National Fire Protection Association

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M E M O R A N D U M

TO: NFPA Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases

FROM: Joanne Goyette

DATE: April 20, 2011

SUBJECT: NFPA 654 ROP **TC FINAL** Ballot Results (A2012)

The Final Results of the NFPA 654 ROP Letter Ballot are as follows:

30 **Members Eligible to Vote**
1 **Not Returned** (G. Navas)
16 **Affirmative on All**
11 **Negatives** (J. Cholin, H. Febo, J. Osborn, M. Runyon, T. Scherpa, T. Slavin, J. Sutton, T. Thomas, E. Ural, S. Rodgers, and B. Chastain) (on one or more proposals as noted in the attached report)
2 **Abstentions** (V. Ebadat and P. Hart) (on one or more proposals as noted in the attached report)

There are two criteria necessary to pass ballot [(1) affirmative $^{2}/_{3}$ vote and (2) simple majority].

(1) The number of affirmative votes needed for the proposal/comment to pass is **18.**
30 eligible to vote - 1 not returned - 2 abstentions = 27 × 0.66 = 17.82

(2) In all cases, an affirmative vote of at least a simple majority of the total membership eligible to vote is required. This is the calculation for simple majority:
[30 eligible ÷ 2 = 15 + 1 = **(16)**]

Reasons for negative votes, etc. from alternate members are not included unless the ballot from the principal member was not received.

According to the final ballot results, all ballot items received the necessary $^{2}/_{3}$ required affirmative votes to pass ballot.

Document # 654

654-1 Entire Document (Log # CP1)

Affirmative with Comment

Ebadat, V. Add NFPA 499 to the list as section 6.6 of NFPA 654 covers electrical equipment and section A.6.6.2 refers to NFPA 499.

654-2 Entire Document (Log # CP25)

Affirmative with Comment

Ebadat, V. We should define explosion "scenario"

Sutton, J. A.7.13.1.1.2 could be eliminated as the reference to NFPA 68 is no longer needed.

654-4 1.4.1 (Log # CP3)

Negative

Scherpa, T. While the spray nozzles and perhaps spray booths are unique to the industry, the supply equipment upstream of the nozzle and the dust collection equipment downstream is similar to that used by other industries covered by NFPA 654. While several of the standards in the exempted list address materials with ‘atypical’ physical properties such as agricultural dusts (NFPA 61), wood dust (NFPA 664), sulfur (NFPA 655), and combustible metal dusts (NFPA 484), the materials handled in spray coating applications are not atypical.

654-5 1.5.1 (Log # 11)

Negative

Chastain, B. I agree with John Cholin's previous negative vote and substantiation. Clarification is needed to avoid unnecessary litigation and user costs of such litigation.

Cholin, J. The retroactivity provision as currently worded is in conflict with the OSH Act of 1970 which does NOT have a grandfather provision like the model building codes. Failure to clarify this in the document leads to unnecessary litigation an exposes users the costs of such litigation.

654-6 Chapter 3 Various Definitions (New) (Log # 28)

Affirmative with Comment

Chastain, B. Pred definition is included in the definitions but not Pstat. Recommend that the definition of "Pstat" be included in the definitions following the definition of Vented Explosion Pressure (Pred).
Recommended definition: Pstat, pressure. The pressure at which the explosion relief panel is designed to open in the event of a developing explosion (usually 0.1 barg).
Also recommend "dense phase" pneumatic conveying and "dilute phase" pneumatic conveying be defined as they are used in the document with no explicit definition provided.
Include definition for "wet air-material separator" that is used in Section 7.13.1.1.2(3).

654-7 3.3.2 Air Material Separator (AMS) and A.3.3.2 (Log # CP11)

Negative

Slavin, T. The proposed change broadens coverage to include devices such as acid scrubbers that should be beyond the scope of this standard. Need to insert word "particulate" in front of "material" in the first line.

654-8 3.3.4 Combustible Dust (Log # CP5)

Negative

Cholin, J. The term "flash fire" is only commonly used in the process chemical industry and the context in which it is currently used does not seem to contemplate the entrainment of accumulated fugitive dust that then propagates the deflagration through a much larger portion of the facility, compartment or other enclosure than would have occurred without the entrainment. I do not object to any other aspect of the committee action.

Slavin, T. As changed this indicates that results of ASTM 1226 (despite the word "screening") would by itself determine that a dust was combustible. I do not believe it is the intent of the committee, but is the conclusion derived form the current wording. This needs to be clarified that the screening test may exclude a given dust sample as non-combustible, and that if positive, other properties determined from the list of tests may be used in the evaluation.

Ural, E. Also mention process specific conditions (e.g. T&P).

