered combustible and the standard shall apply” might imply that when the material is not considered to be combustible by the test method that the standard does NOT apply, and that is certainly not the intent. The proposed annex text will clarify this.

Submitter Information Verification

Submitter Full Name: Dale Hansen
Organization: Harrington Group, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 16:22:26 EST 2013

Committee Statement
Committee  
Action:  
Rejected but see related SR  
Resolution:  
SR-20-NFPA 652-2014  
Statement:  
The changes in section 5.4 are proposed in conjunction with the changes proposed in Public Comment 113-NFPA 652-2013.  

The subsections in Sections 5.4.1 and 5.4.3 were reordered to provide a more logical sequence for the requirements in these sections.  

Section 5.4.4 was added to receive content relocated from other sections in 5.2 and 5.4. The new structure reinforces the concept that 5.4.1 and 5.4.3 address screening testing to determine whether dusts are, respectively, combustible or explosible. The new 5.4.4 then established the requirement that, if a dust is determined to be combustible or explosible, additional testing will be required to quantify the combustibility or explosibility, as required to support implementation of other portions of the standard.  

Annex A: The proposed change to combine annex section text presupposes that Public Comment 114-NFPA 652-2013 has been adopted. Old A.5.2.1 has been edited to make it suitable to be the annex material for A.5.4.4.1. Content from old A.5.2.6 (proposed for deletion under another public comment) has been relocated and incorporated. Content from old A.5.4.3.2 and A.5.4.3.5 have been incorporated into the revised annex material.  

The entire annex item to 5.4.1 is unnecessary. Section 5.4.1.1 points to the necessary testing requirement and anyone who decides that this is needed can go directly to the source and by doing so would be sure the criteria for the test is up to date. In fact, by 5.4.1.1.1 most folks will not even need to do this test. The goal should be to simply rather than complicate as this material does. Therefore, it will be deleted.  

The revised text for A.5.4.3.1 is more consistent with recommendations contained in ASTM standards like ASTM E1226. Additionally, it includes language explaining that sieving and drying a sample does not always produce a dust with higher hazard than the as-received material.  

This explanatory information in A.5.4.3.2 is incomplete and not universally true. A previous annex item provides greater detail about this issue. The fine fraction of a sample does not always present the greatest hazard.  

Assuming public comments 114 and 116 are adopted, the material in A.5.4.3.5 has been incorporated into A.5.4.4.1.
A.5.4.1—1

This preliminary screening test used to demonstrate fire risk is the basis for the regulations governing the transport of dangerous goods for United Nations (UN) regulations, the U.S. Department of Transportation, International Air Transport Association (IATA), and the International Maritime Dangerous Goods (IMDG) Code.

The preliminary screening test is conducted in the following fashion:

1. The substance in its commercial form is formed into an unbroken strip or powder train about 9.84 in. (250 mm) long by 0.79 in. (20 mm) wide by 0.39 in. (10 mm) high on a cool, impervious, low heat conducting base plate.

2. A hot flame [minimum temperature of 1832°F (1000°C) from a gas burner] [minimum diameter of 0.20 in. (5 mm)] is applied to one end of the powder train until the powder ignites or for a maximum of 5 minutes. It should be noted whether combustion propagates along 7.87 in. (200 mm) of the train within a 20-minute test period.

3. If the substance does not ignite and propagate combustion either by burning with flame or smoldering along 7.87 in. (200 mm) of the powder train within the 20-minute test period, the material should not be considered a combustible dust.

4. If the substance propagates burning of the 7.87 in. (200 mm) length of the powder train in less than 20 minutes, the full burning rate test should be conducted.

Because the specific form of the combustible dust and the properties of the form determine the flammability and degree of combustibility of the material, it is critical that the substance be tested precisely in the condition in which it is processed or handled. Changes in particle size distribution, moisture content, degree of fines, and chemical composition can change the results radically. No generic substitute is allowable for accurate determination of fire risk.

If propagation of the powder train occurs along a length of 7.87 in (200 mm) in 20 minutes or less, the burning rate test is required. The burning rate test requires specific preparation of the powder sample. The sample is prepared in a specific fixture as shown in Figure A.5.4.1.

**Figure A.5.4.1 Fixture for Preparation of Sample for Burning Rate Test.**
Preparation of the sample for the burning rate test should be done according to the following description.

The powdered or granular substance, in its commercial form, must be loosely filled into a mold. The mold, which must be 9.84 in. (250 mm) long with a triangular cross section of inner height 0.39 in. (10 mm) and width 0.79 in. (20 mm), is used to form the train for the burning rate test. On both sides of the mold, in the longitudinal direction, two metal sheets are mounted as lateral limitations that extend 0.079 in. (2 mm) beyond the upper edge of the triangular cross section. An impervious, noncombustible, low heat conducting plate is used to support the sample train. The mold is then dropped three times from a height of 0.79 in. (20 mm) onto a solid surface. The lateral limitations are then removed, and the impervious, noncombustible, low heat conducting plate is placed on top of the mold, the apparatus is inverted, and the mold is removed. Pasty substances must be spread on a noncombustible surface in the form of a rope 9.84 in. (250 mm) in length with a cross section of about 0.16 in.² (100 mm²). In the case of a moisture-sensitive substance, the test must be carried out as quickly as possible after its removal from the container.

Test conditions are as follows:

1. The pile is arranged across the draft in a fume cupboard. The air speed is sufficient to prevent fumes from escaping into the laboratory and is not varied during the test. A draft screen can be erected around the apparatus.

2. Any suitable ignition source such as a small flame or hot wire of minimum temperature 1832°F (1000°C) is used to ignite the pile at one end. When the pile has burned a distance of 3.15 in. (80 mm), the rate of burning is measured over the 3.94 in. (100 mm). The test is performed six times using a clean, cool plate each time, unless a positive result is observed earlier.

Statement of Problem and Substantiation for Public Comment

The proposal presumes that 114-NFPA 652-2013 has been adopted.

The comment renumbers this annex item.

Submitter Information Verification
**Submitter Full Name:** Walter Frank  
**Organization:** Frank Risk Solutions, Inc.  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Fri Nov 08 23:35:10 EST 2013

### Committee Statement

<table>
<thead>
<tr>
<th>Committee Action</th>
<th>Resolution</th>
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</thead>
<tbody>
<tr>
<td>Rejected</td>
<td>SR No. 118 in response to PC No. 404 deleted the annex to 5.4.1 so this comment is not applicable in terms of revising the annex.</td>
</tr>
</tbody>
</table>
A.5.4.1 —

This preliminary screening test used to demonstrate fire risk is the basis for the regulations governing the transport of dangerous goods for United Nations (UN) regulations, the U.S. Department of Transportation, International Air Transport Association (IATA), and the International Maritime Dangerous Goods (IMDG) Code.

The preliminary screening test is conducted in the following fashion:

1. The substance in its commercial form is formed into an unbroken strip or powder train about 9.84 in. (250 mm) long by 0.79 in. (20 mm) wide by 0.39 in. (10 mm) high on a cool, impervious, low heat conducting base plate.

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3. If the substance does not ignite and propagate combustion either by burning with flame or smoldering along 7.87 in. (200 mm) of the powder train within the 20-minute test period, the material should not be considered a combustible dust.

4. If the substance propagates burning of the 7.87 in. (200 mm) length of the powder train in less than 20 minutes, the full burning rate test should be conducted.

Because the specific form of the combustible dust and the properties of the form determine the flammability and degree of combustibility of the material, it is critical that the substance be tested precisely in the condition in which it is processed or handled. Changes in particle size distribution, moisture content, degree of fines, and chemical composition can change the results radically. No generic substitute is allowable for accurate determination of fire risk.

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**Figure A.5.4.1 Fixture for Preparation of Sample for Burning Rate Test.**
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Test conditions are as follows:

1. The pile is arranged across the draft in a fume cupboard. The air speed is sufficient to prevent fumes from escaping into the laboratory and is not varied during the test. A draft screen can be erected around the apparatus.

2. Any suitable ignition source such as a small flame or hot wire of minimum temperature 1832°F (1000°C) is used to ignite the pile at one end. When the pile has burned a distance of 3.15 in. (80 mm), the rate of burning is measured over the 3.94 in. (100 mm). The test is performed six times using a clean, cool plate each time, unless a positive result is observed earlier.
The entire annex item is unnecessary. Section 5.4.1.1 points to the necessary testing requirement and anyone who decides that this is needed can go directly to the source and by doing so would be sure the criteria for the test is up to date. In fact by 5.4.1.1.1 most folks will not even need to do this test. The goal should be to simplify rather than complicate as this material does.

Submitter Information Verification

Submitter Full Name: Henry Febo
Organization: FM Global
Street Address:
City:
State:
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Submittal Date: Fri Nov 15 10:37:21 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-20-NFPA 652-2014
Statement: The changes in section 5.4 are proposed in conjunction with the changes proposed in Public Comment 113-NFPA 652-2013.

The subsections in Sections 5.4.1 and 5.4.3 were reordered to provide a more logical sequence for the requirements in these sections.

Section 5.4.4 was added to receive content relocated from other sections in 5.2 and 5.4. The new structure reinforces the concept that 5.4.1 and 5.4.3 address screening testing to determine whether dusts are, respectively, combustible or explosible. The new 5.4.4 then established the requirement that, if a dust is determined to be combustible or explosible, additional testing will be required to quantify the combustibility or explosibility, as required to support implementation of other portions of the standard.

Annex A: The proposed change to combine annex section text presupposes that Public Comment 114-NFPA 652-2013 has been adopted. Old A.5.2.1 has been edited to make it suitable to be the annex material for A.5.4.4.1. Content from old A.5.2.6 (proposed for deletion under another public comment) has been relocated and incorporated. Content from old A.5.4.3.2 and A.5.4.3.5 have been incorporated into the revised annex material.

The entire annex item to 5.4.1 is unnecessary. Section 5.4.1.1 points to the necessary testing requirement and anyone who decides that this is needed can go directly to the source and by doing so would be sure the criteria for the test is up to date. In fact, by 5.4.1.1.1 most folks will not even need to do this test. The goal should be to simply rather than complicate as this material does. Therefore, it will be deleted.

The revised text for A.5.4.3.1 is more consistent with recommendations contained in ASTM standards like ASTM E1226. Additionally, it includes language explaining that sieving and drying a sample does not always produce a dust with higher hazard than the as-received material.

This explanatory information in A.5.4.3.2 is incomplete and not universally true. A previous annex item provides greater detail about this issue. The fine fraction of a sample does not always present the greatest hazard.

Assuming public comments 114 and 116 are adopted, the material in A.5.4.3.5 has been incorporated into A.5.4.4.1.
In general, it is recommended to test in accordance with the test protocol. The test protocol for ASTM 1226, for example, calls for drying the sample so that moisture content is less than 5 percent by weight, and particle size is 95 percent sub-200 mesh screen by weight. The thought behind this approach is to obtain near worst-case test data that could be found within a facility (i.e., accumulations of fines, typically sub-200 mesh, at some locations or changes in processes) and by doing so ensure conservatism in the design of protection equipment.

This is a built-in safety factor for the tests, as the testing laboratory does not know if the samples are a good representation of the dust from the facility. By performing the test in this manner, it assumes a worse-case scenario to account for dust accumulations not taken into account by the facility. On the other hand, testing material "as received" can result in a more realistic appreciation of the true nature of the hazard under assessment. Making the decision whether to test as received or in accordance with protocol is of considerable importance and should be done in consultation with experts or someone familiar with the process and material.

In general, it is recommended to test in accordance with the test protocol. The test protocol for ASTM 1226, for example, calls for drying the sample so that the sample has a moisture content of less than 5 percent by weight, and that 95 percent of the sample by weight has a particle size of less than 200 mesh. To the extent necessary to meet these criteria, the moisture content of the sample would be reduced by drying, and the particle size would be reduced by grinding, pulverizing or sieving. less than 5 percent by weight, and particle size is 95 percent sub-200 mesh screen by weight. The thought behind this approach is to obtain near worst-case test data that, in theory, could be found within a facility (i.e., accumulations of fines, typically sub-200 mesh, at some locations or changes in processes) and by doing so ensure conservatism in the design of protection equipment. This is a built-in safety factor, albeit of undetermined size, for the tests, as the testing laboratory does not know if the samples are a good representation of the dust from the facility. By performing the test in this manner, it assumes a worse-case scenario to account for dust accumulations not taken into account that may somehow be overlooked by the facility. On the other hand, testing material "as received" can result in a more realistic appreciation of the true nature of the hazard under assessment. Making the decision whether to test as received or in accordance with protocol is of considerable importance and should be done in consultation with experts or someone familiar with the process and material. Furthermore, this is not an all or nothing determination. For example, it may be appropriate to reduce the moisture content of the sample, but not the particle size.
Substantiation: It is critical to acknowledge that the testing of samples “as received” will often be appropriate, and we appreciate the Committee’s recognition of that fact. We believe the annex material reflects an inappropriate bias toward modifying samples to meet the two criteria recommended by ASTM 1226 and somewhat overstates the approach described in ASTM 1226. We believe it would be accurate to say that ASTM 1226 recommends, but does not “call for” the sample to meet the referenced moisture and particle size criteria. ASTM 1226 provides, in pertinent part, as follows:

9.2 Tests may be run on an as-received sample. However, due to the possible accumulation of fines at some location in a processing system, it is recommended that the test sample be at least 95 % minus 200 mesh (75 µm).

NOTE 6—It may be desirable in some cases to conduct dust deflagration tests on materials as sampled from a process because process dust streams or deposits may contain a wide range of particle sizes or have a well-defined specific moisture content, materials consisting of a mixture of chemicals may be selectively separated on sieves and certain fibrous materials which may not pass through a relatively coarse screen may produce dust deflagrations. When a material is tested in the as-received state, it should be recognized that the test results may not represent the most severe dust deflagration possible. Any process change resulting in a higher fraction of fines than normal or drier product than normal may increase the explosion severity.

The determination as to whether samples should be tested “as received” or after modification, and what that modification should be, is best addressed by the people involved in the analysis of that site and process without being biased by general recommendations in this standard. They are in the best position to know whether the “possibility” that smaller particles will accumulate in the process is a significant possibility or an irrelevant theoretical possibility. The fact that the testing laboratory does not know whether the sample is representative is irrelevant. That is outside the domain of its responsibility. The final sentence is designed to acknowledge that the choice of what sample to test is not simply between “as received” or as recommended by ASTM 1226.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AIDS’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AIDS staff and AF&PA/AIDS member company representatives. These comments also reflect input we received from other trade associations.

Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 08 17:08:50 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-20-NFPA 652-2014
Statement: The changes in section 5.4 are proposed in conjunction with the changes proposed in Public Comment 113-NFPA 652-2013.

The subsections in Sections 5.4.1 and 5.4.3 were reordered to provide a more logical sequence for the requirements in these sections.

Section 5.4.4 was added to receive content relocated from other sections in 5.2 and 5.4. The new structure reinforces the concept that 5.4.1 and 5.4.3 address screening testing to determine whether dusts are, respectively, combustible or explosible. The new 5.4.4 then established the requirement that, if a dust is determined to be combustible or explosible, additional testing will be required to quantify the combustibility or explosibility, as required to support implementation of other portions of the standard.

Annex A: The proposed change to combine annex section text presupposes that Public Comment 114-NFPA 652-2013 has been adopted. Old A.5.2.1 has been edited to make it suitable to be the annex material for A.5.4.4.1. Content from old A.5.2.6 (proposed for deletion under another public comment) has been relocated and incorporated. Content from old A.5.4.3.2 and A.5.4.3.5 have been incorporated into the revised annex material.

The entire annex item to 5.4.1 is unnecessary. Section 5.4.1.1 points to the necessary testing requirement and anyone who decides that this is needed can go directly to the source and by doing so would be sure the criteria for the test is up to date. In fact, by 5.4.1.1.1 most folks will not even need to do this test. The goal should be to simply rather than complicate as this material does. Therefore, it will be deleted.

The revised text for A.5.4.3.1 is more consistent with recommendations contained in ASTM standards like ASTM E1226. Additionally, it includes language explaining that sieving and drying a sample does not always produce a dust with higher hazard than the as-received material.

This explanatory information in A.5.4.3.2 is incomplete and not universally true. A previous annex item provides greater detail about this issue. The fine fraction of a sample does not always present the greatest hazard.

Assuming public comments 114 and 116 are adopted, the material in A.5.4.3.5 has been incorporated into A.5.4.4.1.
A.5.4.3.1

In general, it is recommended to test in accordance with the test protocol. The test protocol for ASTM 1226, for example, calls for drying the sample so that moisture content is less than 5 percent by weight, and particle size is 95 percent sub-200 mesh screen by weight. The thought behind this approach is to obtain near worst-case test data that could be found within a facility (i.e., accumulations of fines, typically sub-200 mesh, at some locations or changes in processes) and by doing so ensure conservatism in the design of protection equipment.

