

**Report of the Committee on
Agricultural Dusts**

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Todd & Sargent, Inc., IA [SE]

Amy B. Spencer, Secretary
Nat'l Fire Protection Assn., MA
(Nonvoting)

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Joe R. Barton, Indianapolis, IN [U]
Rep. NFPA Industrial Fire Protection Section
Delwyn D. Bluhm, Inst. for Physical Research & Technology, IA [SE]
Duane W. Brown, Ranger Insurance Co., TX [I]
Brian L. Bursiek, American Feed Industry Assn., VA [U]
Clayton S. Ellsworth, EBM Mill & Elevator Supply, NE [IM]
Jan M. Elzey, River Consulting Inc., OH [SE]
Jerry Fawbush, Central Soya Co., Inc., IN [U]
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John E. Heilman, Heilman Consulting Group, CO [SE]
Deane R. Holmes, AON Risk Services, Inc., MO [I]
William E. Janz, Industrial Risk Insurers, IL [I]
Douglas W. Jensen, Cargill, Inc., MN [U]
Bud Kline, Domino Sugar Corp., LA [U]
James E. Maness, Bunge Corp., MO
Rep. Grain Elevator & Processing Society [U]
Robert J. Moore, A E Staley Mfr Co., IL [U]
Rep. Corn Refiners Assn. Inc.
Godan Nambudiripad, The Pillsbury Co., MN [U]
Robert W. Nelson, Pocasset, MA [SE]
Robert W. Schoeff, Manhattan, KS [SE]
William E. Smith, J&H Marsh & McLennan, MN [I]
John Valiulis, Factory Mutual Research Corp., MA [I]
B. J. Walker, Walker & Assoc., MO [SE]
Jerry S. Wodzinski, Underwriters Laboratories Inc., IL [RT]

Alternates

Karl Baumgartner, Buhler Inc., MN [M]
(Voting Alt. to BI Rep.)
Paul G. Dobbs, Global Risk Consultants, MI [I]
(Voting Alt. to ARC Rep.)
Thomas E. Frank, Factory Mutual Engr Assn., WA [I]
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(Alt. to J. E. Maness)
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(Alt. to J. R. Barton)

Staff Liaison: **Amy B. Spencer**

Committee Scope: This Committee shall have primary responsibility for documents on the prevention, control, and extinguishment of fire and explosions resulting from dusts produced by the processing, handling, and storage of grain, starch, food, animal feed, flour, and other agricultural products. The Technical Committee shall also be responsible for requirements relating to the protection of life and property from fire and explosion hazards at agricultural and food products facilities.

This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the front of this book.

The Report of the Technical Committee on **Agricultural Dusts** is presented for adoption.

This Report was prepared by the **Technical Committee on Agricultural Dusts** and proposes for adoption amendments to NFPA 61-1995, **Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Products Facilities**. NFPA 61-1995 is published in Volume 3 of the 1998 National Fire Codes and in separate pamphlet form.

This Report has been submitted to letter ballot of the **Technical Committee on Agricultural Dusts**, which consists of 25 voting members. The results of the balloting, after circulation of any negative votes, can be found in the report.

NFPA 61 — A99 ROP

(Log #CP5)

61- 1 - (Entire Document): Accept
SUBMITTER: Technical Committee on Agricultural Dusts
RECOMMENDATION: Throughout the standard, change the term "interior" to "inside" when applicable to bucket elevators (legs). Also, change the term "exterior" to "outside" when applicable to bucket elevators (legs).
SUBSTANTIATION: The terms were changed to be more consistent with commonly used industry terms.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 23
NOT RETURNED: 2 Baker, Fawbush

(Log #CP23)

61- 2 - (1-1.1): Accept
SUBMITTER: Technical Committee on Agricultural Dusts
RECOMMENDATION: Modify the existing 1-1.1 to read as follows:
1-1.1* This standard shall apply to the following:
(a) All facilities that handle, process, use, blend, mill, receive, load, ship, package, store, or unload dry agricultural bulk materials, their by-products, or dusts that include grains, oilseeds, agricultural seeds, legumes, sugar, flour, spices, feeds, and other related materials;
(b) All facilities designed for manufacturing and handling starch, including drying, grinding, conveying, processing, packaging, and storage of dry or modified starch, and dry products and dusts generated from these processes; and
(c) Those seed preparation and meal-handling systems of oilseed processing plants not covered by NFPA 36, Standard for Solvent Extraction Plants.
SUBSTANTIATION: The terms "use" and "flour" were added to make the scope even more clear.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 23
NOT RETURNED: 2 Baker, Fawbush