654-10 3.3.8 Deflagration Hazard (Log # 13)

Negative

Cholin, J. The proposed definition provides a simple, clear explanation of a concept that is critical in managing the hazards covered by the scope of the document. Failure to view compartments as deflagration hazards on the basis proposed is the single greatest contributor to the loss of life and property damage from dust explosions. There is no loss history to warrant a more complex approach for hazard assessment.

654-11 3.3.10 Duct (Log # CP14)

Negative

Chastain, B. I agree with V. Ebadat and H Febo previous negative comments and substantiations. The "duct" definition should be retained in the definitions.

Ebadat, V. There are at least 15 mentions of "duct" in this standard. Thus definition should be retained and probably expanded.

Febo, Jr., H. Duct is used dozens of times in 654 and keeping the definition in the document saves users the trouble of having to get NFPA 91, if one knows that is where to find the definition, to determine what 654 means by the term duct.

654-12 3.3.11 Dust Collection System (Log # CP13)

Negative

Chastain, B. I agree with J. Osborn's previous negative vote related to the need for the standard to distinguish between a "high pressure" pneumatic transfer system and "low pressure" dust collection system within the definition of Dust Collection System in section 3.3.11 and Air Material Separator in section 3.3.2.. This will aid the user's understanding of the differences between these systems. Additionally, follow-on prescriptive requirements addressing the "high pressure" pneumatic transfer system are recommended and appropriately differentiated between the requirements for "low pressure" dust collection mandatory text and possibly annex material.

Osborn, J. There is distinct confusion in the industry in regard to what is a dust collection system vs. a pneumatic transfer system vs. a centralized vacuum cleaning system. Each has highly differentiated design, function, and operational characteristics that do not correctly relate to the "overall" definitions and descriptions provided in the 654 document. To serve the users of this document properly it is necessary to consider these differences and make the users aware of the effects and affects resulting. Further comment will be provided at a later date, corresponding to the committee's encouragement for such responses.

Affirmative with Comment

Febo, Jr., H. I see potential for confusion with application of requirements for conveying and collection systems as I believe there should be some differences. I'm not convinced the rejected proposal clarifies the issues completely nor is it clear from my experience that the current text is being mishandled by users.

654-14 3.3.14.1 FIBC and 9.3.3.1 (Log # CP38)

Affirmative with Comment

Febo, Jr., H. There have been improvements in the knowledge of FIBC since the last revision of 654. Updating seems in order but my knowledge is not sufficient to conclude whether or not the suggested text is "not sufficiently formed and substantiated" since the source material, an IEC code, could be considered authoritative

654-15 3.3.x Enclosureless Dust Collector (New) (Log # CP12)

Negative

Runyon, M. Although accepted by the committee and NFPA 664, the allowance of a dust collector in the building presents in my opinion a personnel and property risk.

654-16 3.3.x Flash Fire (New) (Log # CP6)

Affirmative with Comment

Chastain, B. I agree with V. Ebadat affirmative with comment vote related to limiting definition to dusts. Consider the following revision: **3.3.13* Flash Fire.** A fire that spreads rapidly through a diffuse fuel, such as combustible dust or a mixture of dust, vapor, gas, or mist of a hybrid mixture, without the production of damaging pressure.

Ebadat, V. Shouldn't this discussion be limited to combustible dusts? Thus, the reference to hydrocarbon, gas, and vapor would be removed, and LFL replaced by MEC.

654-17 3.3.x Deflagration Hazard Area, Dust Explosion Hazard, Area, and Dust Flash Fire Hazard (Log # CP9)

Negative

Ural, E. Remove the word "unvented" from the first definition. Also, the combustible dust quantity in this definition should parallel that in the second definition (e.g. dust accumulation on exposed or concealed surfaces, outside of equipment or containers, AND dust clouds of a hazardous concentration that exist during normal operation)

Affirmative with Comment

Hart, P. 3.3.x.2: The term 'hazardous concentration' is subjective and open to interpretation. Would it be more appropriate to indicate 'where dust clouds exceeding the meeting or exceeding the material's MEC exist...'

654-18 4.2 and 8.2.1.2 (Log # 35)

Negative

Chastain, B. I agree with V. Ebadat's negative vote and substantiation. New paragraph 4.2.3 should be removed from the standard to allow for a multi-step procedure for hazard analysis -- rather than the overly prescriptive, definitive "go/no-go criterion" contained in 4.2.3.

Ebadat, V. The purpose of analyzing a process for hazards is to reduce or eliminate the threats to people and property that might arise from inadequate control of processes or of the materials that are involved in processes. The analysis involves identification of hazards, estimation of the likelihood of occurrence of hazardous events, evaluation of the adequacy of existing hazard controls, and recommendations for correction of inadequate controls. Thus, the risks associated with potentially-hazardous processes can be minimized.