This is a built-in safety factor for the tests, as the testing laboratory does not know if the samples are a good representation of the dust from the facility. By performing the test in this manner, it assumes a worse-case scenario to account for dust accumulations not taken into account by the facility. On the other hand, testing material "as received" can result in a more realistic appreciation of the true nature of the hazard under assessment. Making the decision whether to test as received or in accordance with protocol is of considerable importance and should be done in consultation with experts or someone familiar with the process and material.

Statement of Problem and Substantiation for Public Comment

This proposed change presumes that public comment 114 has been adopted.

The proposed change renumbers this annex item so that it corresponds with the revise content of section 3.4

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 08 23:44:15 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee modified this annex based on several Public Comments; see SR No. 96 for the changes that relate to this comment.
Public Comment No. 206-NFPA 652-2013 [Section No. A.5.4.3.1]

A.5.4.3.1

In general, it is recommended to test in accordance with the test protocol. The test protocol for ASTM 1226, for example, calls for drying the sample so that moisture content is less than 5 percent by weight, and particle size is 95 percent sub-200 mesh screen by weight. The thought behind this approach is to obtain near worst-case test data that could be found within a facility (i.e., accumulations of fines, typically sub-200 mesh, at some locations or changes in processes) and by doing so ensure conservatism in the design of protection equipment.

This is a built-in safety factor for the tests, as the testing laboratory does not know if the samples are a good representation of the dust from the facility. By performing the test in this manner, it assumes a worse-case scenario to account for dust accumulations not taken into account by the facility. On the other hand, testing material "as received" can result in a more realistic appreciation of the true nature of the hazard under assessment. Making the decision whether to test as received or in accordance with protocol is of considerable importance and should be done in consultation with experts or someone familiar with the process and material.

Comment: this section should be revised to read as follows:

In general, it is recommended to test in accordance with the test protocol. The test protocol for ASTM 1226, for example, recommends calls for drying that the sample so that the sample has a moisture content is of less than 5 percent by weight, and that 95 percent of the sample by weight has a particle size of less than 200 mesh. To the extent necessary to meet these criteria, the moisture content of the sample would be reduced by drying, and the particle size would be reduced by grinding, pulverizing or sieving, less than 5 percent by weight, and particle size is 95 percent sub-200 mesh screen by weight. The thought behind this approach is to obtain the near worst-case test data that, in theory, could be found within a facility (i.e., accumulations of fines, typically sub-200 mesh, at some locations or changes in processes) and by doing so ensure conservatism in the design of protection equipment through this, which is a built-in safety factor, albeit of undetermined size, for the tests, as the testing laboratory does not know if the samples are a good representation of the dust from the facility. By performing the test in this manner, it assumes a worse-case scenario to account for dust accumulations, not taken into account, that may somehow be overlooked by the facility. On the other hand, testing material "as received" can result in a more realistic appreciation of the true nature of the hazard under assessment. Making the decision whether to test as received or in accordance with protocol is of considerable importance and should be done in consultation with experts or someone familiar with the process and material. Furthermore, this is not an all or nothing determination. For example, it may be appropriate to reduce the moisture content of the sample, but not the particle size.

Statement of Problem and Substantiation for Public Comment
Substantiation: It is critical to acknowledge that the testing of samples “as received” will often be appropriate, and we appreciate the Committee’s recognition of that fact. We believe the annex material reflects an inappropriate bias toward modifying samples to meet the two criteria recommended by ASTM 1226 and somewhat overstates the approach described in ASTM 1226. We believe it would be accurate to say that ASTM 1226 recommends, but does not “call for” the sample to meet the referenced moisture and particle size criteria. ASTM 1226 provides, in pertinent part, as follows:

9.2 Tests may be run on an as-received sample. However, due to the possible accumulation of fines at some location in a processing system, it is recommended that the test sample be at least 95 % minus 200 mesh (75 µm).

NOTE 6—It may be desirable in some cases to conduct dust deflagration tests on materials as sampled from a process because process dust streams or deposits may contain a wide range of particle sizes or have a well-defined specific moisture content, materials consisting of a mixture of chemicals may be selectively separated on sieves and certain fibrous materials which may not pass through a relatively coarse screen may produce dust deflagrations. When a material is tested in the as-received state, it should be recognized that the test results may not represent the most severe dust deflagration possible. Any process change resulting in a higher fraction of fines than normal or drier product than normal may increase the explosion severity.

The determination as to whether samples should be tested “as received” or after modification, and what that modification should be, is best addressed by the people involved in the analysis of that site and process without being biased by general recommendations in this standard. They are in the best position to know whether the “possibility” that smaller particles will accumulate in the process is a significant possibility or an irrelevant theoretical possibility. The fact that the testing laboratory does not know whether the sample is representative is irrelevant. That is outside the domain of its responsibility. The final sentence is designed to acknowledge that the choice of what sample to test is not simply between “as received” or as recommended by ASTM 1226.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Street Address:  
City:  
State:  
Zip:  
Submittal Date: Tue Nov 12 14:36:56 EST 2013

Committee Statement
Committee Action: Rejected but see related SR

Resolution: SR-20-NFPA 652-2014

Statement: The changes in section 5.4 are proposed in conjunction with the changes proposed in Public Comment 113-NFPA 652-2013.

The subsections in Sections 5.4.1 and 5.4.3 were reordered to provide a more logical sequence for the requirements in these sections.

Section 5.4.4 was added to receive content relocated from other sections in 5.2 and 5.4. The new structure reinforces the concept that 5.4.1 and 5.4.3 address screening testing to determine whether dusts are, respectively, combustible or explosible. The new 5.4.4 then established the requirement that, if a dust is determined to be combustible or explosible, additional testing will be required to quantify the combustibility or explosibility, as required to support implementation of other portions of the standard.

Annex A: The proposed change to combine annex section text presupposes that Public Comment 114-NFPA 652-2013 has been adopted. Old A.5.2.1 has been edited to make it suitable to be the annex material for A.5.4.4.1. Content from old A.5.2.6 (proposed for deletion under another public comment) has been relocated and incorporated. Content from old A.5.4.3.2 and A.5.4.3.5 have been incorporated into the revised annex material.

The entire annex item to 5.4.1 is unnecessary. Section 5.4.1.1 points to the necessary testing requirement and anyone who decides that this is needed can go directly to the source and by doing so would be sure the criteria for the test is up to date. In fact, by 5.4.1.1.1 most folks will not even need to do this test. The goal should be to simply rather than complicate as this material does. Therefore, it will be deleted.

The revised text for A.5.4.3.1 is more consistent with recommendations contained in ASTM standards like ASTM E1226. Additionally, it includes language explaining that sieving and drying a sample does not always produce a dust with higher hazard than the as-received material.

This explanatory information in A.5.4.3.2 is incomplete and not universally true. A previous annex item provides greater detail about this issue. The fine fraction of a sample does not always present the greatest hazard.

Assuming public comments 114 and 116 are adopted, the material in A.5.4.3.5 has been incorporated into A.5.4.4.1.
A.5.4.3.1

In general, it is recommended to test in accordance with the test protocol. The test protocol for ASTM 1226, for example, calls for drying, recommends that the sample so that has a moisture content is of less than 5 percent by weight, and particle size is 95 percent sub-200 mesh screen by weight that 95 percent of the sample by weight has a particle size of less than 200 mesh. To the extent necessary to meet these criteria, the moisture content of the sample would be reduced by drying, and the particle size would be reduced by grinding, pulverizing or sieving. The thought behind this approach is to obtain near the worst-case test data that, in theory, could be found within a facility (i.e., accumulations of fines, typically sub-200 mesh, at some locations or changes in processes) and by doing so ensure conservatism in the design of protection equipment. This is a through this built-in safety factor for the tests, as the testing laboratory does not know if the samples are a good representation of the dust from the facility, albeit of undetermined size. By performing the test in this manner, it assumes a worse-case scenario to account for dust accumulations not taken into account that may be somehow overlooked by the facility. On the other hand, testing material "as received" can result in a more realistic appreciation of the true nature of the hazard under assessment. Making the decision whether to test as received or in accordance with protocol is of considerable importance and should be done in consultation with experts or someone familiar with the process and material. Furthermore, this is not an all or nothing determination. For example, it may be appropriate to reduce the moisture content of the sample, but not the particle size.

Statement of Problem and Substantiation for Public Comment
It is critical to acknowledge that the testing of samples “as received” will often be appropriate, and we appreciate the Committee’s recognition of that fact. We believe the annex material reflects an inappropriate bias toward modifying samples to meet the two criteria recommended by ASTM 1226 and somewhat overstates the approach described in ASTM 1226. We believe it would be accurate to say that ASTM 1226 recommends, but does not “call for” the sample to meet the referenced moisture and particle size criteria. ASTM 1226 provides, in pertinent part, as follows:

9.2 Tests may be run on an as-received sample. However, due to the possible accumulation of fines at some location in a processing system, it is recommended that the test sample be at least 95 % minus 200 mesh (75 µm).

NOTE 6—It may be desirable in some cases to conduct dust deflagration tests on materials as sampled from a process because process dust streams or deposits may contain a wide range of particle sizes or have a well-defined specific moisture content, materials consisting of a mixture of chemicals may be selectively separated on sieves and certain fibrous materials which may not pass through a relatively coarse screen may produce dust deflagrations. When a material is tested in the as-received state, it should be recognized that the test results may not represent the most severe dust deflagration possible. Any process change resulting in a higher fraction of fines than normal or drier product than normal may increase the explosion severity.

The determination as to whether samples should be tested “as received” or after modification, and what that modification should be, is best addressed by the people involved in the analysis of that site and process without being biased by general recommendations in this standard. They are in the best position to know whether the “possibility” that smaller particles will accumulate in the process is a significant possibility or an irrelevant theoretical possibility. The fact that the testing laboratory does not know whether the sample is representative is irrelevant. That is outside the domain of its responsibility. The final sentence is designed to acknowledge that the choice of what sample to test is not simply between “as received” or as recommended by ASTM 1226.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 08:32:45 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-20-NFPA 652-2014
Statement:
The changes in section 5.4 are proposed in conjunction with the changes proposed in Public Comment 113-NFPA 652-2013.

The subsections in Sections 5.4.1 and 5.4.3 were reordered to provide a more logical sequence for the requirements in these sections.

Section 5.4.4 was added to receive content relocated from other sections in 5.2 and 5.4. The new structure reinforces the concept that 5.4.1 and 5.4.3 address screening testing to determine whether dusts are, respectively, combustible or explosible. The new 5.4.4 then established the requirement that, if a dust is determined to be combustible or explosible, additional testing will be required to quantify the combustibility or explosibility, as required to support implementation of other portions of the standard.

Annex A: The proposed change to combine annex section text presupposes that Public Comment 114-NFPA 652-2013 has been adopted. Old A.5.2.1 has been edited to make it suitable to be the annex material for A.5.4.4.1. Content from old A.5.2.6 (proposed for deletion under another public comment) has been relocated and incorporated. Content from old A.5.4.3.2 and A.5.4.3.5 have been incorporated into the revised annex material.

The entire annex item to 5.4.1 is unnecessary. Section 5.4.1.1 points to the necessary testing requirement and anyone who decides that this is needed can go directly to the source and by doing so would be sure the criteria for the test is up to date. In fact, by 5.4.1.1.1 most folks will not even need to do this test. The goal should be to simply rather than complicate as this material does. Therefore, it will be deleted.

The revised text for A.5.4.3.1 is more consistent with recommendations contained in ASTM standards like ASTM E1226. Additionally, it includes language explaining that sieving and drying a sample does not always produce a dust with higher hazard than the as-received material.

This explanatory information in A.5.4.3.2 is incomplete and not universally true. A previous annex item provides greater detail about this issue. The fine fraction of a sample does not always present the greatest hazard.

Assuming public comments 114 and 116 are adopted, the material in A.5.4.3.5 has been incorporated into A.5.4.4.1.
A.5.4.3.1

In general, it is recommended to test. Tests should typically be performed in accordance with the test protocol. The test protocol for ASTM 1226, for example, calls for drying the sample so that moisture content is standard recommendations. For example, most ASTM combustible dust test methods recommend testing the sample at less than 5 percent by-moisture by weight, and particle size size that is 95 at least 95 percent sub-200 mesh screen by weight. The This may require drying and grinding or sieving of samples. The thought behind this approach is to obtain near worst-case test data that could be found within a facility (i.e., accumulations of dry fines, typically sub-200 mesh, at some locations or changes in processes) and by doing so ensure conservatism in the design hazard assessment and design of protection equipment. This is a built This typically produces a built-in safety factor for the tests, as the testing laboratory does not know if the samples are a good representation of the dust from the facility. By performing the test in this manner, it typically assumes a worse-case scenario to account for dust accumulations not taken into account by the facility.

On the other hand, testing material "as received" can result in a more realistic appreciation, realistic determination, of the true nature of the hazard under assessment. Making the decision whether to test as received or in accordance with protocol. Additionally, in some cases the as received material may present a greater hazard than the dried fine fraction of the material. For instance, some samples may consist of a mixture of fine noncombustible material and coarse combustible material, where the fine fraction is a lower hazard than the as received material. Similarly, some water reactive materials may present a greater hazard with some moisture present than when dried. Making the decision of the moisture content and particle size fraction of a dust sample is of considerable importance and should be done in consultation with experts or someone familiar with the process and material.

Statement of Problem and Substantiation for Public Comment

The revised text is more consistent with recommendations contained in ASTM standards like ASTM E1226. Additionally, it includes language explaining that sieving and drying a sample does not always produce a dust with a higher hazard than the as-received material.
Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-20-NFPA 652-2014
Statement: The changes in section 5.4 are proposed in conjunction with the changes proposed in Public Comment 113-NFPA 652-2013.

The subsections in Sections 5.4.1 and 5.4.3 were reordered to provide a more logical sequence for the requirements in these sections.

Section 5.4.4 was added to receive content relocated from other sections in 5.2 and 5.4. The new structure reinforces the concept that 5.4.1 and 5.4.3 address screening testing to determine whether dusts are, respectively, combustible or explosible. The new 5.4.4 then established the requirement that, if a dust is determined to be combustible or explosible, additional testing will be required to quantify the combustibility or explosibility, as required to support implementation of other portions of the standard.

Annex A: The proposed change to combine annex section text presupposes that Public Comment 114-NFPA 652-2013 has been adopted. Old A.5.2.1 has been edited to make it suitable to be the annex material for A.5.4.4.1. Content from old A.5.2.6 (proposed for deletion under another public comment) has been relocated and incorporated. Content from old A.5.4.3.2 and A.5.4.3.5 have been incorporated into the revised annex material.

The entire annex item to 5.4.1 is unnecessary. Section 5.4.1.1 points to the necessary testing requirement and anyone who decides that this is needed can go directly to the source and by doing so would be sure the criteria for the test is up to date. In fact, by 5.4.1.1.1 most folks will not even need to do this test. The goal should be to simply rather than complicate as this material does. Therefore, it will be deleted.

The revised text for A.5.4.3.1 is more consistent with recommendations contained in ASTM standards like ASTM E1226. Additionally, it includes language explaining that sieving and drying a sample does not always produce a dust with higher hazard than the as-received material.

This explanatory information in A.5.4.3.2 is incomplete and not universally true. A previous annex item provides greater detail about this issue. The fine fraction of a sample does not always present the greatest hazard.

Assuming public comments 114 and 116 are adopted, the material in A.5.4.3.5 has been incorporated into A.5.4.4.1.
A.5.4.3.1
In general, it is recommended to test in accordance with the test protocol. The test protocol for ASTM 1226, for example, calls for drying the sample so that moisture content is less than 5 percent by weight, and sieving or milling the sample so that the particle size is 95 percent sub-200 mesh screen by weight. The thought behind this approach is to obtain near worst-case test data that could be found within a facility (i.e., accumulations of fines, typically sub-200 mesh, at some locations or changes in processes) and by doing so ensure conservatism in the design of protection equipment. This is a through this built-in safety factor. For the tests, as the testing laboratory does not know if the samples are a good representation of the dust from the facility. By performing the test in this manner, it assumes a worse-case scenario to account for dust accumulations that may not have been taken into account by the facility. On the other hand, testing material "as received" can result in a more realistic appreciation of the true nature of the hazard under assessment. Making the decision whether to test as received or in accordance with protocol is of considerable importance and should be done in consultation with experts or someone familiar with the process and material. Furthermore, this is not an all or nothing determination. For example, it may be appropriate to reduce the moisture content of the sample, but not the particle size.