(Log #CP4)

61- 3 - (1-4 Outside Bucket Elevator (Leg) (New)): Accept
SUBMITTER: Technical Committee on Agricultural Dusts
RECOMMENDATION: Add a definition for "Outside Bucket Elevator (Leg)" to the definitions section, 1-4 to read as follows:
Outside Bucket Elevator (Leg). Outside bucket elevator means a bucket elevator that has less than 20 percent of the total leg height (above grade or ground level) inside any enclosed structure.
SUBSTANTIATION: The definition was added to clarify the use of the term "outside leg".
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 23
NOT RETURNED: 2 Baker, Fawbush

(Log #CP30)

61- 4 - (2-4.1): Accept
SUBMITTER: Technical Committee on Agricultural Dusts
RECOMMENDATION: Modify 2-4.1 to read as follows:
"Means of egress shall be in accordance with NFPA 101, Life Safety Code."
SUBSTANTIATION: Editorial change.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 23
NOT RETURNED: 2 Baker, Fawbush

(Log #CP31)

61- 5 - (2-5.2): Accept
SUBMITTER: Technical Committee on Agricultural Dusts
RECOMMENDATION: Modify the existing 2-5.2 and delete the corresponding Exceptions to read as follows:
2-5.2 Although explosion relief vents are not required on silos, bins and tanks, where provided, they shall operate due to overpressure before the silo walls fail.
SUBSTANTIATION: The Exceptions were deleted because they were redundant to the main text. The main text was clarified.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 20
NEGATIVE: 3
NOT RETURNED: 2 Baker, Fawbush

EXPLANATION OF NEGATIVE:

JANZ: Individuals reading this statement would relate "relief vents not required" to relief vents not needed. Data compiled by the Department of Agriculture and Kansas State University since 1958 indicate that third highest incidence of dust explosions were identified as occurring in bins or tanks.

Editions of NFPA 61 prior to 1995 indicated that as far as practicable, explosion venting should be provided and the roof wall connection designed so the roof deck would relief before the bin wall failed. The intent was to provide as much explosion venting as possible using the rationale that some venting is better than none. It is understood that due to the high aspect ratio of some silos, effective venting using NFPA 68 is a problem, however, all calculations assume an empty silo or bin with an optimum mixture of suspended dust. In practice, bins and silos are rarely empty and a 1/3 full silo or bin would significantly reduce the aspect ratio and the venting required. Additionally, we are assuming all silos and bins have aspect ratios which do not allow adequate venting. Large marine terminals may fall into this category but what about smaller country elevators and processing plants. The facilities I am seeing being erected utilize large capacity low profile metal bins for storage of grains where venting is viable. Processing plants utilizing bins for storage of finished or semifinished products also do not fall into the high aspect category and can be adequately vented.

To eliminate the need to vent all bins and silos because for a segment of the industry it may not be totally effective is not the way to deal with the problem in a segment of the industry.

NELSON: The removal of any requirement for explosion venting is not justified as there is a long history of silo and bin explosions in the agricultural products industry. There are examples of bin and silo explosions in NFPA "Report of Important Oust Explosions", in R.K. Eckhoff's book "Dust Explosions in the Process Industries" and in the references cited in the negative ballot of J. Valiulis.

The committee must consider that it is not just for use in the feed and grain industries but powers a large number of food products facilities. It is suggested that the requirement for explosion venting of bins and silos be restored, and that a task group be established to research methods other than the calculation method used in NFPA 68.