The present wording of paragraph 4.2.3 in the proposed draft of NFPA 654 does not allow for this multi-step procedure for analysis of hazards. Rather, it stipulates a “go/no-go” criterion for hazard assessment: if the dust layer is less than the calculated value, there is no hazard, and no need for further risk-mitigation effort; if the dust layer exceeds this calculated value, the process is considered to be hazardous, and further effort in reducing the likelihood of ignition or protection of personnel, as examples, would not be fruitful.

The process hazards analysis team should be permitted to utilize the properties of a dust, nature/type of operation, processing equipment used, etc., in determining whether or not a fire or explosion hazard exists, rather than be constrained to a calculation of a dust-layer thickness. For example, the concept of “Ignition Sensitivity” - as introduced in NFPA 499 for electrical classification - could be used by the team to identify hazardous locations and to develop recommendations for mitigation or control of the identified hazards.

Slavin, T. this section should only apply to combustible dust not all dust as currently revised. This should not apply to non-combustible sand accumulations in a foundry.

654-21 Chapter 6, 7, and 8 (Log # 57)

Negative

Ebadat, V. Eqn 6.1.4: Shouldn't it be Pes x DLF and not Pes/DLF? The DFL essentially increased the pressure that could be withstood by an enclosure or structure.

Eqn 6.1.5: This equation seems to be "backwards". As written, no/zero exposure would require/allow no dust accumulation. A high exposure probability (high value of p) should result in a lower value of M. Either p should be in the denominator (where zero exposure would allow an infinite accumulation of dust) or p should be replaced by (1-p) (where 100% exposure would allow no dust accumulation.

6.1.6.2: Define "footprint area"

654-22 6.1 (Log # CP4)

Negative

Chastain, B. I agree with J Cholin's previous negative ballot and substantiation. Entrainment factor use in the new equations is at best a "guess" without a proven, accepted methodology for measuring a particular dust's "entrainment factor". Assigning a default value of 0.25 (Section 6.1.5.3) to "any" dust whose entrainment factor is not known is also "a guess" and has no basis from a scientific perspective. Recommend the new equations be removed from mandatory text and placed in the annex as performance based alternatives until a proven, accepted methodology for determining "entrainment factor" is established.

Additionally, through simple math, it can be shown that when applying the total volume of dust accumulations criteria per Section 6.1.1.3(b) and assuming an even dust distribution over the entire area, the critical depth (in inches) at which a deflagration hazard is deemed to exist is independent of area. (See previously provided spreadsheet (dated 12Jan11 addressed to NFPA 654 TC members provided during TIA consideration.)
More importantly, those dusts with low bulk density (<7.5 pounds per cubic foot, pcf) such as paper dusts are unfairly penalized anytime the critical dust build-up is calculated at slightly above the 1/64 inch “trace” dust criterion.
When considering areas less than 20,000 sq.ft., it can be shown that when the bulk density = 7.5 pounds per cubic foot (pcf), the build-up from a total volume approach [per Section 6.1.6.2(b)] is 1/64th of an inch. Per Section 6.1.2.1, a deflagration hazard would not be deemed to exist since the dust build up is <= 1/64th of an inch.
However, if we considered a slightly lighter less dense dust, say 7.499 pcf, build-up from a total volume approach [per Section 6.1.1.3(b)] is 1/63rd of an inch. Per Section 6.1.1.1, a deflagration hazard would be deemed to exist since the dust build up is >1/64th of an inch even though the bulk density is 1/1000th less than the threshold criterion at which a deflagration hazard would not be deemed to exist.
Per the “Layer Depth Criterion” (LDC) for the 7.499 dust, the LDC is 5/16ths of an inch (reasonable). Yet its critical depth (D) in deflagration hazard determination (if dust were spread across the room) is 1/63rd of an inch or 20 times less.
The 1/64th of an inch threshold was essentially one-half of the 1/32” threshold and is a threshold that reaches the limit of practical field measurement. The 1/32" threshold is based on heavier, 75-pcf dust, per Annex D of 654 (2006 Edtion). If so, then 75 pcf dust enjoys a factor of 10 when considering whether or not a deflagration hazard exists per its calculated critical depth (i.e., 1/64th inch divided by its critical depth, or 1/64” / 1/640”).
Further, the 75-pcf dust's Critical Depth threshold is 50% of the LDC.
Lighter dusts have not been given the same “waiver”. For the 7.499 pcf dust, its Critical Depth threshold is just 5% (0.05) of its LDC.
Since the 75 pcf dust enjoys a factor of 0.50 (50%), it appears all other dusts should have the same benefit. This could easily be done by applying 50% of the calculated LDC when determining the lower threshold for dust layers that will not be counted in determining whether an area is or is not a deflagration hazard.

Therefore, I recommend the 1/64th criterion be removed altogether or replaced by 50% of the calculated layer depth criterion when determining the lower threshold for dust layers that will not be counted in determining whether an area is or is not a deflagration hazard.