Statement of Problem and Substantiation for Public Comment
It is critical to acknowledge that the testing of samples “as received” will often be appropriate, and while the standard text acknowledges this, the annex material reflects an inappropriate bias toward modifying samples to meet the two criteria recommended by ASTM 1226 and somewhat overstates the approach described in ASTM 1226. It would be more accurate to say that ASTM 1226 recommends, but does not “call for” the sample to meet the referenced moisture and particle size criteria. ASTM 1226 provides, in pertinent part, as follows:

9.2 Tests may be run on an as-received sample. However, due to the possible accumulation of fines at some location in a processing system, it is recommended that the test sample be at least 95 % minus 200 mesh (75 µm).

NOTE 6—It may be desirable in some cases to conduct dust deflagration tests on materials as sampled from a process because process dust streams or deposits may contain a wide range of particle sizes or have a well-defined specific moisture content, materials consisting of a mixture of chemicals may be selectively separated on sieves and certain fibrous materials which may not pass through a relatively coarse screen may produce dust deflagrations. When a material is tested in the as-received state, it should be recognized that the test results may not represent the most severe dust deflagration possible. Any process change resulting in a higher fraction of fines than normal or drier product than normal may increase the explosion severity.

The determination as to whether samples should be tested “as received” or after modification, and what that modification should be, is best addressed by the people involved in the analysis of that site and process without being biased by general recommendations in this standard. They are in the best position to know whether the “possibility” that smaller particles will accumulate in the process is a significant possibility or an irrelevant theoretical possibility. The fact that the testing laboratory does not know whether the sample is representative is irrelevant—that is outside the domain of its responsibility. The final sentence acknowledges that the choice of what sample to test is not simply between “as received” or as recommended by ASTM 1226.

Submitter Information Verification

Submitter Full Name: Dale Hansen
Organization: Harrington Group, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 16:24:53 EST 2013
Committee Action: Rejected but see related SR
Resolution: SR-20-NFPA 652-2014
Statement: The changes in section 5.4 are proposed in conjunction with the changes proposed in Public Comment 113-NFPA 652-2013.

The subsections in Sections 5.4.1 and 5.4.3 were reordered to provide a more logical sequence for the requirements in these sections.

Section 5.4.4 was added to receive content relocated from other sections in 5.2 and 5.4. The new structure reinforces the concept that 5.4.1 and 5.4.3 address screening testing to determine whether dusts are, respectively, combustible or explosible. The new 5.4.4 then established the requirement that, if a dust is determined to be combustible or explosible, additional testing will be required to quantify the combustibility or explosibility, as required to support implementation of other portions of the standard.

Annex A: The proposed change to combine annex section text presupposes that Public Comment 114-NFPA 652-2013 has been adopted. Old A.5.2.1 has been edited to make it suitable to be the annex material for A.5.4.4.1. Content from old A.5.2.6 (proposed for deletion under another public comment) has been relocated and incorporated. Content from old A.5.4.3.2 and A.5.4.3.5 have been incorporated into the revised annex material.

The entire annex item to 5.4.1 is unnecessary. Section 5.4.1.1 points to the necessary testing requirement and anyone who decides that this is needed can go directly to the source and by doing so would be sure the criteria for the test is up to date. In fact, by 5.4.1.1.1 most folks will not even need to do this test. The goal should be to simply rather than complicate as this material does. Therefore, it will be deleted.

The revised text for A.5.4.3.1 is more consistent with recommendations contained in ASTM standards like ASTM E1226. Additionally, it includes language explaining that sieving and drying a sample does not always produce a dust with higher hazard than the as-received material.

This explanatory information in A.5.4.3.2 is incomplete and not universally true. A previous annex item provides greater detail about this issue. The fine fraction of a sample does not always present the greatest hazard.

Assuming public comments 114 and 116 are adopted, the material in A.5.4.3.5 has been incorporated into A.5.4.4.1.
A.5.4.3.2
Testing a worst-case (finest) particle size distribution will provide a
conservative determination of the combustibility of the material. (See Table
A.5.4.3.2.)

Table A.5.4.3.2 Standard Test Methods to Determine
Explosibility Properties

<table>
<thead>
<tr>
<th>Method</th>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM E 2019, Standard Test Method for Minimum Ignition Energy of a Dust Cloud in Air</td>
<td>Minimum ignition energy (MIE) of dust cloud in air</td>
</tr>
<tr>
<td>ASTM E 1491, Standard Test Method for Minimum Autoignition Temperature of Dust Clouds</td>
<td>Minimum ignition temperature (T_i) of dust clouds</td>
</tr>
<tr>
<td>ASTM E 1226, Standard Test Method for Explosibility of Dust Clouds</td>
<td>Maximum explosion pressure (P_{max}), rate and maximum rate of pressure rise (dP/dt), and explosion severity (K_{st})</td>
</tr>
<tr>
<td>ASTM E 1515, Standard Test Method for Minimum Explosible Concentration of Combustible Dusts</td>
<td>Minimum explosible concentration (MEC)</td>
</tr>
<tr>
<td>ASTM E 2021, Standard Test Method for Hot-Surface Ignition Temperature of Dust Layers</td>
<td>Minimum ignition temperature (T_i) of dust layers</td>
</tr>
<tr>
<td>ASTM WK1680, Standard Test Method for Limiting Oxygen (Oxidant) Concentration of Combustible Dust Clouds</td>
<td>Limiting oxygen concentration (LOC)</td>
</tr>
</tbody>
</table>

Statement of Problem and Substantiation for Public Comment

The table should not be part of A.5.4.3.2.

Assuming public comments 114 and 116 are adopted, the table should become part of
A.5.4.4.1.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 08 23:54:47 EST 2013
Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-20-NFPA 652-2014
Statement: The changes in section 5.4 are proposed in conjunction with the changes proposed in Public Comment 113-NFPA 652-2013.

The subsections in Sections 5.4.1 and 5.4.3 were reordered to provide a more logical sequence for the requirements in these sections.

Section 5.4.4 was added to receive content relocated from other sections in 5.2 and 5.4. The new structure reinforces the concept that 5.4.1 and 5.4.3 address screening testing to determine whether dusts are, respectively, combustible or explosible. The new 5.4.4 then established the requirement that, if a dust is determined to be combustible or explosible, additional testing will be required to quantify the combustibility or explosibility, as required to support implementation of other portions of the standard.

Annex A: The proposed change to combine annex section text presupposes that Public Comment 114-NFPA 652-2013 has been adopted. Old A.5.2.1 has been edited to make it suitable to be the annex material for A.5.4.4.1. Content from old A.5.2.6 (proposed for deletion under another public comment) has been relocated and incorporated. Content from old A.5.4.3.2 and A.5.4.3.5 have been incorporated into the revised annex material.

The entire annex item to 5.4.1 is unnecessary. Section 5.4.1.1 points to the necessary testing requirement and anyone who decides that this is needed can go directly to the source and by doing so would be sure the criteria for the test is up to date. In fact, by 5.4.1.1.1 most folks will not even need to do this test. The goal should be to simply rather than complicate as this material does. Therefore, it will be deleted.

The revised text for A.5.4.3.1 is more consistent with recommendations contained in ASTM standards like ASTM E1226. Additionally, it includes language explaining that sieving and drying a sample does not always produce a dust with higher hazard than the as-received material.

This explanatory information in A.5.4.3.2 is incomplete and not universally true. A previous annex item provides greater detail about this issue. The fine fraction of a sample does not always present the greatest hazard.

Assuming public comments 114 and 116 are adopted, the material in A.5.4.3.5 has been incorporated into A.5.4.4.1.
A.5.4.3.2 Testing a worst-case (finest) particle size distribution will provide a conservative determination of the combustibility of the material. (See Table A.5.4.3.2.)

Table A.5.4.3.2 Standard Test Methods to Determine Explosibility Properties

<table>
<thead>
<tr>
<th>Method</th>
<th>Property</th>
<th>ASTM Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM E 2019</td>
<td>Minimum Ignition Energy of a Dust Cloud in Air</td>
<td>Minimum ignition energy (MIE) of dust cloud in air</td>
<td>ASTM E 1491</td>
</tr>
<tr>
<td>ASTM E 1226</td>
<td>Standard Test Method for Minimum Autoignition Temperature of Dust Clouds</td>
<td>Minimum ignition temperature ($T_c$) of dust clouds</td>
<td>ASTM E 1226</td>
</tr>
<tr>
<td>ASTM E 1515</td>
<td>Standard Test Method for Explosibility of Dust Clouds</td>
<td>Maximum explosion pressure ($P_{max}$), rate and maximum rate of pressure rise ($dP/dt$), and explosion severity ($K_{st}$)</td>
<td>ASTM E 1515</td>
</tr>
<tr>
<td>ASTM E 2021</td>
<td>Standard Test Method for Hot-Surface Ignition Temperature of Dust Layers</td>
<td>Minimum ignition temperature ($T_c$) of dust layers</td>
<td>ASTM WK1680</td>
</tr>
</tbody>
</table>

Statement of Problem and Substantiation for Public Comment

A comment to delete the main body text has been submitted. In addition this listing of alternate or additional explosibility properties while possibly appropriate in Annex D could lead a less informed user to conclude that this data is needed too when in fact the listed tests are useful only in a small percentage of cases and their indiscriminate use is wasteful of both time and money.

Submitter Information Verification

Submitter Full Name: Henry Febo
Organization: FM Global
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 11:21:53 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee did not delete this annex material as the comment recommends; see SR No. 97 for the revisions.
A.5.4.3.2
Testing a worst-case (finest) particle size distribution will provide a conservative determination of the combustibility of the material. *(See Table A.5.4.3.2.)*

Table A.5.4.3.2 Standard Test Methods to Determine Explosibility Properties

<table>
<thead>
<tr>
<th>Method</th>
<th>Property</th>
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</tr>
</tbody>
</table>

Statement of Problem and Substantiation for Public Comment

This explanatory information is incomplete and not universally true. A previous annex item provides greater detail about this issue. The fine fraction of a sample does not always present the greatest hazard.

Submitter Information Verification

Submitter Full Name: Timothy Myers
Organization: Exponent, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Tue Oct 29 18:52:34 EDT 2013

Committee Statement
<table>
<thead>
<tr>
<th>Committee Action:</th>
<th>Rejected but see related SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>SR-20-NFPA 652-2014</td>
</tr>
<tr>
<td>Statement:</td>
<td>The changes in section 5.4 are proposed in conjunction with the changes proposed in Public Comment 113-NFPA 652-2013.</td>
</tr>
<tr>
<td></td>
<td>The subsections in Sections 5.4.1 and 5.4.3 were reordered to provide a more logical sequence for the requirements in these sections.</td>
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<td></td>
<td>Section 5.4.4 was added to receive content relocated from other sections in 5.2 and 5.4. The new structure reinforces the concept that 5.4.1 and 5.4.3 address screening testing to determine whether dusts are, respectively, combustible or explosible. The new 5.4.4 then established the requirement that, if a dust is determined to be combustible or explosible, additional testing will be required to quantify the combustibility or explosibility, as required to support implementation of other portions of the standard.</td>
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<td>Annex A: The proposed change to combine annex section text presupposes that Public Comment 114-NFPA 652-2013 has been adopted. Old A.5.2.1 has been edited to make it suitable to be the annex material for A.5.4.4.1. Content from old A.5.2.6 (proposed for deletion under another public comment) has been relocated and incorporated. Content from old A.5.4.3.2 and A.5.4.3.5 have been incorporated into the revised annex material.</td>
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<td>The entire annex item to 5.4.1 is unnecessary. Section 5.4.1.1 points to the necessary testing requirement and anyone who decides that this is needed can go directly to the source and by doing so would be sure the criteria for the test is up to date. In fact, by 5.4.1.1.1 most folks will not even need to do this test. The goal should be to simply rather than complicate as this material does. Therefore, it will be deleted.</td>
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<tr>
<td></td>
<td>This explanatory information in A.5.4.3.2 is incomplete and not universally true. A previous annex item provides greater detail about this issue. The fine fraction of a sample does not always present the greatest hazard.</td>
</tr>
<tr>
<td></td>
<td>Assuming public comments 114 and 116 are adopted, the material in A.5.4.3.5 has been incorporated into A.5.4.4.1.</td>
</tr>
</tbody>
</table>
A.5.4.3.5

ASTM E 2021, *Standard Test Method for Hot-Surface Ignition Temperature of Dust Layers*, uses a constant temperature hot-plate to heat the dust on one side only. Routine tests use a 12.7 mm (0.5 in.) thick layer, which might simulate a substantial build-up of dust on the outside of hot equipment. However, since the ignition temperature normally decreases markedly with increased dust layer thickness, the method allows layer thickness to be varied according to the application.

ASTM E 2019, *Standard Test Method for Minimum Ignition Energy of a Dust Cloud in Air*, is used to determine the minimum ignition energy (MIE) for any given fuel concentration. The method uses the lowest energy, stored by a capacitor, that when released as a spark will ignite dust cloud-oxidant mixtures. By testing a range of concentrations, the lowest MIE is determined for the optimum mixture. Observed MIE and MIE values are highly sensitive to the test method, particularly the spark-electrode geometry and characteristics of the capacitor discharge circuit. Dust ignition energy standard ASTM E 2019 describes test methods in current use that have been found to yield comparable results; however, it is a “performance standard” whereby the methodology adopted must produce data within the expected range for a series of reference dusts.

ASTM E 1491, *Standard Test Method for Minimum Autoignition Temperature of Dust Clouds*, is used to determine the dust cloud autoignition temperature (AIT). The test involves blowing dust into a heated furnace set at a predetermined temperature. The dust concentration is systematically varied to find the lowest temperature at which self-ignition occurs at ambient pressure, known as the minimum autoignition temperature (MAIT). A visible flame exiting the furnace provides evidence for ignition. Four different furnaces are described in ASTM E 1491 (0.27-L Godbert-Greenwald Furnace, 0.35-L BAM Quen, 1.2-L Bureau of Mines Furnace, and 6.8-L Bureau of Mines Furnace). Each yields somewhat different MAIT data, the largest deviations occurring at the greatest MAIT values. However, the lower AIT range is of more practical importance and here the agreement is better (for example 265±25°C for sulfur).

ASTM E 1226, *Standard Test Method for Explosibility of Dust Clouds*, is used to determine the pressure and rate of pressure rise for suspended combustible dusts. The measurement of the explosibility parameters (\( P_{\text{max}} \) and \( K_{\text{St}} \)) requires the reproducible generation of a near homogeneous dust cloud inside a containment vessel of known volume. The explosibility parameters, \( P_{\text{max}} \) (maximum pressure) and \( K_{\text{St}} \) (maximum rate of pressure rise of the worst case concentration times the cube root of the test volume) are obtained from such measurements. The determination of a \( P_{\text{max}} \) and \( K_{\text{St}} \) for a material first establishes that it is an explosible dust. A bench scale test method in ASTM E 1226 involves a vessel at least 20 liters in volume in which a dust cloud is formed using the discharge of a small cylinder of compressed air. After a prescribed time delay, the highly turbulent dust cloud is ignited using a strong ignition source of known energy. Pressure is monitored versus time by appropriate transducers and expressed as pressure, \( P_{\text{Bar}} \), and pressure rate of rise, \( dP/dt \). Dust concentration is varied to determine the maxima of both parameters. Particle size and moisture are other variables that must be considered. Particle size should be less than 75 microns ensuring a design that is conservative.
The primary use of the test data $P_{\text{max}}$ and $K_{\text{St}}$ is for the design of explosion protection systems: venting, suppression, isolation. Vent designs provide a relief area that will limit damage to the process equipment to an acceptable level. The required vent area is calculated using equations from NFPA 68, *Standard on Explosion Protection by Deflagration Venting*, and requires knowledge of the process — volume, temperature, operating pressure, design strength, vent relief pressure — and of the fuel, $P_{\text{max}}$ and $K_{\text{St}}$. Suppression is the active extinguishment of the combustion and again limits the explosion pressure to an acceptable level. Suppression designs require similar process and hazard data in order to determine the hardware requirements such as size, number, and location of containers, detection conditions, and the final or reduced explosion pressure. Isolation, the prevention of flame propagation through interconnections, requires the same process and hazard data to determine hardware needs and locations. The extent of testing should depend on what the scenario or evaluation such as explosion venting for a dust collector would require: $K_{\text{St}}$ and $P_{\text{max}}$.

Refer to Table A.5.4.3.2 for standard test methods for determining explosibility characteristics of dusts that are used for the process hazard analysis, performance-based design method risk assessments, and hazard management of combustible dusts.

**Statement of Problem and Substantiation for Public Comment**

Assuming public comments 114 and 116 are adopted, this material has been incorporated into A.5.4.4.1

**Submitter Information Verification**

Submitter Full Name: Walter Frank  
Organization: Frank Risk Solutions, Inc.  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Sat Nov 09 00:09:09 EST 2013

**Committee Statement**
Committee Action: Rejected but see related SR
Resolution: SR-20-NFPA 652-2014
Statement: The changes in section 5.4 are proposed in conjunction with the changes proposed in Public Comment 113-NFPA 652-2013.

The subsections in Sections 5.4.1 and 5.4.3 were reordered to provide a more logical sequence for the requirements in these sections.

Section 5.4.4 was added to receive content relocated from other sections in 5.2 and 5.4. The new structure reinforces the concept that 5.4.1 and 5.4.3 address screening testing to determine whether dusts are, respectively, combustible or explosible. The new 5.4.4 then established the requirement that, if a dust is determined to be combustible or explosible, additional testing will be required to quantify the combustibility or explosibility, as required to support implementation of other portions of the standard.

Annex A: The proposed change to combine annex section text presupposes that Public Comment 114-NFPA 652-2013 has been adopted. Old A.5.2.1 has been edited to make it suitable to be the annex material for A.5.4.4.1. Content from old A.5.2.6 (proposed for deletion under another public comment) has been relocated and incorporated. Content from old A.5.4.3.2 and A.5.4.3.5 have been incorporated into the revised annex material.

The entire annex item to 5.4.1 is unnecessary. Section 5.4.1.1 points to the necessary testing requirement and anyone who decides that this is needed can go directly to the source and by doing so would be sure the criteria for the test is up to date. In fact, by 5.4.1.1.1 most folks will not even need to do this test. The goal should be to simply rather than complicate as this material does. Therefore, it will be deleted.

The revised text for A.5.4.3.1 is more consistent with recommendations contained in ASTM standards like ASTM E1226. Additionally, it includes language explaining that sieving and drying a sample does not always produce a dust with higher hazard than the as-received material.

This explanatory information in A.5.4.3.2 is incomplete and not universally true. A previous annex item provides greater detail about this issue. The fine fraction of a sample does not always present the greatest hazard.

Assuming public comments 114 and 116 are adopted, the material in A.5.4.3.5 has been incorporated into A.5.4.4.1.
A.5.4.3.5 —

ASTM E 2021, *Standard Test Method for Hot-Surface Ignition Temperature of Dust Layers*, uses a constant temperature hot-plate to heat the dust on one side only. Routine tests use a 12.7 mm (0.5 in.) thick layer, which might simulate a substantial build-up of dust on the outside of hot equipment. However, since the ignition temperature normally decreases markedly with increased dust layer thickness, the method allows layer thickness to be varied according to the application.

ASTM E 2019, *Standard Test Method for Minimum Ignition Energy of a Dust Cloud in Air*, is used to determine the minimum ignition energy (MIE) for any given fuel concentration. The method uses the lowest energy, stored by a capacitor, that when released as a spark will ignite dust cloud-oxidant mixtures. By testing a range of concentrations, the lowest MIE is determined for the optimum mixture. Observed MIE and MIE values are highly sensitive to the test method, particularly the spark electrode geometry and characteristics of the capacitor discharge circuit. Dust ignition energy standard ASTM E 2019 describes test methods in current use that have been found to yield comparable results; however, it is a “performance standard” whereby the methodology adopted must produce data within the expected range for a series of reference dusts.

ASTM E 1491, *Standard Test Method for Minimum Autoignition Temperature of Dust Clouds*, is used to determine the dust cloud autoignition temperature (AIT). The test involves blowing dust into a heated furnace set at a predetermined temperature. The dust concentration is systematically varied to find the lowest temperature at which self-ignition occurs at ambient pressure, known as the minimum autoignition temperature (MAIT). A visible flame exiting the furnace provides evidence for ignition. Four different furnaces are described in ASTM E 1491 (0.27-L Godbert-Greenwald Furnace, 0.35-L BAM Oven, 1.2-L Bureau of Mines Furnace, and 6.8-L Bureau of Mines Furnace). Each yields somewhat different MAIT data, the largest deviations occurring at the greatest MAIT values. However, the lower AIT range is of more practical importance and here the agreement is better (for example 265±25°C for sulfur).

ASTM E 1226, *Standard Test Method for Explosibility of Dust Clouds*, is used to determine the pressure and rate of pressure rise for suspended combustible dusts. The measurement of the explosibility parameters ($P_{\text{max}}$ and $K_{\text{St}}$) requires the reproducible generation of a near homogeneous dust cloud inside a containment vessel of known volume. The explosibility parameters $P_{\text{max}}$ (maximum pressure) and $K_{\text{St}}$ (maximum rate of pressure rise of the worst case concentration times the cube root of the test volume) are obtained from such measurements. The determination of a $P_{\text{max}}$ and $K_{\text{St}}$ for a material first establishes that it is an explosible dust. A bench scale test method in ASTM E 1226 involves a vessel at least 20 liters in volume in which a dust cloud is formed using the discharge of a small cylinder of compressed air. After a prescribed time delay, the highly turbulent dust cloud is ignited using a strong ignition source of known energy. Pressure is monitored versus time by appropriate transducers and expressed as pressure, $P_{\text{ax}}$, and pressure rate of rise, $dP/dt_{\text{ax}}$. Dust concentration is varied to determine the maxima of both parameters. Particle size and moisture are other variables that must be considered. Particle size should be less than 75 microns ensuring a design that is conservative.
The primary use of the test data $P_{\text{max}}$ and $K_{\text{SI}}$ is for the design of explosion protection systems: venting, suppression, isolation. Vent designs provide a relief area that will limit damage to the process equipment to an acceptable level. The required vent area is calculated using equations from NFPA 68, *Standard on Explosion Protection by Deflagration Venting*, and requires knowledge of the process—volume, temperature, operating pressure, design strength, vent relief pressure—and of the fuel. $P_{\text{max}}$ and $K_{\text{SI}}$. Suppression is the active extinguishment of the combustion and again limits the explosion pressure to an acceptable level. Suppression designs require similar process and hazard data in order to determine the hardware requirements such as size, number, and location of containers, detection conditions, and the final or reduced explosion pressure. Isolation, the prevention of flame propagation through interconnections, requires the same process and hazard data to determine hardware needs and locations. The extent of testing should depend on what the scenario or evaluation such as explosion venting for a dust collector would require: $K_{\text{SI}}$ and $P_{\text{max}}$.

Refer to Table A.5.4.3.2 for standard test methods for determining explosibility characteristics of dusts that are used for the process hazard analysis, performance-based design method risk assessments, and hazard management of combustible dusts.

**Statement of Problem and Substantiation for Public Comment**

This annex material would be helpful in a text on combustible dust hazards but as part of this document only adds marginally to the code. If a test is specifically referenced in other sections of the Code a brief explanation of why the test is useful might be provided without all the details on how it is conducted.

**Submitter Information Verification**

Submitter Full Name: Henry Febo  
Organization: FM Global  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Fri Nov 15 11:48:22 EST 2013

**Committee Statement**
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The subsections in Sections 5.4.1 and 5.4.3 were reordered to provide a more logical sequence for the requirements in these sections.

Section 5.4.4 was added to receive content relocated from other sections in 5.2 and 5.4. The new structure reinforces the concept that 5.4.1 and 5.4.3 address screening testing to determine whether dusts are, respectively, combustible or explosible. The new 5.4.4 then established the requirement that, if a dust is determined to be combustible or explosible, additional testing will be required to quantify the combustibility or explosibility, as required to support implementation of other portions of the standard.

Annex A: The proposed change to combine annex section text presupposes that Public Comment 114-NFPA 652-2013 has been adopted. Old A.5.2.1 has been edited to make it suitable to be the annex material for A.5.4.4.1. Content from old A.5.2.6 (proposed for deletion under another public comment) has been relocated and incorporated. Content from old A.5.4.3.2 and A.5.4.3.5 have been incorporated into the revised annex material.

The entire annex item to 5.4.1 is unnecessary. Section 5.4.1.1 points to the necessary testing requirement and anyone who decides that this is needed can go directly to the source and by doing so would be sure the criteria for the test is up to date. In fact, by 5.4.1.1.1 most folks will not even need to do this test. The goal should be to simply rather than complicate as this material does. Therefore, it will be deleted.

The revised text for A.5.4.3.1 is more consistent with recommendations contained in ASTM standards like ASTM E1226. Additionally, it includes language explaining that sieving and drying a sample does not always produce a dust with higher hazard than the as-received material.

This explanatory information in A.5.4.3.2 is incomplete and not universally true. A previous annex item provides greater detail about this issue. The fine fraction of a sample does not always present the greatest hazard.

Assuming public comments 114 and 116 are adopted, the material in A.5.4.3.5 has been incorporated into A.5.4.4.1.
A.5.4.3.5
ASTM E 2021, Standard Test Method for Hot-Surface Ignition Temperature of Dust Layers, uses a constant temperature hot-plate to heat the dust on one side only. Routine tests use a 12.7 mm (0.5 in.) thick layer, which might simulate a substantial build-up of dust on the outside of hot equipment. However, since the ignition temperature normally decreases markedly with increased dust layer thickness, the method allows layer thickness to be varied according to the application.

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Refer to Table A.5.4.3.2 for standard test methods for determining explosibility characteristics of dusts that are used for the process hazard analysis, performance-based design method risk assessments, and hazard management of combustible dusts.

**Statement of Problem and Substantiation for Public Comment**

The term conservative is ambiguous as it does not describe whether results are conservatively high or low. The standard recommends testing a fine fraction but does not require it. The fine fraction does not always present the greatest hazard. More detailed guidance is provided on this issue in a previous annex item.

**Submitter Information Verification**

**Submitter Full Name:** Timothy Myers  
**Organization:** Exponent, Inc.  
**Street Address:**  
**City:**  
**State:**  
**Zip:**  
**Submittal Date:** Tue Oct 29 18:55:03 EDT 2013

**Committee Statement**
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The subsections in Sections 5.4.1 and 5.4.3 were reordered to provide a more logical sequence for the requirements in these sections.

Section 5.4.4 was added to receive content relocated from other sections in 5.2 and 5.4. The new structure reinforces the concept that 5.4.1 and 5.4.3 address screening testing to determine whether dusts are, respectively, combustible or explosible. The new 5.4.4 then established the requirement that, if a dust is determined to be combustible or explosible, additional testing will be required to quantify the combustibility or explosibility, as required to support implementation of other portions of the standard.

Annex A: The proposed change to combine annex section text presupposes that Public Comment 114-NFPA 652-2013 has been adopted. Old A.5.2.1 has been edited to make it suitable to be the annex material for A.5.4.4.1. Content from old A.5.2.6 (proposed for deletion under another public comment) has been relocated and incorporated. Content from old A.5.4.3.2 and A.5.4.3.5 have been incorporated into the revised annex material.

The entire annex item to 5.4.1 is unnecessary. Section 5.4.1.1 points to the necessary testing requirement and anyone who decides that this is needed can go directly to the source and by doing so would be sure the criteria for the test is up to date. In fact, by 5.4.1.1.1 most folks will not even need to do this test. The goal should be to simply rather than complicate as this material does. Therefore, it will be deleted.

The revised text for A.5.4.3.1 is more consistent with recommendations contained in ASTM standards like ASTM E1226. Additionally, it includes language explaining that sieving and drying a sample does not always produce a dust with higher hazard than the as-received material.

This explanatory information in A.5.4.3.2 is incomplete and not universally true. A previous annex item provides greater detail about this issue. The fine fraction of a sample does not always present the greatest hazard.

Assuming public comments 114 and 116 are adopted, the material in A.5.4.3.5 has been incorporated into A.5.4.4.1.
A.5.5.2.1
If the dust sample is a mixture of materials (organic, inorganic, or combustible combustible metals), the amount or concentration of each constituent should be determined by laboratory analysis. Common methods for an analysis of mixture composition include material separation, mass fraction analysis, energy dispersive X-ray spectroscopy, Fourier transform infrared spectroscopy, inductively coupled plasma spectroscopy, and X-ray fluorescence spectroscopy etc.) which can commonly occur in fugitive dusts or dust collectors, knowing general information about the composition can be helpful in determining possible need for further testing and comparing with other possibly similar materials in the facility.

Statement of Problem and Substantiation for Public Comment

There is already a comment for removing lab analysis from the main text. The revisions here support a need for understanding of mixtures but have removed the unnecessary suggestion of highly scientific analysis which would be costly and provide little or no actionable information.

Submitter Information Verification

Submitter Full Name: Henry Febo
Organization: FM Global
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 12:48:29 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee does not agree with the submitter's substantiation and the proposed changes to the existing annex.
Sections A.5.5.2.1, A.5.5.2.2.1

A.5.5.2.1

If the dust sample is a mixture of organic, inorganic, or combustible metals, the amount or concentration of each constituent should be determined by laboratory analysis. Common methods for an analysis of mixture composition include material separation, mass fraction analysis, energy dispersive x-ray spectroscopy, Fourier transform infrared spectroscopy, inductively coupled plasma spectroscopy, and x-ray fluorescence spectroscopy.

A.5.5.2.2.1

For example, a mixture that contains some metal powder or dust should be analyzed to determine whether that metal is reactive with water. If so, then the entire mixture must be analyzed to determine whether it is water reactive.

Statement of Problem and Substantiation for Public Comment

Assuming public comment 115 is adopted, these annex items need to be deleted.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Sat Nov 09 00:19:54 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee prefers to retain the existing annex material, so it is not deleted as recommended in this comment.
Unique chemical reactivity issues could include water reactivity, reactivity with extinguishing agents or other mixture constituent, pyrophoricity, chemical instability, oxidizer, etc. For example, a mixture that contains some metal powder or dust should be analyzed to determine whether that metal is reactive with water. If its potential for water reactivity should be considered based on SDS or other public or company resources. If so, then the entire mixture must be analyzed to determine whether it is water reactive.

Statement of Problem and Substantiation for Public Comment

As proposed in PC-439 the prior 5.5.2.2.1 material has been relocated to the annex and existing annex text was modified to clarify intent. In particular the need for analysis was replaced with replaced with more available and simple options to remove the potential interpretation of a need for some more expensive testing.

Submitter Information Verification

Submitter Full Name: Henry Febo
Organization: FM Global
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 13:00:33 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-22-NFPA 652-2014
Statement: The paragraph now identified as 5.5.1.1 was relocated from section 5.2 in order to consolidate all sampling-related requirements in section 5.5.

The content related to mixtures was removed for several reasons. First, the requirements for analysis of mixtures to determine the concentration of various components would impose an expensive and unnecessary analytical burden on the user. Such information is not needed to support standard testing to obtain combustible dust explosibility data.

This SR addresses multiple PC that deal with the requirements proposed for 5.5. One or more recommended deleting some of the requirements; while no requirements have been deleted, they have been modified through the various recommendations and combined into this single action. The Committee believes that the revision to the standard reflected in this SR address and satisfy all the public comments shown as related items for this SR.

Second, the requirements related to unique chemical reactivity issues are not germane to the topic of sampling.

Annex: As proposed in PC-439 the prior 5.5.2.2.1 material has been relocated to the annex and existing annex text was modified to clarify intent. In particular the need for analysis was replaced with replaced with more available and simple options to remove the potential interpretation of a need for some more expensive testing.

The associated main body text has already been proposed to be combined with section 5.5.3.1 and the annex text adds very little to what is already in that annex material. Annex text for old 5.5.3.1 and 5.5.3.2 will be relocated to 5.5.3.
A.5.5.3.2 —

Some processes require further evaluation such as grinding. Grinding can result in a broad range of particle size. A representative sample should be tested. Combustible particulate solids include dusts, fibers, fines, chips, chunks, flakes, or mixtures of these. The term combustible particulate solid addresses the attrition of material as it moves within the process equipment. Particle abrasion breaks the material down and produces a mixture of large and small particulates, some of which could be small enough to be classified as dusts. Consequently, the presence of dusts should be anticipated in the process stream, regardless of the starting particle size of the material.

Statement of Problem and Substantiation for Public Comment

The associated main body text has already been proposed to be combined with section 5.5.3.1 and the annex text adds very little to what is already in that annex material

Submitter Information Verification

Submitter Full Name: Henry Febo
Organization: FM Global
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 13:35:12 EST 2013

Committee Statement
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<td>The paragraph now identified as 5.5.1.1 was relocated from section 5.2 in order to consolidate all sampling-related requirements in section 5.5. The content related to mixtures was removed for several reasons. First, the requirements for analysis of mixtures to determine the concentration of various components would impose an expensive and unnecessary analytical burden on the user. Such information is not needed to support standard testing to obtain combustible dust explosibility data. This SR addresses multiple PC that deal with the requirements proposed for 5.5. One or more recommended deleting some of the requirements; while no requirements have been deleted, they have been modified through the various recommendations and combined into this single action. The Committee believes that the revision to the standard reflected in this SR address and satisfy all the public comments shown as related items for this SR. Second, the requirements related to unique chemical reactivity issues are not germane to the topic of sampling. Annex: As proposed in PC-439 the prior 5.5.2.2.1 material has been relocated to the annex and existing annex text was modified to clarify intent. In particular the need for analysis was replaced with replaced with more available and simple options to remove the potential interpretation of a need for some more expensive testing. The associated main body text has already been proposed to be combined with section 5.5.3.1 and the annex text adds very little to what is already in that annex material. Annex text for old 5.5.3.1 and 5.5.3.2 will be relocated to 5.5.3.</td>
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A.5.5.3.3
The following changes in material or process can initiate the should warrant a management of change in Chapter 9 review per section 9.9, and new samples should be collected and analyzed:

(1) New process equipment is installed that presents new hazards.
(2) New operating conditions for existing equipment create a new hazard.
(3) A new material is used in the process.