The equation 6.1.3.2 defines H as the lessor of the ceiling height (m) or 12 meters. It is my understanding that the 12 meter criterion limit is an arbitrary selected height with no substantiation provided as to why the criterion is 12 meters (~39 feet). The criterion selected could have just as easily been 15.5 meters or ~ 50 feet. Recommend the 12 meters be changed to 15.5 meters unless substantiation can be provided to justify the height criterion of 12 meters as many buildings in the many industries have heights up to 50 feet.

"Footprint area" in section 6.1.6.2 requires a definition. Recommend definition or explanation of "footprint area" be included.

Cholin, J. The hazard calculations embodied in equation 6.1.4 rely on a parameter nD, yet no test method exists for quantifying nD for a given particulate. Furthermore, no research exists to support the assumption in this method that nD will remain constant over time or variations in conditions. This portion of the proposal should be moved to the annex. Users of the document would be free to use this method subject to the limitations placed on performance-based design by Chapter 5. The same is true for equation 6.1.5. Section 6.1.6 limits areas to a volume derived from the permitted dust layer thickness multiplied by an area. It does not take into account that a localized accumulation that constitutes a smaller fraction of the total compartment area can trigger the designation as a dust explosion ore deflagration hazard area without regard to whether that localized accumulation is likely to be entrained from a single initiating event. The reality is that there is no record of a propagating deflagration through a compartment with dust accumulation levels that are currently permitted in the document. All of this is based upon a hypothetical hazard. Before the entire user community is forced to comply with such requirements it would be appropriate to verify the need for them. Adopting these requirements imposes a significant incremental cost on facility operators. Is there a demonstrable benefit? The large-loss explosions that have focussed attention on the combustible dust issue all involved accumulated dust layers many times larger than that permitted by the current language. These events do NOT indicate a need to make the document more stringent - they indicate a need to make the document more usable.

Ebadat, V. Eqn 6.1.4: Shouldn't it be Pes x DLF and not Pes/DLF? The DFL essentially increased the pressure that could be withstood by an enclosure or structure.

Eqn 6.1.5: This equation seems to be "backwards". As written, no/zero exposure would require/allow no dust accumulation. A high exposure probability (high value of p) should result in a lower value of M. Either p should be in the denominator (where zero exposure would allow an infinite accumulation of dust) or p should be replaced by (1-p) (where 100% exposure would allow no dust accumulation.

6.1.6.2: Define "footprint area"

Slavin, T. 6.1.1 should refer to "**dust** flash fire hazard", not to all flash fire hazards. That is also consistent with the terminology in 3.3.x.2

6.1.2.1 should remove the reference to 1/64" because it is too difficult to apply and adds more confusion than clarity

6.1.7 should refer to ***dust*** explosion hazard and the bullet points seem to be abbreviated in the revision. It looks like #3 is missing.

Affirmative with Comment

Febo, Jr., H. In 6.1.2.1, the inclusion of the 1/64 inch criterion in defining a explosion or flash fire hazard area is impractical to determine with any accuracy in the real world. It distracts from the real hazard of fugitive dust that is not being controlled. If there are extensive areas of even small quantities of dust, this could be an indicator for physical separation from adjoining, lower hazard occupancies rather than an attempt to define acceptable separation just on sufficient space from the dust creating process.
6.1.2.3, the reference to 6.1.10 is incorrect and should be 6.1.7.
6.1.3 should be written to point first to the simplified equations (6.1.3.1 and 6.1.3.2) and then the more complex equations as an alternate rather than the current vice versa.
6.1.3 should be based on English units as this is primarily a US centric document with metric as alternate units. 6.1.6 is English based and metric equivalence should be provided.
6.1.3.2, for H > 5 m (16 ft) the Mbasic-fire equation controls the mass limit.
6.1.6.1, it is unclear that the criterion of 1/32 inch is an alternative to equations and methods in 6.1.4, 6.1.5 or the simplified equations in 6.1.3.1 or 6.1.3.2. The criterion should be stated in one requirement and the permission to adjust in a second requirement.
Equations 6.1.3.1 or 6.1.3.2, it is not obvious that these two equations are simplifications of equations 6.1.4 and 6.1.5 even in the Annex material.
A.1.6.4.2, delete the reference to ducts? We don't do fugitive dust evaluations for inside ducts.
6.1.7 (2), delete the 'and' at the end of the sentence.

Hart, P. Does dust contained in enclosureless dust collectors and other 'loose' containers get included in the calculation?

Sutton, J. Regarding 6.1.2.1, I would suggest changing the 1/64 inch to less than 1/32 inch. I think this would be more consistent with the current document and still accomplish the intent that the committee wished to accomplish with this without introducing a new depth. While I still disagree with the simplified equations in 6.1.3.1 and 6.1.3.2 due to the 0.25 entrainment factor, at least there are two other alternatives to use in this section, which is a good compromise. Perhaps a more explanatory Annex note explaining the entrainment factor issue would be beneficial.