Statement of Problem and Substantiation for Public Comment

If A.5.5.3.3 is retained, the citation should be corrected to cite 9.9.

Submitter Information Verification

Submitter Full Name: Walter Frank
Organization: Frank Risk Solutions, Inc.

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-122-NFPA 652-2014
Statement: If A.5.5.3.3 is retained, the citation should be corrected to cite 9.9.
A.5.6 —
Specific fire hazards include self-heating, heat of reaction (i.e., heat of hydration), pyrophoricity, water reactivity, and thermite reactions.

Statement of Problem and Substantiation for Public Comment

This annex item appears to be a lonely orphan that seemed important to someone but had no real home. It adds little or nothing to the document. As an alternative to deleting if someone really feels it belongs in the document, add it to section 5.3 Self Heating where it at least makes a little sense.

Submitter Information Verification

Submitter Full Name: Henry Febo  
Organization: FM Global  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Fri Nov 15 13:47:57 EST 2013

Committee Statement

Committee Action: Rejected but see related SR  
Resolution: SR-23-NFPA 652-2014  
Statement: This section is reserved, but has supporting Annex material. That is inconsistent, there should be no reference to reserved material for reasons previously stated, and the Annex should be deleted.

The Committee agreed with the submitters of these comments and this reserved section has been deleted.

Annex: The annex item appears to be a lonely orphan that seemed important to someone but had no real home. It adds little or nothing to the document. As an alternative to deleting if someone really feels it belongs in the document, add it to section 5.3 Self Heating where it at least makes a little sense.
A.7.3.1(4)
The hazard management document for all of the portions of the process or facility compartment determined to be a combustible dust hazard should include, but not be limited to, the following:

(1) Test reports
(2) Drawings
(3) Sizing calculations

Methods to prevent or mitigate the consequences of the combustible dust hazards can be accomplished by using the methods permitted in this standard or other industry or commodity-specific NFPA standards. This information outlines the minimum steps of a process hazards analysis.

Statement of Problem and Substantiation for Public Comment

Added combustible dust to align with scope of this standard and remove the word minimum as this implies there are additional steps. There may be many types of activities but they all fall under the general hazard analysis steps described in the standard. see comment from Craig Froehling for 7.3.1 that suggest changes that better aligns the description for a hazard analysis with industry>

Submitter Information Verification

Submitter Full Name: Chris Aiken
Organization: Cargill, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 11:39:30 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-44-NFPA 652-2014
Statement: The proposed language change more accurately and clearly describes the PHA activities. The Process Hazard Analysis as described throughout the document should be reviewed for consistency throughout the standard. The risk assessment in Chapter 8 should be a part of PHA as described in 7.2.1 and not a separate analysis. The existing language in NFPA 652 for risk assessment and PHA is inconsistent and will be confusing to the user.

see PC139 on section 7.2.1

Annex: Added combustible dust to align with scope of this standard and remove the word minimum as this implies there are additional steps. There may be many types of activities but they all fall under the general hazard analysis steps described in the standard. see comment from Craig Froehling for 7.3.1 that suggest changes that better aligns the description for a hazard analysis with industry.
A.7.3.4.1 – Where multiple compartments present essentially the same hazard, a single evaluation might be appropriate.

Statement of Problem and Substantiation for Public Comment

This Annex material has been moved to the body of the code where it will be given equal validity as an alternate to the main requirement

Submitter Information Verification

Submitter Full Name: Henry Febo
Organization: FM Global
Street Address:
City:
State:
Zip:
Submittal Date: Wed Nov 13 15:17:44 EST 2013

Committee Statement

Committee Action: Accepted
Statement: This Annex material has been moved to the body of the code where it will be given equal validity as an alternate to the main requirement
Public Comment No. 338-NFPA 652-2013 [Section No. A.7.3.4.2]

A.7.3.4.2—1
Each and every facility compartment containing every building or room containing combustible particulate solids should be evaluated. The complete contents of the compartment building or room should be considered, including hidden areas. Each area in the compartment building or room should be described, and hazards at each point should be identified. Remedial measures for each hazard should be identified and documented. The means by which the hazard should be managed is then determined. Usually the relevant industry or commodity-specific NFPA standard will provide options. (See Annex C.)

Statement of Problem and Substantiation for Public Comment

It was necessary to renumber this Annex item after deleting the original main body text. The information easily fits with A.7.3.4.1

Submitter Information Verification

Submitter Full Name: Henry Febo
Organization: FM Global
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Nov 13 15:23:42 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The mandatory text at 7.3.4.2 has not been deleted so it is appropriate to retain the related annex.
A.7.3.4.2
Each and every facility compartment containing combustible particulate solids should be evaluated. A common analysis for processes or equipment that have the same hazards and risks can be used. The complete contents of the compartment should be considered, including hidden areas. Each area in the compartment should be described, and hazards at each point should be identified. Remedial measures for each hazard should be identified and documented. The means by which the hazard should be managed is then determined. Usually the relevant industry or commodity-specific NFPA standard will provide options. (See Annex C.)

Statement of Problem and Substantiation for Public Comment

Added a sentence highlighting the ability to apply a common hazard analysis to equipment or processes that are the same.

Submitter Information Verification

Submitter Full Name: Chris Aiken
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 11:49:01 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The proposed change introduced in this comment is already addressed by both the annex A.7.3.4.1 as well as in the mandatory provisions in 7.3.4, so the Committee does not believe it is necessary to edit this.
A.8.2.4.1
To the extent feasible and practical from a cost and sanitation standpoint, horizontal surfaces should be minimized to prevent accumulation of dust. Horizontal surfaces that can benefit from a sloped cover include girders, beams, ledges, and equipment tops. Overhead steel I-beams and similar structural shapes can be boxed with concrete or other noncombustible material to eliminate surfaces for dust accumulation. The additional weight of the box enclosures should be considered in the structural design. Surfaces should be as smooth as possible to minimize dust accumulations and to facilitate cleaning. One option based on clean design concepts is to construct the building walls so that the structural supports, electrical conduit, and so forth are on the exterior side of the building walls; therefore, the interior building compartment walls are smooth and less likely to collect fugitive dust.

Statement of Problem and Substantiation for Public Comment

Substantiation:

As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. The proposed annex language acknowledges that this absolute language is inappropriate and attempts to temper it. As a result, Sections 8.2.4.1 and A.8.2.4.1 are in conflict. Section 8.2.4.1 is written as an absolute design and construction requirement, although it was clearly recognized by the committee to be impractical if not infeasible in many situations. To prevent imposition of an infeasible requirement or a significant if not gross misallocation of resources, Section A.8.2.4.1 was apparently inserted to somehow undo the damage that would be inflicted if Section 8.2.4.1 was literally interpreted. It is not permissible to write a standard in this fashion. Annex material may be used to explain and clarify mandatory text; it may not be used to amend mandatory text. The word “minimize” means to prevent or reduce to risk to the lowest level possible, even if it would reduce the risk well below the acceptable risk level at completely unwarranted costs that would result in an inappropriate allocation of limited resources. The risk should be reduced to an acceptable level rather than to the lowest feasible level.

Submitter Information Verification
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<thead>
<tr>
<th><strong>Submitter Full Name:</strong></th>
<th>Richard Krock</th>
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<tbody>
<tr>
<td><strong>Organization:</strong></td>
<td>The Vinyl Institute</td>
</tr>
<tr>
<td></td>
<td>These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.</td>
</tr>
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<td>Tue Nov 12 14:40:17 EST 2013</td>
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**Committee Statement**

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<tr>
<th><strong>Committee Action:</strong></th>
<th>Rejected</th>
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<tr>
<td><strong>Resolution:</strong></td>
<td>The Committee believes that the author of the comment has misinterpreted the purpose of the annex and the application of the mandatory and annex items. In addition, there is no specific technical recommendation provided in the comment. For these reasons the Committee proposes no changes to the annex based on this comment.</td>
</tr>
</tbody>
</table>
A.8.3.2.1  
A means to determine protection requirements should be based on a risk assessment, with consideration given to the size of the equipment, consequences of fire or explosion, combustible properties and ignition sensitivity of the material, combustible concentration, and recognized potential ignition sources. Where multiple protections are prescriptively required, a risk assessment could determine that an adequate level of safety can be achieved with only some, or possibly none, of the prescribed protective measures. More specifically, while ignition source control without consideration of the potential consequences is generally not an accepted primary means of explosion protection, a risk assessment (which by definition requires consideration of the consequences) could determine that ignition source control provides an acceptable level of safety.

Statement of Problem and Substantiation for Public Comment

Simply renumbered to A.8.3.2.1 to go with modifications proposed in PC-502

Submitter Information Verification

Submitter Full Name: Henry Febo  
Organization: FM Global  
Street Address:  
City:  
State:  
Zip:  
Submittal Date: Fri Nov 15 15:41:59 EST 2013

Committee Statement

Committee Action: Rejected  
Resolution: Since the Committee did not make the changes recommended in PC No. 502, there is no need to renumber the annex correspondingly since no change was made.
All three of these types of systems commonly utilize air (or inert gases) to convey the combustible dusts from one location to another. However, each of the systems has unique design, function, and operational characteristics that are significantly different from each other. Each of these types of systems, due to these factors, represents a different level of risk that must be considered when used.

Compared to typical dust collection systems and centralized vacuum cleaning systems handling combustible dusts, typical dilute and dense phase pneumatic conveying systems represent a significantly lower deflagration risk. However, that does not mean there is not a deflagration risk present. Risk assessment should be used to determine the level of risk involved and the correct means to minimize that risk.

Comment: This section should be revised to read as follows:

**A.8.3.3, Revised text**

All three of these types of systems commonly utilize air (or inert gases) to convey the combustible dusts from one location to another. However, each of the systems has unique design, function, and operational characteristics that are significantly different from each other. Each of these types of systems, due to these factors, represents a different level of risk that must be considered when used.

Compared to typical dust collection systems and centralized vacuum cleaning systems handling combustible dusts, typical dilute and dense phase pneumatic conveying systems represent a significantly lower deflagration risk. However, that does not mean there is not a deflagration risk present. Risk assessment should be used to determine the level of risk involved and the correct means to minimize that risk.

**Statement of Problem and Substantiation for Public Comment**

Substantiation: The suggested heading is needed to identify the types of systems being discussed in A.8.3.3 and A.8.3.3.1.3. The second change clarifies the text.

**Submitter Information Verification**
Committee Statement

Committee Action: Rejected

Resolution: The proposed change to include a heading in the annex entry for A.8.3.3 is not consistent with the NFPA Manual of Style, so no change is accepted by the Committee for these comments.
A.8.3.3
All three of these types of systems commonly utilize air (or inert gases) to convey the combustible dusts from one location to another. However, each of the systems has unique design, function, and operational characteristics that are significantly different from each other. Each of these types of systems, due to these factors, represents a different level of risk that must be considered when used.

Compared to typical dust collection systems and centralized vacuum cleaning systems handling combustible dusts, typical dilute and dense phase pneumatic conveying systems represent a significantly lower deflagration risk. However, that does not mean there is not a deflagration risk present. Risk assessment should be used to determine the level of risk involved and the correct means to minimize that risk.

Comment: This section should be revised to read as follows:

**A.8.3.3 Pneumatic Conveying, Dust Collection, and Centralized Vacuum Cleaning Systems**

All three of these types of systems commonly utilize air (or inert gases) to convey the combustible dusts from one location to another. However, each of the systems has unique design, function, and operational characteristics that are significantly different from each other. Each of these types of systems, due to these factors, represents a different level of risk that must be considered when used.

Compared to typical dust collection systems and centralized vacuum cleaning systems handling combustible dusts, typical dilute and dense phase pneumatic conveying systems represent a significantly lower deflagration risk. However, that does not mean there is not a deflagration risk present. Risk assessment should be used to determine the level of risk involved and the correct means to minimize that risk.

Statement of Problem and Substantiation for Public Comment

Substantiation: The suggested heading is needed to identify the types of systems being discussed in A.8.3.3 and A.8.3.3.1.3. The second change clarifies the text.

Submitter Information Verification
Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement
Committee Action: Rejected
Resolution: The proposed change to include a heading in the annex entry for A.8.3.3 is not consistent with the NFPA Manual of Style, so no change is accepted by the Committee for these comments.
A.8.3.3 — Pneumatic Conveying, Dust Collection, and Centralized Vacuum Cleaning Systems

All three of these types of systems commonly utilize air (or inert gases) to convey the combustible dusts from one location to another. However, each of the systems has unique design, function, and operational characteristics that are significantly different from each other. Each of these types of systems, due to these factors, represents a different level of risk that must be considered when used.

Compared to typical dust collection systems and centralized vacuum cleaning systems handling combustible dusts, typical dilute and dense phase pneumatic conveying systems represent a significantly lower deflagration risk. However, that does not mean there is not a deflagration risk present. Risk assessment should be used to determine the level of risk involved and the correct means to minimize that risk.

Statement of Problem and Substantiation for Public Comment

The suggested heading is needed to identify the types of systems being discussed in A.8.3.3 and A.8.3.3.1.3. The second change clarifies the text.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 09:29:22 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The proposed change to include a heading in the annex entry for A.8.3.3 is not consistent with the NFPA Manual of Style, so no change is accepted by the Committee for these comments.
Public Comment No. 109-NFPA 652-2013 [Section No. A.8.3.1.3]

A.8.3.1.3

**Comment:** revise this section to read as follows:

A.8.3.1.3  

*The design minimum velocity, specified in the design, for each of these systems differs significantly. Refer to the specific sections to follow on the for each type of system for that information. For guidance on designing, acquisition, operation, and maintenance of dust collection systems, refer to ACGIH, Industrial Ventilation: A Manual of Recommended Practice, published by ACGIH.*

---

Statement of Problem and Substantiation for Public Comment

Revised to clarify ambiguous language.

Submitter Information Verification

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<tr>
<th>Submitter Full Name:</th>
<th>Stan Lancey</th>
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<tr>
<td>Organization:</td>
<td>American Forest &amp; Paper Ass</td>
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Committee Statement
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<td><strong>Resolution:</strong></td>
<td>SR-67-NFPA 652-2014</td>
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<tr>
<td><strong>Statement:</strong></td>
<td>These systems are designed to meet this requirement under normal operating ranges. The phrase 'under all operating modes' has been deleted as in an upset condition, these systems will be operating outside its design parameters and may fail (product choke). Annex: Revised to clarify ambiguous language.</td>
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</table>
A.8.3.3.1.3
The design minimum velocity for each of these systems differs significantly. Refer to the specific sections to follow on the type of system for that information. For guidance on designing acquisition, operation, and maintenance of dust collection systems, refer to ACGIH, Industrial Ventilation: A Manual of Recommended Practice.

Comment: revise this section to read as follows:

A.8.3.3.1.3
The design minimum velocity specified in the design for each of these systems differs significantly. Refer to the specific sections to follow on the type of system for that information. For guidance on designing, acquisition, operation, and maintenance of dust collection systems, refer to ACGIH, Industrial Ventilation: A Manual of Recommended Practice, published by ACGIH.

Statement of Problem and Substantiation for Public Comment

Substantiation: The wording is awkward and the changes clarify the references.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Street Address:
City:
State:
Zip:
Submittal Date: Tue Nov 12 14:46:10 EST 2013

Committee Statement
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<tr>
<th>Committee Action:</th>
<th>Rejected but see related SR</th>
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<tr>
<td>Statement:</td>
<td>These systems are designed to meet this requirement under normal operating ranges. The phrase 'under all operating modes' has been deleted as in an upset condition, these systems will be operating outside its design parameters and may fail (product choke). Annex: Revised to clarify ambiguous language.</td>
</tr>
</tbody>
</table>
A.8.3.3.1.3
The design minimum velocity specified in the design for each of these systems differs significantly. Refer to the specific sections to follow on the for each type of system for that information. For guidance on designing acquisition, operation, and maintenance of dust collection systems, refer to ACGIH, *Industrial Ventilation: A Manual of Recommended Practice*, published by ACGIH.

**Statement of Problem and Substantiation for Public Comment**

Improve clarity

**Submitter Information Verification**

Submitter Full Name: MARIE MARTINKO
Organization: SPI
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 09:33:05 EST 2013

**Committee Statement**

Committee Action: Rejected but see related SR
Statement: These systems are designed to meet this requirement under normal operating ranges. The phrase 'under all operating modes' has been deleted as in an upset condition, these systems will be operating outside its design parameters and may fail (product choke).

Annex: Revised to clarify ambiguous language.
A.8.3.3.3
Proper system design requires that airflows in the various branch lines be balanced to assure minimum air volume flow at each dust source collection point. When a branch line is disconnected, blanked off, or otherwise modified it changes the airflows in all the other branches of the system. This can lead to an imbalance of air flows that result in flows below the minimum required to keep the dust from accumulating in the ducts.

Use of manual slide or “blast” gates is not recommended. Use of such gates can lead to uncontrolled modification of the flow volumes for both a single line and the system as a whole. The results often lead to improper balance of the system airflows and material accumulations in the ducts. Proper design methods inherently assure minimum airflows and duct velocities without the use of manual slide or “blast” gates. However, "blast" gates may be appropriate for agricultural operations.

Statement of Problem and Substantiation for Public Comment

This section indicates that in designing a dust collection system, manual shade or "blast" gates are not recommended. However, in the agricultural sector, such "blast" gates are often required due to the variance in bulk density, particulate size and other characteristics commensurate with the multiple commodities handled and crop year product quality variance. In addition, blast gates must be installed in dehulling equipment in processing operations (such as soybean processing) in order to make adjustments to avoid picking up soybean "meats" or "cracks" that can vary in size due to condition of cracking equipment, or when cracking rolls are replaced. While the Annex is non-mandatory, we recommend that language be added to recognize the importance of blast gates for agricultural operations.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Wed Nov 13 16:51:46 EST 2013

Committee Statement
<table>
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<tr>
<th>Committee Action:</th>
<th>Rejected</th>
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<tr>
<td>Resolution:</td>
<td>The Committee in this annex is not prohibiting their use (that would be in a mandatory requirement, not annex); however, there is still a caution applicable to their use in certain applications and the Committee prefers to retain that in this annex.</td>
</tr>
</tbody>
</table>
A.8.4.2.6.1
Compressed air blow-down used for cleaning purposes has been demonstrated to present significant hazards and should only be employed where no other cleaning method is available. Compressed air blow-down does not remove accumulated dust; it simply moves the dust somewhere else, which will then have to be cleaned. It is always methods present higher risk. If blow-down is used then appropriate precautions such as ignition source control, minimization of the dust cloud, etc must be taken. It is preferable to use engineering design controls to eliminate areas that can be inaccessible or difficult to clean by other methods.

Statement of Problem and Substantiation for Public Comment

Blow-down can be an acceptable means with the appropriate safeguards. Other methods may pose other significant hazards. For example wash down with water may be an acceptable method for dust removal, but introduction of water into a facility may create an environment for microbiological growth creating a significant food safety risk.

Submitter Information Verification

Submitter Full Name: Chris Aiken
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 11:53:46 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-77-NFPA 652-2014
Statement: The proposed revision removes reference to steam blowdown, as this is to be covered in 8.4.2.7.

Item 2 in 8.4.2.6.2 is clarified to point out where dust thresholds are determined. The Committee does not support deletion of item (2) as it only applies if item (1) is satisfied, otherwise the accumulations do not apply.

Annex: Blowdown can be an acceptable means with the appropriate safeguards. Other methods may pose other significant hazards. For example wash down with water may be an acceptable method for dust removal, but introduction of water into a facility may create an environment for microbiological growth creating a significant food safety risk.
A.8.4.2.6.2
All of the listed precautions might not be required for limited use of compressed air for cleaning minor accumulations of dust from machines or other surfaces between shifts. A risk assessment should be conducted to determine which precautions are required for the specific conditions under which compressed air is being used.

A.8.4.2.6.2
All of the listed precautions might not be required for limited use of compressed air for cleaning minor accumulations of dust from machines or other surfaces between shifts. A risk assessment should be conducted to determine which precautions are required for the specific conditions under which compressed air is being used.

(1) Vacuum cleaning, sweeping, or water wash down methods are used first to clean surfaces that can be safely accessed prior to using compressed air.

(2) Dust accumulations in the area after vacuum cleaning, sweeping, or water wash down 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 potentially exposed to airborne dust in the area meets, at a minimum, NFPA 70, National Electrical Code; NEMA 12 as defined by NEMA 250; or the equivalent.

(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) Where metal or metal-containing dust or powder under the scope of NFPA 484, Standard for Combustible Metal, are present, the requirements of NFPA 484 apply.

(7) Vacuum cleaning, sweeping, or water wash down methods are used first to clean surfaces that can be safely accessed prior to using compressed air.

(8) Dust accumulations in the area after vacuum cleaning, sweeping, or water wash down do not exceed the threshold housekeeping dust accumulation.

(9) 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).

(10) All electrical equipment potentially exposed to airborne dust in the area meets, at a minimum, NFPA 70, National Electrical Code; NEMA 12 as defined by NEMA 250; or the equivalent.

(11) Where metal or metal-containing dust or powder under the scope of NFPA 484, Standard for Combustible Metal, are present, the requirements of NFPA 484 apply.
Substantiation:

As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. This retroactive provision appears to be inappropriately written in a way designed to achieve zero risk. If, per item 5, “all ignition sources and hot surfaces capable of igniting a dust cloud or dust layer are shut down or removed from the area,” it is unclear why the remainder of the precautionary measures is required.

Submitter Information Verification

Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 08 17:15:15 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: There is no specific technical justification in support of the proposed change, which is to move mandatory requirements into this annex. The submitter has interpreted the mandatory provision which includes a risk assessment provision as an absolute; however, risk assessments are permitted to be conducted using performance-based approach.
A.8.4.2.6.2
All of the listed precautions might not be required for limited use of compressed air for cleaning minor accumulations of dust from machines or other surfaces between shifts. A risk assessment should be conducted to determine which precautions are required for the specific conditions under which compressed air is being used.

Statement of Problem and Substantiation for Public Comment

Substantiation:

As proposed, this requirement is inappropriately stated in absolute terms without regard to feasibility, practicality or the level of residual risk. This retroactive provision appears to be inappropriately written in a way designed to achieve zero risk. If, per item 5, “all ignition sources and hot surfaces capable of igniting a dust cloud or dust layer are shut down or removed from the area,” it is unclear why the remainder of the precautionary measures is required.

Submitter Information Verification

Submitter Full Name: Richard Krock
Organization: The Vinyl Institute
Affiliation: These materials were developed through a cooperative effort involving the Vinyl Institute's outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, the Vinyl Institute staff and the Vinyl Institute member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement
**Committee Action:** Rejected

**Resolution:** The submitter has provided no specific technical language in this comment; in addition, it appears that the submitter is misinterpreting the annex and mandatory items. The annex notes that a risk assessment should be conducted and the standard permits risk assessments to be either prescriptive or performance-based so this provision is not absolute as suggested in the substantiation. But again, there is no technical change presented, so nothing on which the Committee can take action.
A.8.5.1

It is not always possible or practical for existing facilities to be in compliance with the new provisions of a standard at the effective date of that standard. Therefore, retroactivity in this section means that a plan should be established to achieve compliance within a reasonable time frame.

Statement of Problem and Substantiation for Public Comment

Removed “in this section” because this is the only reference to the intent of retroactivity I found in the document. The wording here implies that immediate compliance in all other retroactive sections is practical which is not the case.

Submitter Information Verification

Submitter Full Name: Chris Aiken
Organization: Cargill, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri Nov 15 11:55:52 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee believes the existing wording expresses the intent of the mandatory requirement as it applies in this section, so prefers to retain the language as written.
Public Comment No. 435-NFPA 652-2013 [Section No. A.8.6.1.6]

A.8.6.1.6
At a minimum, the policy procedure should address who is responsible for laundering, inspecting, repairing, and retiring garments. See also Section 6.1 from NFPA 2113, Standard on Selection, Care, Use, and Maintenance of Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire. If flame-resistant clothing becomes contaminated with combustible particulate solids, the protective performance of the garments could be compromised. Wearers should maintain an awareness of and take precautions against the accumulation of combustible particulate solids on their protective clothing.

Statement of Problem and Substantiation for Public Comment

Changes the word policy to procedure as policies typically does not include this level of detail

Submitter Information Verification

Submitter Full Name: Chris Aiken
Organization: Cargill, Inc.
Street Address: 
City: 
State: 
Zip: 
Submittal Date: Fri Nov 15 11:57:59 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee does not support the proposed change to the annex; policy is the word used in the mandatory section so it should be used for consistency in the annex as well rather than introduce an alternative word, which might not relate back to the referenced mandatory section.
Public Comment No. 534-NFPA 652-2013 [ Section No. A.8.9.3.1 ]

A.8.9.3.1 — Refer to NFPA 484, Standard for Combustible Metals, for specific requirements regarding combustible metals.

Statement of Problem and Substantiation for Public Comment

This has been moved into the body of the document in PC-533

Submitter Information Verification

Submitter Full Name: Henry Febo
Organization: FM Global
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City:
State:
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Submittal Date: Fri Nov 15 19:50:50 EST 2013

Committee Statement

Committee Action: Accepted
Resolution: SR-123-NFPA 652-2014
Statement: This has been moved into the body of the document in PC-533
Public Comment No. 437-NFPA 652-2013 [Section No. A.9.3.1]

A.9.3.1
The operating procedures should address both the normal operating conditions as well as the safe operating limits. Where possible, the basis for establishing the limits and the consequences of exceeding the limits should also be described. The operating procedures should address all aspects of the operation, including the following (as applicable):

1. Normal startup
2. Continuous operation
3. Normal shutdown
4. Emergency shutdown
5. Restart after normal or emergency shutdown
6. Anticipated process upset conditions
7. System idling

For manual operations, the procedures and practices should describe techniques, procedural steps, and equipment that are intended to minimize or eliminate combustible dust hazards.

Operating procedures and practices should be reviewed on a periodic basis, typically annually, to ensure that they are current and accurate.

Statement of Problem and Substantiation for Public Comment
modified to align with scope of standard

Submitter Information Verification
Submitter Full Name: Chris Aiken
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Street Address:
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Zip:
Submittal Date: Fri Nov 15 11:59:46 EST 2013

Committee Statement
Committee Action: Accepted
Resolution: SR-102-NFPA 652-2014
Statement: modified to align with scope of standard
Public Comment No. 441-NFPA 652-2013 [ Section No. A.9.5.2.1 ]

A.9.5.2.1
Safe work habits are developed and do not occur naturally. The training program should provide enough background information regarding the dust explosion hazards of the materials and the process so that the employees can understand why it is important to follow the prescribed procedures. Training should address the following:
(1) The dust explosion hazards of their working environment and procedures in case of emergencies, including fires, explosions, and hazardous materials releases.
(2) Operating, inspection, testing, and maintenance procedures applicable to their assigned work.
(3) Normal process procedures as well as emergency procedures and changes to procedures.
(4) Emergency response plans, including safe and proper evacuation of their work area and the permissible methods for fighting incipient fires in their work area.
(5) The necessity for proper functioning of related fire and explosion protection systems.
(6) Safe handling, use, storage, and disposal of hazardous materials, combustible dust used in the employees' work areas.
(7) The location and operation of fire protection equipment, manual pull stations and alarms, emergency phones, first-aid supplies, and safety equipment.
(8) Equipment operation, safe startup and shutdown, and response to upset conditions.

Statement of Problem and Substantiation for Public Comment

modified the content to aligns with the scope of the standard. The scope of this standard does not include all hazardous materials and toxic releases.
Submitter Information Verification

Submitter Full Name: Chris Aiken
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Street Address: 
City: 
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Submittal Date: Fri Nov 15 12:12:58 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The focus of the standard is combustible dust, however it is important at the same time to be aware of other hazards as well. The Committee does not support the proposed changes.
It is essential to have thorough written documentation, as the slightest changes to procedures, processes, resources, staffing, and equipment, including equipment from suppliers, can have a dramatic impact on the overall hazard analysis. Change includes something as benign as process materials sourcing from a different manufacturer, the same raw material manufacturer using new methods to produce the product, or changes in formulation. These changes from a supplier’s end can impact the characteristics of the processes and materials. Individuals involved should include those involved in the process such as maintenance, engineering, and purchasing personnel, and all others as deemed necessary. Staffing and job tasks are not intended for shift changes, but for overall staff and their representative tasks... evaluate changes that may introduce new explosion risk from combustible dust. As an example changing the sourcing of combustible dust, the formulation of a combustible dust mixture or changes in the processing of combustible dust should be evaluated. The evaluation should be done by people qualified to understand and evaluate the risk. For reference, see the documentation form in ANSI/AIHA Z10-2012, Occupational Health and Safety Management Systems.

Statement of Problem and Substantiation for Public Comment

As written this is outside the scope of the standard. For example this standard does not include the "overall hazard analysis" of the facility/process. Modified to align with standard’s scope.

Submitter Information Verification

Submitter Full Name: Chris Aiken
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Street Address:
City:
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Submittal Date: Fri Nov 15 12:16:40 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee does not agree with the submitter's substantiation and does not support the proposed revision.
A.9.10.1(8)
Contractor records typically include information such as the contract documentation with scope of work and necessary insurance coverage, the contractor’s safety programs, records demonstrating the contractor’s safety performance, qualifications and certifications necessary for the work to be done, periodic evaluations of the contractor’s work performance, and records demonstrating that the employees of the contractor have been trained to safely perform the assigned work.

Statement of Problem and Substantiation for Public Comment
remove Insurance coverage as it is not necessary to manage combustible dust risks

Submitter Information Verification
Submitter Full Name: Chris Aiken
Organization: Cargill, Inc.
Street Address:
City:
State:
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Submittal Date: Fri Nov 15 12:18:01 EST 2013

Committee Statement
Committee Action: Rejected
Resolution: The Committee does not see the need to modify the annex based on the submitter's justification.
A.9.12 — .

Effective employee participation is an essential element of the Occupational Health and Safety Management System (OHSMS) to achieve continuous improvement in risk reduction, as described in ANSI/AIHA Z10-2012, *Occupational Health and Safety Management Systems.* The OHSMS ensures that employees and their authorized representatives are involved, informed, and trained on all aspects of health associated with their work, including emergency arrangements. Employee participation includes items such as, but not limited to the following:

1. Involving employees and their authorized representatives, where they exist, in establishing, maintaining, and evaluating the OHSMS
2. An occupational health and safety committee
3. Access to safety and health information
4. Risk assessment, and implementation and review of risk control measures
5. Incident and near-miss investigations
6. Inspections and audits
7. Reporting unsafe conditions, tools, equipment, and practices
8. Mentoring of new employees, apprentices, and for on-site orientation
9. Identifying hazards with strong emphasis on high-risk jobs and the application of the hierarchy of controls
10. In accordance with established and maintained procedures, appropriate arrangements will ensure that concerns, ideas, and input employees and their representatives share are received, considered, and responded to
11. Employees removing themselves from work situations that they have reasonable justification to believe present an imminent and serious danger to their safety or health

Employees who justifiably take those actions by notifying their supervisor should be protected from discrimination by removing those barriers as outlined in the OSHMS.

Where this standard and annex refers to employees and their representatives (where representatives exist), the intention is that they should be consulted as the primary means to achieve appropriate participation in the development and implementation of all aspects of the OHSMS. In some instances, it might be appropriate to involve all employees and all representatives.
Employee participation is a key component of an OHSMS. When employees and their representatives are engaged and their contributions are taken seriously, they tend to be more satisfied and committed to the OHSMS, and the system is more effective. Engaging employees and their representatives in dialogue with management and each other about safety and health can lead to improved relationships, better overall communication, improved compliance, and reduced injury/illness/death rates. The improved morale translates to greater safety and health results.

Employees and their representatives need to be trained about how the OHSMS works and to evaluate it periodically to determine whether improvements need to be made. The information needs to be presented in a form and language that employees and their representatives easily understand. (See also A.9.8.4.)

Statement of Problem and Substantiation for Public Comment

While there can be no disagreement with the proposition that employee involvement in safety processes is critical, the proposals in this Annex section go well beyond the scope of NFPA 652, and can affect employer-employee relationships in ways not anticipated. Many of the items addressed in this section are covered by federal and state labor laws, and are inappropriate for NFPA to address. We recommend that this section of the Annex be removed.