654-23 6.1.2 and A.6.1.2 (Log # 1)

Negative

Ebadat, V. See My Explanation of Negative on on 654-21 (Log #57).

654-24 6.1.3 (Log # 12)

Negative

Ebadat, V. See My Explanation of Negative on on 654-21 (Log #57).

654-25 6.2 (Log # CP8)

Negative

Chastain, B. It is impractical and difficult at best for a user to determine with any accuracy whether a dust layer exceeds or is less than 1/64th. Measurements at this criterion are especially impractical in extremely large buildings where trace dusts are present. Recommend the 1/64th criterion be removed as a criterion.

Slavin, T. 6.2.3.1.2 the reference to to 1/64" should be deleted. It adds more confusion than clarity.

Affirmative with Comment

Febo, Jr., H. 6.2.3.1.2, Inclusion of the 1/64 inch criterion in defining a explosion or flash fire hazard area is impractical to determine with any accuracy in the real world. It distracts from the real hazard of fugitive dust that is not being controlled. If there are extensive areas of even small quantities of dust, this could be an indicator for physical separation from adjoining, lower hazard occupancies rather than an attempt to define acceptable separation just on sufficient space from the dust creating process.
6.2.3.3, the equation references should be 6.1.3.2 or 6.1.5.

Sutton, J. Regarding 6.2.3.1.2, I would suggest changing the 1/64 inch to less than 1/32 inch. I think this would be more consistent with the current document and still accomplish the intent that the committee wished to accomplish with this without introducing a new depth. Also, in 6.2.3.3, I believe section 6.1.6 should be allowed to be used in addition the quoted 6.1.2.2 and 6.1.4 equations (not sure these references are correct).

654-28 6.2.3.1 and 6.2.3.2 (Log # 56)

Affirmative with Comment

Ebadat, V. 6.2.3.2: ... "limit the extent" ... qualification seems to conflict with "shall not be less than 30 feet" in 6.2.3.1.

654-29 6.2.3.2 (Log # 29)

Affirmative with Comment

Ebadat, V. See My Affirmative with Comment on 654-28 (Log #56).

654-30 6.5 (Log # CP27)

Affirmative with Comment

Ebadat, V. Electrical Equipment: Include reference to NFPA 499.

654-31 7.1.1 and 7.2.3 (Log # CP16)

Affirmative with Comment

Hart, P. What criteria is used to determine if an explosion hazard exists in a fixed bulk storage container. Dust in suspension above at or above the MEC, or dust present in sufficient quantity to cause rupture if suspended and ignited and means of suspension is present?

654-34 7.1.4 (Log # 36)

Affirmative with Comment

Febo, Jr., H. While not accepted, modifications proposed for 7.1.4.3 present valid clarifications of the existing criteria and should be implemented.

654-35 7.1.4 (Log # 41)

Abstain

Hart, P. The submitter did provide justification for some of the elements of this item. If the paper dealing with propagation in 4 inch ducts were available for review it may provide more justification.

Affirmative with Comment

Scherpa, T. I recognize that there are technical shortcomings with the proposal and substantiation as submitted, but feel that the concept is valid.

654-36 7.1.4.4 (Log # 40)

Negative

Chastain, B. I disagree that section 7.1.4.4 be excluded from the 2013 Edition. I agree with V. Ebadat that no valid reason has been provided and substantiated. Removing section 7.1.4.4 prevents safe alternatives for special situations.

Ebadat, V. There does not seem to be a valid reason for excluding 7.1.4.4 from the new 654. Exclusion of 7.1.4.4 prevents the use of alternative safe approaches for special situations.

654-37 7.1.5.3 (Log # 42)

Negative

Chastain, B. I disagree that section 7.1.5.3 be excluded from the 2013 Edition. I agree with V. Ebadat that no valid reason has been provided and substantiated. Removing section 7.1.5.3 prevents safe alternatives for special situations.

Ebadat, V. There does not seem to be a valid reason for excluding 7.1.5.3 from the new 654. Exclusion of 7.1.5.3 prevents the use of alternative safe approaches for special situations.

654-38 7.1.6 (New) (Log # CP32)

Negative

Chastain, B. I agree with T. Thomas previous negative ballot and explanation. Remove the second sentence in A.7.1.6 to prevent confusion to the user as abort gates are addressed in A.7.14.

Thomas, T. The second sentence in the annex concerning the abort gate should be removed as it already exists in the appropriate abort gate section (A.7.14). This sentence in this section will cause confusion because prevention systems do not always utilize abort gates. Fire extinguishing, material diversion, process shutdowns and other actions are also typically accomplished with this type of equipment.

654-42 7.3.2.1 and 7.3.2.2 (Log # CP26)

Negative

Chastain, B. I agree with J Osborn's previously provided negative ballot comments and substantiation.

Osborn, J. This is an example where a misunderstanding of the design requirements and methods for pneumatic transfer systems is critical to understanding. There are many dense phase systems and some dilute phase systems which operate with an initial pressure at 15 psig or greater. however, due to to the losses of the conveying section of the system the pressure at the receiving end may be close to atmosphere (and that is desirable - leftover pressure will create problems with the system filtration, etc.). To require the ASME code for the system under these conditions is incorrect as there is no relevance under the previously described conditions, etc. No reference to the code should be made for the system, but only for parts where they are actually subject to pressures that would fall under those codes. Plus, the blowers used don't follow such codes in normal practice.

Affirmative with Comment

Febo, Jr., H. New A.7.3.2.1 has deleted original A.6.1.5 text and I disagree with that. It should be returned to the document as part of A.7.3.2.
New A.7.3.2.1 has added text not in the original regarding 'rotary valves not needing to comply with ASME code and not indicated the text is new

654-44 7.4 (Log # 45)

Negative

Ural, E. I don't quite see the benefit of this revision. It will be useful to say something like "Compliance with NFPA 654 shall be considered fully equivalent to compliance with NFPA 484 for production, processing, handling, conveying and storage of combustible dust mixtures containing metals when all of the following criteria are met:
- The dust KSt is less than or equal to 200 bar-m/s and
- The dust Pmax is less than or equal to 8 bar-g and
-* The dust does not present special hazards such as excessive reactivity or binary compatibility in the process.
Annex: For example, pyrophoric material, molten material or thermite reaction hazards are not addressed in NFPA 654."
As the Committee members know, NFPA 484 predominantly applies to highly reactive, severely explosible, or fast burning metals. As a result, it is the most conservative among the occupancy dust standards. Through its scope statement, NFPA 484 also applies to marginally explosible dusts such as steel shot or sandpaper debris from polishing operations. NFPA 654 is better suited for dusts in the latter category.

654-48 7.12.2 (Log # CP37)

Negative

Chastain, B. I agree with the V. Ebadat, T. Sherpa previously provided negative ballots and substantiations. Section 7.12.2 is recommended revised to address these concerns.

Ebadat, V. 7.12.2.2: These criteria (the lower of the MEC or LFL) do not provide adequate protection against explosion of a hybrid mixture, and the MEC and LFL typically are in different units (g./cu.m., and volume-percent, respectively). If the LFL were "very high", these criteria would allow 100% of the MEC to pass through the air moving device.

Scherpa, T. I disagree with the notion of equating the dust concentration limit with that of flammable vapors and gases because 1) many dust handling operations produce transient and nonuniform dust concentrations making it difficult to apply a 'average' design concentration concept as is often done with flammable vapors, and 2) unlike flammable vapors, combustible dusts can settle out of an airflow, creating deposits within the system that can be disturbed to create a dust concentration higher than the design concentration. For these reasons, additional conservatism is warranted.

Also, the production of mechanical sparks (as addressed in the proposed 7.12.2.5) is only one possible ignition mechanism from a fan or blower. Frictional heat due to contact between moving parts (misalignment) or bearing failure can present an ignition source both in the fan and downstream. Additionally, these failure mechanisms can result in a decrease in airflow through the air moving device which results in an increase in the combustible dust concentration coincident with the creation of an ignition source.

Thomas, T. In 21 years of field experience I have never seen or heard of a deflagration originating inside of a material handling fan. The more common problem is a downstream fire or explosion that results from burning material conveyed downstream from a fan failure or from debris passing through the fan. There are thousands of material handling currently installed and running and I believe that the 25% MEC is too conservative to force the additional cost of isolation.

654-49 7.13.1 (Log # 47)

Negative

Chastain, B. I agree with V Ebadat that section 7.13.1.3.2 should be retained. An process hazard evaluation should be used to determine the hazard and level of fire and explosion protection required to protect employees and equipment.

Ebadat, V. 7.13.1.3.2: This provision should be retained as there may still be an explosion/fire risk to people and facilities from AMS's that are located outdoors. Alternatively include a word or two in 7.13.1.2.1 to say so.

Slavin, T. Because of the new definition of air material separator 7.13.1.1.1 needs to be clear that it refers to "where a combustible dust explosion hazard exists".
Section 7.13.1.1.2 refers to a wet air-material separator which is not defined. This appears to be the same as a scrubber which is defined in A.3.3.2.

654-50 7.13.1 (Log # CP17)

Negative

Chastain, B. I agree with M Holcombe objection and rationale for not using automatic interlocked shutdowns.

Slavin, T. See My Explanation of Negative on 654-49 (Log #47).