Submitter Information Verification

Submitter Full Name: MARC FLEISCHAKER
Organization: ARENT FOX LLP
Affiliation: NOPA, NGFA, IOMSA
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Submittal Date: Wed Nov 13 17:00:42 EST 2013

Committee Statement

Committee Action: Rejected
Resolution: The Committee believes the information in this annex is useful in support of the mandatory section concerning employee involvement and prefers to retain it as informative content with the standard as part of this annex.
B.1 Introduction.
This annex is intended to illustrate one example of how to develop a process hazard analysis for a facility. There are other methods to develop a process hazard analysis that include, but are not limited to, "what-if" analysis, failure mode and effects analysis, fault tree analysis, "Haz-Op," etc. Additional guidance on performing a process hazard analysis is available in the NFPA Guide to Combustible Dusts. It is not the intent of this standard to require all users to comply with OSHA Process Safety Management Regulation. The requirement is intentionally vague to allow users to match the complexity and extent of the analysis to the complexity and extent of the facility and its process.

B.1 Introduction, Revised text

Comment: This section should be revised as follows:

B.1 Introduction.
This annex is intended to illustrate one example of how to develop a process hazard analysis for a facility. There are other methods to develop a process hazard analysis that include, but are not limited to, "what-if" analysis, failure mode and effects analysis, fault tree analysis, "Haz-Op," etc. Additional guidance on performing a process hazard analysis is available in the NFPA Guide to Combustible Dusts, and also in the AIChE CCPS Guideline for Hazard Evaluation Procedures (3rd Edition, 2008). It is not the intent of this standard to require all users to comply with OSHA Process Safety Management Standard in developing a process hazard analysis under this standard. The process hazard analysis requirement of this standard is written in performance-based language, intentionally vague, to allow users to match the complexity and extent of the analysis to the complexity and extent of the facility and its process.

Statement of Problem and Substantiation for Public Comment

Substantiation: The recommended language identifies a valuable additional reference for performing process hazard analyses and appropriately acknowledges that the process hazard analysis requirement is written in performance-based language rather than "intentionally vague language." The word "all" was struck to avoid the implication that most but not all users would be expected to apply the PHA provisions of the OSHA Process Safety Management Standard.

Submitter Information Verification
Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.
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Submittal Date: Fri Nov 08 16:40:45 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-103-NFPA 652-2014
Statement: Substantiation: The recommended language identifies valuable additional references for performing process (dust) hazard analyses. The word “all” was struck to avoid the implication that most but not all users would be expected to apply the PHA provisions of the OSHA Process Safety Management Standard.
B.1 Introduction.
This annex is intended to illustrate one example of how to develop a process hazard analysis for a facility. There are other methods to develop a process hazard analysis that include, but are not limited to, "what-if" analysis, failure mode and effects analysis, fault tree analysis, "Haz-Op," etc. Additional guidance on performing a process hazard analysis is available in the NFPA Guide to Combustible Dusts. It is not the intent of this standard to require all users to comply with OSHA Process Safety Management Regulation. The requirement is intentionally vague to allow users to match the complexity and extent of the analysis to the complexity and extent of the facility and its process.

B.1 Introduction.
This annex is intended to illustrate one example of how to develop a process hazard analysis for a facility. There are other methods to develop a process hazard analysis that include, but are not limited to, "what-if" analysis, failure mode and effects analysis, fault tree analysis, "Haz-Op," etc. Additional guidance on performing a process hazard analysis is available in the NFPA Guide to Combustible Dusts, and also in the AIChE CCPS Guideline for Hazard Evaluation Procedures (3rd Edition, 2008). It is not the intent of this standard to require all users to apply the PHA provisions of the OSHA Process Safety Management Standard in developing a process hazard analysis under this standard. The process hazard analysis requirement of this standard is written in performance-based language, intentionally vague to allow users to match the complexity and extent of the analysis to the complexity and extent of the facility and its process.

Statement of Problem and Substantiation for Public Comment
Substantiation: The recommended language identifies a valuable additional reference for performing process hazard analyses and appropriately acknowledges that the process hazard analysis requirement is written in performance-based language rather than "intentionally vague language." The word "all" was struck to avoid the implication that most but not all users would be expected to apply the PHA provisions of the OSHA Process Safety Management Standard.

Submitter Information Verification
Submitter Full Name: Stan Lancey
Organization: American Forest & Paper Ass
Affiliation: These materials were developed through a cooperative effort involving AF&PA/AWC’s outside counsel, Lawrence P. Halprin of Keller and Heckman LLP, AF&PA/AWC staff and AF&PA/AWC member company representatives. These comments also reflect input we received from other trade associations.

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-103-NFPA 652-2014
Statement: Substantiation: The recommended language identifies valuable additional references for performing process (dust) hazard analyses. The word “all” was struck to avoid the implication that most but not all users would be expected to apply the PHA provisions of the OSHA Process Safety Management Standard.
Public Comment No. 229-NFPA 652-2013 [ Section No. B.1 ]

B.1 Introduction.
This annex is intended to illustrate one example of how to develop a process hazard analysis for a facility. There are other methods to develop a process hazard analysis that include, but are not limited to, "what-if" analysis, failure mode and effects analysis, fault tree analysis, "Haz-Op," etc. Additional guidance on performing a process hazard analysis is available in the NFPA Guide to Combustible Dusts. It is not the intent of this standard to require all users to comply with OSHA Process Safety Management Regulation. The requirement is intentionally vague to allow users to match the complexity and extent of the analysis to the complexity and extent of the facility and its process.

Comment: This section should be revised as follows:

B.1 Introduction.

This annex is intended to illustrate one example of how to develop a process hazard analysis for a facility. There are other methods to develop a process hazard analysis that include, but are not limited to, "what-if" analysis, failure mode and effects analysis, fault tree analysis, "Haz-Op," etc. Additional guidance on performing a process hazard analysis is available in the NFPA Guide to Combustible Dusts, and also in the AIChE CCPS Guideline for Hazard Evaluation Procedures (3rd Edition, 2008). It is not the intent of this standard to require all users to comply with OSHA Process Safety Management Standard in developing a process hazard analysis under this standard Regulation. The process hazard analysis requirement of this standard is written in performance-based language intentionally vague to allow users to match the complexity and extent of the analysis to the complexity and extent of the facility and its process.

Statement of Problem and Substantiation for Public Comment

Substantiation: The recommended language identifies a valuable additional reference for performing process hazard analyses and appropriately acknowledges that the process hazard analysis requirement is written in performance-based language rather than "intentionally vague language." The word "all" was struck to avoid the implication that most but not all users would be expected to apply the PHA provisions of the OSHA Process Safety Management Standard.

Submitter Information Verification
**Committee Statement**

<table>
<thead>
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<th>Rejected but see related SR</th>
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<td>SR-103-NFPA 652-2014</td>
</tr>
<tr>
<td>Statement</td>
<td>Substantiation: The recommended language identifies valuable additional references for performing process (dust) hazard analyses. The word “all” was struck to avoid the implication that most but not all users would be expected to apply the PHA provisions of the OSHA Process Safety Management Standard.</td>
</tr>
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</table>
B.1 Introduction.

This annex is intended to illustrate one example of how to develop a process hazard analysis for a facility. There are other methods to develop a process hazard analysis that include, but are not limited to, "what-if" analysis, failure mode and effects analysis, "Haz-Op," etc. Additional guidance on performing a process hazard analysis is available in the NFPA Guide to Combustible Dusts and also in the AIChE CCPS Guideline for Hazard Evaluation Procedures (3rd Edition, 2008). It is not the intent of this standard to require all users to comply with the PHA provisions of the OSHA Process Safety Management Regulation Standard in developing a process hazard analysis under this standard. The process hazard analysis requirement is intentionally vague of this standard is written in performance-based language to allow users to match the complexity and extent of the analysis to the complexity and extent of the facility and its process.

Statement of Problem and Substantiation for Public Comment

The recommended language identifies a valuable additional reference for performing process hazard analyses and appropriately acknowledges that the process hazard analysis requirement is written in performance-based language rather than "intentionally vague language." The word "all" was struck to avoid the implication that most but not all users would be expected to apply the PHA provisions of the OSHA Process Safety Management Standard.

Submitter Information Verification

Submitter Full Name: MARIE MARTINKO
Organization: SPI
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Submittal Date: Wed Nov 13 14:55:53 EST 2013

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-103-NFPA 652-2014
Statement: Substantiation: The recommended language identifies valuable additional references for performing process (dust) hazard analyses. The word "all" was struck to avoid the implication that most but not all users would be expected to apply the PHA provisions of the OSHA Process Safety Management Standard.
B.1 Introduction.
This annex is intended to illustrate one example of how to develop a process hazard analysis for a facility. There are other methods to provide examples of risk mitigation techniques that could be used by the user when a hazard analysis identifies a risk that needs further mitigation. There are methods to develop a process hazard analysis that include, but are not limited to, "what-if" analysis, failure mode and effects analysis, fault tree analysis, "Haz-Op," etc. Additional guidance on performing a process hazard analysis is available in the NFPA Guide to Combustible Dusts. It is not the intent of this standard to require all users to comply with OSHA Process Safety Management Regulation. The requirement is intentionally vague to allow users to match the complexity and extent of the analysis to the complexity and extent of the facility and its process.

Statement of Problem and Substantiation for Public Comment
My proposal is to change this annex from example of a hazard analysis to risk mitigation techniques for combustible dust. The example is well intentioned but is missing a fundamental piece of defining the risk - the consequence stops a deflagration implying all deflagrations have the same outcome and the likelihood of occurrence is also missing. This is a complex topic and books are written around this subject. Therefore suggest that this annex is modified to provide examples of mitigation techniques to combustible dust hazards which would better support a user in a hazard analysis.

Submitter Information Verification
Submitter Full Name: Chris Aiken
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City:
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Submittal Date: Fri Nov 15 12:49:21 EST 2013

Committee Statement
Committee Action: Rejected but see related SR
Resolution: SR-103-NFPA 652-2014
Statement: Substantiation: The recommended language identifies valuable additional references for performing process (dust) hazard analyses. The word “all” was struck to avoid the implication that most but not all users would be expected to apply the PHA provisions of the OSHA Process Safety Management Standard.
B.4.5 Each point in the process is identified and considered a “compartment” in which a deflagration could occur, as follows:

1. Each duct
2. Each conveyor
3. Each silo, bunker, or other vessel
4. Each fan
5. Each piece of process equipment

Usually a volume exemption of \&frac{1}{12} ft^3 (0.2-3 m^3) or smaller is applied to enclosed pieces of process equipment in deflagration hazard management. This exemption comes from the difficulty in designing deflagration suppression for vessels that size, as well as the modest hazard such small vessels represent. Assuming an \&frac{1}{12}-to-1 volumetric expansion from a dust deflagration, an \&frac{1}{12} ft^3 (0.2-3 m^3) enclosure will yield a fireball volume of approximately 64.144 ft^3 (4.18 m^3), the volume of a 10 ft (3 m) diameter sphere. This is the estimated maximum extent of the fireball volume. This fact can be used to select the parts of the process system to be considered in the analysis. If a piece of process equipment includes a column of less than \&frac{1}{12} ft^3 (0.2m-3 m^3), it should be documented as such in the process hazard analysis.

The process hazard analysis also considers the building compartment (room) where combustible particulates are being handled or processed. These compartments should be evaluated for both deflagration hazard and building rupture/collapse (explosion) hazard. (See Figure B.4.5.)

Figure B.4.5 An Example Process. (Source: J.M. Cholin Consultants, Inc.)

B.4.5.1 Location 1: Off-Load Duct to Off-Load Fan.

B.4.5.1.1 Is the particulate deflagrable (explosible)? The ability to propagate a deflagration flame front is the artifact of material chemistry – how much heat is released per unit of mass when it burns – and particle size. What are the deflagration metrics for this material? Has the material been tested for MEC, MIE, K_{St}, and P_{max}? Depending upon the material, other data might be necessary.
Currently, ASTM E 1226, \textit{Standard Test Method for Explosibility of Dust Clouds}, includes a screening test to determine if the particulate is capable of propagating a deflagration. However, often the average particle size is used as a first order estimate. Some standards use a nominal average particle size of 500 microns as the dividing line. Wood hogs generally have screens that produce particulates between 0.25 in. and 1.00 in. in largest particle dimension. This is substantially greater than 500 micron. While the particulate is all mixed together, it is probably not deflagrable (explosible). So, for this example the answer is no. But if the particulate is allowed to separate on the basis of size, the “fines” content will probably change the conclusion.

While sieve analysis cannot be relied upon as the sole hazard identification means, it is useful for informing the analysis. There isn't yet reported research that serves as a basis for establishing a percentage of fine particulate versus coarse particulate sufficient to propagate a flame front.

\textbf{B.4.5.1.2}
Is the particulate suspended in air? Since a fan is used to suck this material through a duct the answer is yes.

\textbf{B.4.5.1.3}
Is there sufficient concentration to propagate a flame front? At this point in the process, a sieve analysis of the process stream could provide some additional information. If the dust concentration exceeds the MEC of the dust, then there is the potential for flame propagation. However, large particles are quenching surfaces and inhibit flame propagation. In the mixture used in this example it is not likely.

\textbf{B.4.5.1.4}
Are there competent igniters available? Yes. The material could have been ignited as it was loaded into the railcar or truck trailer. (This has happened.) Tramp metal could be present in the particulate that can strike sparks as it hits the wall of the duct.

\textbf{B.4.5.1.5}
What hazard management is in place? Is there metal detection, spark detection, bonding and grounding, or other hazard management means in place?

\textbf{B.4.5.2 Location 2: Off-Load Fan.}

\textbf{B.4.5.2.1}
Is the particulate deflagrable (explosible)? This the same material as in \textbf{B.4.5.1.1}.

\textbf{B.4.5.2.2}
Is the particulate suspended in air? Yes, same as \textbf{B.4.5.1.2}.

\textbf{B.4.5.2.3}
Is there sufficient concentration to propagate a flame front? Maybe, same as \textbf{B.4.5.1.3}.

\textbf{B.4.5.2.4}
Are there competent igniters available? Yes. In addition to the ones identified in \textbf{B.4.5.1.4}, the fan introduces a number of ignition mechanisms.

\textbf{B.4.5.2.5}
What hazard management is in place? This is the same as in \textbf{B.4.5.1.5}. It is difficult to apply hazard management to a material conveyance fan. Usually hazard management is applied downstream from the fan.

\textbf{B.4.5.3 Location 3: Duct from Fan to Cyclone.}

\textbf{B.4.5.3.1}
Is the particulate deflagrable (explosible)? This the same material as in B.4.5.1.1. However, the fan will cause particle attrition, increasing the relative concentration of fine particulate in the mixture. How much it is increased is not known unless a sieve analysis comparing material before and after the fan is conducted.

B.4.5.3.2

Is the particulate suspended in air? Yes, same as B.4.5.1.2.

B.4.5.3.3

Is there sufficient concentration to propagate a flame front? Maybe, same as B.4.5.1.3, with the caveat that fan produced particle attrition will increase the fines content.

B.4.5.3.4

Are there competent igniters available? Yes. In addition to those from the in-feed duct there are those from the fan. Often a spark detection and extinguishment system is used to detect and quench sparks and burning material before it gets to a location where these could serve as an ignition source for a dust deflagration.

B.4.5.3.5

What hazard management is in place? Is there spark detection and extinguishment? Is there metal detection?

B.4.5.4 Location 4: Cyclone.

Cyclones are designed to use particulate inertia to separate the particulate from the conveyance air. Deflagrations can occur in cyclones. Cyclones intentionally concentrate particulate near the perimeter of the cyclone. Cyclones also cause the large particles to separate from the fine material. Both of these factors increase the likelihood that a portion of the volume within the cyclone will have conditions sufficient for a deflagration. (See Figure B.4.5.4.)

Figure B.4.5.4 The Operating Cyclone in Cross-Section. (Source: J.M. Cholin Consultants.)

B.4.5.4.1

Is the particulate deflagrable (explosible)? If there are any fines in the process particulate they will be separated, at least partially, from the larger particulates and concentrated by the cyclone. Since the fan creates fines and there is particle attrition as particulate goes rattling up the duct the likely conclusion is: yes.

B.4.5.4.2

Is the particulate suspended in air? Yes.

B.4.5.4.3

Is there sufficient concentration to propagate a flame front? Probably, and that translates to a yes. This depends on the quantity of fine, deflagrable (explosible) particulate per unit of mass of total particulate moved and the volume of air to move it. Calculations should be performed to determine if there is sufficient fine material per unit of air volume under the range of operating conditions achieve a concentration of deflagrable particulate in excess of the MEC and render the cyclone an explosion hazard.

B.4.5.4.4
Are there competent igniters available? Yes. All of the ignition sources identified in the earlier portions of the system will be sending the ignited particulate to the cyclone. Therefore, there is no alternative but to consider the cyclone an explosion hazard — all four necessary criteria for a deflagration are satisfied in the cyclone.

**B.4.5.4.5**

What hazard management is in place? The cyclone should be equipped with deflagration hazard management. This usually takes the form of venting and isolation but might also take the form of deflagration suppression and isolation. It is possible that the rotary air lock at the base of the cyclone is sufficient to serve as an isolation device.