Affirmative with Comment

Holcomb, M. I object to requirement (a) under item 3 - wet scrubbers. A flow sensor and alarm should be required, which is consistent with most air pollution permit requirements. Since a wet scrubber with low flow would not present an immediate hazard, I don't think an requirement for automatic interlocked shutdown is reasonable. Most scrubbers do not have automatic interlocked shutdown, therefore this requirement would add additional retrofit costs with little additional risk reduction.

654-51 7.13.1.1.2 (Log # 6)

Negative

Ebadat, V. This excludes AMS's with volume <8cu.ft from requiring explosion protection without any reference to the dust properties and circumstances of use.

654-53 7.13.1.1.2(4) (Log # CP41)

Negative

Hart, P. Enclosureless dust collectors return the air directly to the building in which they are located but they may not necessarily prevent combustible particulate solids are above applicable industrial hygiene exposure limits or 1% of the MEC, whichever is lower. In the event of a bag break an ignitable dust cloud could be created which could be ignited by nearby ignition sources. The 5000 cfm limit would not preclude numerous 5000 cfm systems to be installed in one location. These issues should be addressed.

Rodgers, S. The committee action to accept this proposal for enclosureless collectors does not address the addition of this minimally contained dust (up to 10 kg in each of unlimited number of collectors) to the threshold accumulation outside of equipment. By so doing, the potential for contributing to a much larger secondary explosion is not recognized.

Scherpa, T. When used for nuisance dust removal, the design of these devices requires that the fan be located in the dirty air stream. Even with "spark proof" construction, fans can still produce ignition sources via frictional heating of tramp metal, misalignment, or bearing failure. If a fan failure occurs, the airflow will drop which can potentially create higher dust loadings coincident with the creation of an ignition source. With these units, the fan and AMS are often close-coupled, making explosion isolation between the fan and the AMS impossible.

Also, the filtration media is under positive pressure, which can cause the release of a dust cloud into the room given a failure of the filter elements or misconnection of the collection drum. While the requirement for daily dust removal limits the amount of material present, it also routinely puts a person into the flash-fire hazard area implied by the requirements in (f) and (g).

Furthermore, it is not appropriate to say "demonstrated to meet Type B, C, or D FIBC properties". How would one demonstrate this? (Note that the reference in (i) should probably be to (h), not (g).)

Slavin, T. Not clear what an enclosureless AMS is. There should be a reference or definition in A3.3.2

Abstain

Ebadat, V. 7.13.1.1.2 (4) (h): The choice of an MIE of >1,000mJ seems to be arbitrary. There is no requirement in NFPA 664 for a specific MIE.

Affirmative with Comment

Chastain, B. I disagree with the arbitrary selection of 1000 mj MIE criterion in section 7.13.1.1.2(4)(h). There is no justification or substantiation for establishing this arbitrary criterion. Recommend that the MIE criterion in (h) be eliminated from the 7.13.1.1.2. or established as > 500 mj consistent with most wood dust MIEs where EDCs are prevalently used and do not have a known history of fire or explosion.

Febo, Jr., H. In item (a) the text is not correct. It should read "The air material separator is used..."
In item (i) it does not appear appropriate to exclude requirement (g)
In item (j) the reference paragraph should be 7.12.2.5

Garzia, H. Replace the term "collector" in (a), (c), (f), & (g) with air-material separator(s) to maintain consistent terminology in the section.

Osborn, J. My experience with industry is that abuse of this approach will occur and will be used with applications that are not suitable for this method and should involve "true" dust collection systems. I believe this is the "camel's-nose-under-the-tent" and that it will be expanded, in the future to cover other materials where it should NOT be used. This method is valid only for a very limited range of applications.

654-54 7.13.1.7.3 (Log # CP10)

Negative

Runyon, M. The suggested criteria is in the right direction, however, I do not think it is a safe to allow dust collectors without any protection inside of the building.

Affirmative with Comment

Febo, Jr., H. During committee discussion there was an indication that criteria effectively preclude the use of enclosureless AMS. More user feedback would be helpful.
Items 4 and 5 can be easily combined into one requirement and should be.
The ACGIH manual noted in A.7.13.1.7.3 should be added to section 2.3.

Osborn, J. Secondary filtration should be included - at least as a direct statement in the annex. It is the only reliable method to assure a malfunctioning dust collector does not allow significant emissions back into the building and the filling of the return ducting, which is often of larger diameter, and not designed to maintain velocities adequate to prevent the dust from falling out into the duct - creating a further hazard. Other methods such a detectors are notorious for false alarms and being unreliable and difficult to calibrate.

654-55 7.13.2.1.2 (Log # 22)

Affirmative with Comment

Febo, Jr., H. I disagree with the substantiation statement that implies the combustible frames represent a 'small' additional fuel loading. AMS with combustible media and frames often justify sprinkler protection to limit fire loss.