If the system is shut down and there is burning material in the hopper section (base) of the cyclone, how is that managed? Most explosions result from deflagrations that are initiated by ongoing fires. Is there any fire detection in place? What is the plan if a fire is detected? (Dumping burning material into a silo is not an option.)

**B.4.5.5 Location 5: Storage Silo.**

Every storage vessel is a particle size separator. When a mixture of material is dumped into a silo, bin, bunker, and so forth, the large particulate falls rapidly to the bottom of the vessel while the fines are lifted up by the air being displaced by the large particulate. This creates a cloud of fine dust in the ullage space, above the settled material. If any burning material or matter at a temperature above the auto-ignition temperature of the fine dust passes through this cloud, a deflagration is likely to result. *(See Figure B.4.5.5.)*

**Figure B.4.5.5 A Silo Serves as a Particle Size Separator and Becomes an Explosion Hazard Courtesy: J.M.Cholin Consultants, Inc.**

**B.4.5.5.1**

Is the particulate deflagrable (explosible)? Yes. The fines have separated from the coarse material and are suspended in a cloud in the ullage space.

**B.4.5.5.2**

Is the particulate suspended in air? Yes. The large particulate falls faster than the fines due to its lower Reynolds Number. The large particulate displaces air where it accumulates in the silo, producing an upward air current that keeps the fine particulate suspended. The more material that is introduced into the silo, the greater the concentration of dust in that cloud.

**B.4.5.5.3**

Is there sufficient concentration to propagate a flame front? Eventually, Yes. The large particulate displaces air where it accumulates in the silo, producing an upward air current that keeps the fine particulate suspended. The more material that is introduced into the silo the greater the concentration of dust in that cloud.
Are there competent igniters available? Yes. All of the ignition sources identified in the earlier portions of the system send the ignited particulate through the cyclone and on to the silo. The rotary air lock at the base of the cyclone hopper section can also be an ignition source in some cases where tramp metal has been introduced in the process stream. Therefore, there is no alternative but to consider the silo an explosion hazard — all four necessary criteria for a deflagration are satisfied in the cyclone.

B.4.5.5
What hazard management is in place? The silo should be equipped with deflagration hazard management. This usually takes the form of venting and isolation but might also take the form of deflagration suppression and isolation. It is possible that the rotary air lock at the base of the cyclone is sufficient to serve as an isolation device. It is also likely that the mass of material in the bottom of the silo will serve as isolation.

B.4.5.6 Location 7: The Out-Feed Screw Conveyor.
B.4.5.6.1
Is the particulate deflagrable (explosible)? The material moving through this conveyor is a mixture of the large chips and the fine dust that eventually settled from the ullage space. So, there is a deflagrable (explosible) fraction included in the coarse material. The question is whether that fine fraction can become suspended.

B.4.5.6.2
Is the particulate suspended in air? It depends on the screw conveyor. Usually materials only fill the bottom half of a screw conveyor. There are exceptions. If the screw conveyor is rotating slowly, the rotation of the flight does not lift the fine material and put it into air suspension in the upper half of the conveyor interior. If the screw conveyor is operating at a high speed, then the rotation of the flight will suspend material above the central axis of the screw and produce a dust suspension within the screw conveyor. We have to assume this is the case unless we can prove otherwise. Generally, the speed of the edge of the conveyor flight will attain speeds on the order of 16.5 ft/sec (5 m/sec) to achieve a sustained dust cloud. (This number is half the minimum air entrainment value reported for glass microspheres in Towards Estimating Entrainment Fraction for Dust Layers, Erdem Ural, Fire Protection Research Foundation, June 2011. See also NFPA 68, Standard on Explosion Protection by Deflagration Venting.)

B.4.5.6.3
Is there sufficient concentration to support a deflagration? The fine dust is remixed with the coarse material so the concentration is a function of the percentage of the material that is the fine fraction and the air volume in the screw conveyor. If this concentration can exceed 25 percent of the MEC, then one can assume that there is sufficient concentration to propagate a deflagration.

B.4.5.6.4
Are there competent igniters available? Yes. It is quite possible that burning material was loaded into the silo; wood particulates are notorious for sustaining a smoldering combustion process for extended periods of time. Furthermore, the screw conveyor has bearings. Many screw conveyors have hanger bearings that are in the material stream and are potential ignition sources.

Consequently, it is very likely that if the speed of the screw is sufficient, the screw conveyor will be designated as a deflagration hazard and explosion management provisions will be necessary.

B.4.5.6.5
What hazard management is in place? Deflagration suppression and isolation is generally needed on high-speed screws. However, it might be possible to manage the hazard by replacing the screw with one that has a larger diameter but operates too slowly to produce a dust suspension. Sometimes changing the process or process equipment can reduce or eliminate the hazard, and that might be the best strategy.

**B.4.5.7** Location 8: The Mill and Discharge Fan. While the drawing shows these as separate components, most mills have an integral discharge fan.

**B.4.5.7.1** Is the particulate deflagrable (explosible)? It depends. What is the target product particle size? If the mill has 1/4 in. screens, then the unit is receiving large particles and making them less large, but they're still too large to be considered a deflagrable (explosible) particulate. But there are also included fines. If the mill is reducing the particulate down to 250 μ, then all of the particulate would be considered deflagrable (explosible). So the determination for whether the particulate in the mill is deflagrable is based on the range of particle size exiting the mill. It is usually necessary to submit this material for a go/no-go screening test to determine if the mixture exiting the mill is capable of propagating a deflagration flame front.

**B.4.5.7.2** Is the particulate suspended in air? Yes. Inside the mill the particulate is in continuous air suspension.

**B.4.5.7.3** Is there sufficient concentration to support deflagration? This again depends on the test data and a sieve analysis. Remember that while a sieve analysis is not a definitive criterion for identifying whether a particulate is deflagrable (explosible), it is a very valuable tool for identifying changes that have occurred in the process that signify an change in the hazard associated with the particulate. It is a management of change and safety assessment audit tool.

**B.4.5.7.4** Are there competent igniters available? Most mills are capable of igniting the material being milled. If tramp metal gets into the process stream it is likely that the particulate will exit burning, at the very least.

**B.4.5.7.5** What hazard management is in place? Are there magnetic separators or traps on the in-feed to the mill? Is there deflagration suppression and isolation on the mill? Even if the mill is designed strong enough to withstand a deflagration within it (many are), the deflagration flame front will exit the mill via the in-feed and out-feed. What provisions are in place to isolate the mill from the rest of the process?

**B.4.5.8** Location 9: The Mill Discharge Duct to Screens.

**B.4.5.8.1** Is the particulate deflagrable (explosible)? *(See B.4.5.7.1.)* If the material is deflagrable this duct can pose a significant hazard.

**B.4.5.8.2** Is the particulate suspended in air? Yes. It is a pneumatic conveying duct — but what kind? If it is a dilute-phase conveying duct, then the material is suspended in air and the level of concentration becomes an important issue. However, if the plant is designed with a dense-phase or semi-dense-phase conveying system at this location, then the material does not move as an air suspension but as a region of concentrated material that usually does not represent a deflagration hazard in the duct under normal operating conditions.
Is there sufficient concentration to support a deflagration? If the duct is part of a dilute phase conveying setup, then the duct must be considered a deflagration hazard if the concentration exceeds 25 percent of the MEC for the material in the duct. If the material is tested and it does not propagate a deflagration flame front, then concentration ceases to be an issue. But if the material in the duct can propagate a deflagration flame front, then the concentration must be limited by the system design, or deflagration hazard management must be applied to the duct.

**B.4.5.8.4**
Are there competent igniters available? Yes. This duct is immediately downstream from the mill, which can be a source of ignition.

**B.4.5.8.5**
What hazard management is in place? If the particulate is sufficiently small enough to produce an affirmative test for deflagration flame front propagation, then the entire duct represents an explosion hazard, and that hazard must be managed. If it does not, either because the particulate is not deflagrable or dense-phase conveying is being used, then it does not. The analysis should document whether the duct is a deflagration hazard and if it is, how that hazard is being managed.

**B.4.5.9** Location 10: The Screens.

**B.4.5.9.1**
Is the particulate deflagrable (explosible)? This is the same particulate that is exiting the mill, so that analysis is applicable to the screens.

**B.4.5.9.2**
Is the particulate suspended in air? This depends on the type, make, and model of the screens used. Some agitate the material more aggressively than others. An analysis of the operating screens for the presence of a dust suspension should be undertaken to determine if this criterion is satisfied.

Most screens leak dust into the building interior, and that issue has to be addressed.

**B.4.5.9.3**
Is there sufficient concentration to support deflagration? This criterion is again determined by the fraction of the process particulate that is sufficiently small to propagate a dust deflagration flame front. Note that the screens are equipped with dust collection. What is the air flow rate for the dust collection? What is the fraction of the particulate that is sufficiently small to propagate a deflagration flame front? How much of that dust is captured by the dust collection system? There are cases where a deflagration hazard has been successfully managed by just keeping the concentration below the 25 percent MEC threshold with active dust collection.

**B.4.5.9.4**
Are there competent igniters available? This depends on the type of screens used. Usually the bearings and moving members are located outside of the material flow path. However, there are ignition sources upstream in the process that could be a source of burning material introduced onto the screens. Usually this poses a fire hazard rather a deflagration hazard. But that fire hazard must be managed.

**B.4.5.9.5**
What hazard management is in place? Depending on whether the screens are found to be a deflagration hazard or a fire hazard, different hazard management strategies will apply. The strategy employed and the reason for selecting that strategy should be documented.

**B.4.5.10**
This example includes other ducts, conveyors, and other process equipment that would be addressed in a manner similar to those already covered. However, there are two hazards that have not yet been addressed: the building compartment and the dust collector.
B.4.5.11 Location 2: The Building Compartment Housing the Process.
B.4.5.11.1
Is the particulate deflagrable (explosible)? There are a number of pieces of equipment that can leak dust. The leaks always constitute the fines fraction of the particulate being handled. In addition, air movement generally lifts the finest, most hazardous dust highest in the space. So the hazard assessment for the building compartment is based on the test data for the fine dust that is obtained from the highest locations in the building compartment.

Is there sufficient fugitive dust accumulation within the building to trigger the designation of deflagration hazard or flash-fire hazard in the building interior?

If the building compartment contains sufficient fugitive dust accumulations to warrant designating it a deflagration of flash-fire hazard, then the occupant must be protected from the building interior. This requires the use of flame-resistant garments and a housekeeping program. Venting is one common approach to protect against building collapse.

Furthermore, dust accumulations trigger requirements for using electrical equipment that is listed as suitable for Class II hazardous locations in accordance with Articles 500 through 506 of NFPA 70, National Electrical Code.

B.4.5.11.2
Is the particulate suspended in air? Most large-loss explosions involving combustible dust have occurred because a small event produced an ignition mechanism and a dust dispersion of the accumulated fugitive dust in the building interior.

B.4.5.11.3
Is there sufficient concentration to support a deflagration? Generally, the dust layer criteria in the occupancy standards are derived from calculations that take into consideration the requisite concentrations to propagate a flame front.

B.4.5.11.4
Are there competent igniters available? Under abnormal (accident) conditions the answer is usually yes.

B.4.5.11.5
What hazard management is in place? Deflagration venting for compartments is a common management strategy to preserve the building integrity. What provisions are in place to protect the employees from a propagating deflagration (flash fire)? Is the housekeeping program sufficient to prevent fugitive dust layer from developing over time?

B.4.5.12 The Dust Collector.
The dust collector in this example is located outside of the building, but it is equipped with a clean air return to the facility interior. This triggers the need to protect the employees within the facility compartment from a fire in the dust collector as well as a deflagration in the dust collector.

B.4.5.12.1
Is the particulate deflagrable (explosible)? Probably. This dust collector is collecting the fines that are generated by various process steps including the dust suspended in the silo ullage space, the silo discharge screw conveyor, the screens, and the product out-feed screw.

B.4.5.12.2
Is the particulate suspended in air? Yes. Dust collection systems are invariably designed as dilute phase conveying systems.

B.4.5.12.3
Is there sufficient concentration to support deflagration? Usually such dust collection systems operate at dust loadings in the ducts in the range of 1 to 3 g/m³; well below the 25 percent MEC range for most dusts. But this parameter must be verified and documented. So the ducts are probably not a deflagration hazard, but the dust collector’s job is to concentrate that dust. So an ignitable concentration of dust within the dust collector is probably certain.

B.4.5.12.4
Are there competent igniters available? Generally, yes. All of the ignition sources in the entire process have access to the dust collector via the dust collection ducts. While the concentration in those ducts is typically well below the MEC, there is always the potential for a burning particle to survive the trip from the point of ignition to the dust collector interior, where it can become attached to the filter media and ignite a fire. For many particulates there is an electrostatic ignition mechanism present. For others, the inherent reactivity of the particulate with atmospheric oxygen makes them inherently self-igniting. All of these sources of ignition have to be considered.

B.4.5.12.5
What hazard management is in place? The occupants must be protected from the dust collector — both the dust collector fire as well as the dust collector explosion. (In many industries dust collector fires outnumber dust collector explosions.) For dust collector fire, return air diversion to prevent combustion products from entering the building is sufficient. (Generally, dust collectors collecting metallic particulates are not permitted to return air to the building.) To protect occupants from the dust collector explosion, a common approach is to install deflagration isolation as well as either deflagration venting or deflagration suppression. The protection feature in place should be documented.

Statement of Problem and Substantiation for Public Comment

B.4.5 “... Usually a volume exemption of 8 12 ft³ (0.2 0.3 m³) or smaller is applied to enclosed pieces of process equipment in deflagration hazard management. ... Assuming an 8-to-1 to 12-to-1 volumetric expansion from a dust deflagration, an 8 12 ft³ (0.2 0.3 m³) enclosure will yield a fireball volume of approximately 64 144 ft³ (1.8 4.1 m³), the volume of a 10-ft (3 m) diameter sphere. ...If a piece of process equipment includes a column of less than 8 12 ft³ (0.2 0.3 m³), it should be documented as such in the process hazard analysis.”

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Committee Statement
<table>
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<tr>
<th>Committee Action:</th>
<th>Rejected</th>
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<tr>
<td>Resolution:</td>
<td>The proposed change to the annex has not been adequately substantiated with a clear technical basis for the change. The Committee does not agree with the proposed changes so no revision is being made at this time.</td>
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Annex C – Accumulated Fugitive Dust -
C.1 – Accumulated Fugitive Dust.
[Need to add a text reference to the figure.]

1. The single most important factor in propagating a deflagration within a building.
2. Dust layers trigger critical hazard management decisions.
3. See NFPA 499.
4. Electrical Equipment for Hazardous Occupancies.
5. All electrical equipment must be “listed” for use in the occupancy based upon the Class, Division and Group classification.
6. When all electrical equipment in the occupancy is listed for use in that occupancy the electrical system is not deemed to be a likely igniter.
7. The extent of the electrically classified area is controlled by the rate of dust release and the frequency of clean-up.

Figure C.1 Comparison of Accumulated Fugitive Dust Thicknesses.
(Source: J.M. Cholin Consultants, Inc.)

Process Building Compartments -

1. Where the management of the hazard is dependent upon routine cleaning, that cleaning program should be outlined in the PHA.
2. Where the management of the hazard is dependent upon routine cleaning, that cleaning program should be outlined in the PHA.
3. Explosion Hazards.
4. Dust explosion hazards exist where ever combustible particulate solids are handled or produced.
5. There is no alternative to pro-actively managing the hazard.
6. Is there accumulated fugitive dust? If so – how much and where is it?
7. What is the MEC, MIE and $K_S$, of the particulate in the duct?
8. Does the building compartment pose a deflagration hazard?
9. Does it pose and explosion hazard?
(10) Does it pose a fire hazard?
(11) The majority of the property damage and personnel injury is due to the fugitive dust accumulations within the building or process compartment.

Control, limitation, or elimination of accumulated fugitive dust is CRITICAL and the single most important criterion for a safe workplace.

Statement of Problem and Substantiation for Public Comment

It is difficult to ascertain the purpose of this Annex. The graph apparently has been developed by J.M. Cholin Consultants, Inc., but there is no indication whether the graph has been peer-reviewed, or otherwise tested for its validity. Graphs and analyses such as this should not be included in an NFPA document unless they have been generally accepted in the technical community. There is no indication of that here. Therefore, this Annex should be deleted.

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Committee Statement

Committee Action: Rejected
Resolution: The graph is a representation of the provisions in the National Electrical Code (NEC), NFPA 70, Article 500 - 505 and NFPA 499. It is not an experimental representation and does not need to be peer-reviewed. The Committee has retained Annex C. The Committee has revised Figure C.1 in a separate SR to better depict the information provided by the graph.