654-64 8.2.1.1, 7.1.1 (Log # CP30)

Negative

Slavin, T. The new language of 7.1.1 needs to be limited to "where a combustible dust explosion hazard or dust flash fire hazard exist, ...".

654-65 8.2.1.1, 8.2.1.2, 8.2.1.3, and 8.2.1.4 (Log # CP33)

Negative

Ebadat, V. The purpose of the risk evaluation is to reduce the risks associated with potentially-hazardous processes to a tolerable level. The analysis involves identification of hazards, estimation of the likelihood of occurrence of hazardous events, evaluation of the adequacy of existing hazard controls, and recommendations for correction of inadequate controls. The present wording of paragraph 8.2.1.4 (....to determine the level of housekeeping consistent .....) in the proposed draft of NFPA 654 does not allow for this multi-step procedure for analysis of hazards. Rather, it stipulates specific criterion (housekeeping, venting) for hazard assessment, and further efforts for example reducing the likelihood of ignition, would not be fruitful.
The process hazards analysis Team should be permitted to utilize the properties of a dust, in determining whether or not a fire or explosion hazard exists, rather than be constrained to a calculation of a dust-layer thickness.

Slavin, T. This section challenges comprehension for the intended user. A more user friendly version could be something like the following:

Where control of combustible dust explosion hazards and dust flash fire hazards requires maintaining the dust accumulation below the level determined in section 6.1 the following conditions shall be met:

(1) the housekeeping frequency...

(2) a planned inspection process...

(3) the housekeeping procedure

Sutton, J. In 8.2.1.4, the concept of intentionally allowing a facility to operate above the threshold values calculated in Section 6.1, is in my opinion, misguided. If the threshold values calculated in 6.1 are exceeded, this by definition indicates that the area in question has an explosion and/or flash fire hazard, and that the facility should be taking actions to avoid such situations. Intentionally operating above these thresholds is not avoiding the hazard irregardless of other controls that may be in place.

654-70 9.3.1 (Log # CP2)

Affirmative with Comment

Scherpa, T. The breakdown voltage limit should be 4 kV for sheets. 6kV is the limit for woven materials.

654-73 9.3.2 (Log # 26)

Negative

Chastain, B. I agree with V. Ebadat's previous negative ballot and substantiation related to non-conductive belt drive risk and possible non-availability in the market place for meeting all specified requirements.

Ebadat, V. It is not clear what the risk of using a non-conductive drive belt would be (brush discharges, propagating brush discharges?). Secondly, there may not be any drive belt with a resistance-to-ground of <1x106 ohms in the market place that would also satisfy the mechanical strength requirements of such drives.

654-74 9.3.3 (Log # 9)

Affirmative with Comment

Chastain, B. I agree with V. Ebadat's recommendation that there should be discussion included related to "safe filling" of FIBCs.

Ebadat, V. There should be some discussion/mention regarding the safe "filling" of FIBCs.

654-76 9.3.5 (New) (Log # CP31)

Negative

Ebadat, V. 9.3.5.3: This requirement may not prevent "brush discharges" that are capable of igniting flammable vapor atmospheres.

654-78 9.7 (Log # 23)

Affirmative with Comment

Ebadat, V. include: .... external surfaces, such as ......,"electrical

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654-86 11.5 (Log # CP23)

Negative

Slavin, T. this does not specify whether a contractor is an individual, a supervisor, or a company. It would require laborers such as a contract finisher or a contract janitor to have ASME stamps. The problem could be solved by inserting the word "credentials, which <u>may</u> include..."

654-87 A.1.1 (Log # 21)

Affirmative with Comment

Ebadat, V. Add: There may be situations (1) where the concentration of combustible particulate solids is such a small fraction of the Minimum Explosible Concentration that there is no likelihood of flash fire or explosion, or (2) where the size and shape of particles prevent propagation of explosive combustion, as demonstrated by tests.

654-89 A.4.2.1 Various (Log # 7)

Negative

Ebadat, V. A.4.2.1(3): Delete "It is best to assume ignition is possible in all cases." This is not an accurate statement as there are many situations where ignition sources are/can be identified and effectively controlled.

654-91 A.6.6.2 (Log # CP40)

Affirmative with Comment

Ebadat, V. This table will create confusion with regard to the differences in acceptable accumulation levels compared to section 6.1.
According to this document if dust accumulation is above the "maximum allowable" level in a room then a dust explosion hazard exists and explosion protection (venting) is required. In this case what is the incentive for controlling ignition sources such as having rated electrical equipment?

Ural, E. This section should further emphasize:
1) classification requirement can be relaxed by appropriate housekeeping frequency, and
2) the layer thicknesses given in the table are nominal which can be refined considering the effects of parameters such as thermal conductivity, porosity, density and combustion chemistry of the dust layer being considered.