VALIULIS: The 1995 version of 2-5.2 did not specify whether bins or silos needed explosion venting or not. It merely stated that "...if provided...", the explosion venting should be designed with a certain performance objective in mind. The proposed new 2-5.2 now makes the statement that "...explosion relief vents are not required on silos, bins and tanks...". The committee justification for the new wording states that it is a clarification of the previous text. There is absolutely nothing in the 1995 2-5.2 which could be implied to create such a far-reaching blanket exemption. The proposed change to 2-5.2 is changing the intent of the paragraph, not blanket exemption. The proposed change to 2-5.2 is changing the intent of the paragraph, not clarifying it. Thus, the substantiation is inaccurate, leaving it with no actual substantiation.

There is no justification provided for the creation of a brand new blanket exemption from explosion protection for all bins and silos. Such an exemption would not likely be justifiable from a technical standpoint. Loss history shows that bins and silos in the food products industries do have a significant dust explosion hazard that should be addressed. Data collected by Kansas State University, Dept. of Grain Science and Industry reports that from 1980 to 1997, 42 explosions involved storage bins and silos as the primary location. This gives an average of 2.3 bin/silo explosions per year. In some years (e.g., 1996), the Kansas State University data¹ showed that storage bins were the most frequent location of agricultural dust explosions, even ahead of bucket elevators. A

detailed study² of food industry dust explosions in Germany over a five-year period showed that 23 percent of explosions occurred in silos, second only to bucket elevators (27 percent).

Factory Mutual loss history provides an indication of the relative destruction produced by dust explosions in bins and silos. For the period 1977-1997, 19 losses were recorded involving bulk agricultural storage facilities (mostly grain storage), creating \$205 million in property damage, for an average loss of \$10.7 million per incident. There were also 8 explosion losses involving storage of finished agricultural products (flour, sugar, starch, cocoa) in bins and silos. These created \$20.5 million in damage, for an average loss of \$2.6 million per incident.

Given the non-negligible frequency and very high level of damage caused by explosions in bins and silos, I cannot vote in favor of creating a new, blanket exclusion from explosion venting for all bins and silos.

¹http://www.grainnet.com/dust.htm

²BIA - Report 2/87, (ISSN 0173-0487), Dokumentation Staubexplosionen, Analyse und Einzelfalldarstellung, Berufsgenossenschaftliches Institut Für Arbeitssicherheit, Sandrt Augustin, Germany

(Log #CP29)

61-6 - (3-1.1): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Delete Note in existing Section 3-1.1

SUBSTANTIATION: The note provided no additional guidance and was deleted.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

(Log #CP34)

61-7 - (3-2.1): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Modify existing 3-2.1 to read as follows:

3-2.1 Each bin, tank, or silo shall be provided with means for air displacement during filling or emptying with 1) dust collection, or 2) shall be vented to the outside.

SUBSTANTIATION: The text was clarified without changing the intended meaning.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

(Log #CP22)

61-8 - (3-2.6 (New)): Reject

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Add a new Section 3-2.6 to read as follows:

3-2.6 There shall be no structural openings between storage areas of bulk raw grain bins and tanks.

SUBSTANTIATION: Text proposed to increase safety.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: The Committee does not believe that there is any significant improvement in safety by prohibiting structural openings between storage areas of bulk raw grain bins and tanks. In addition, it would facilitate the need for bin aspiration or ventilation which may present the same hazard that the proposed prohibition is seeking to prevent.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 21

NEGATIVE: 2

NOT RETURNED: 2 Baker, Fawbush

EXPLANATION OF NEGATIVE:

JANZ: Allowing construction or ventilation openings between bins provides a path for propagation of an explosion which increases the likelihood of an explosion involving multiple bins and tanks. The only way to reduce the potential for an explosion involving more than one bin, is to design the bins without interconnections, design the bins so that the interconnection do not serve as a conduit for explosion propagation or provide

protection for the interconnections. It is understood that eliminating ventilation openings between bins may require the installation of additional ventilation, however, means currently exist to protect and isolate the ventilation systems so they do not increase the possibility or potential size of an explosion.

VALIULIS: Factory Mutual loss history for the period 1977-1997 records 19 losses involving bulk agricultural storage facilities (mostly grain storage), creating \$205 million in property damage, for an average loss of \$10.7 million per incident. Such widespread explosion damage is created because dust explosions are able to propagate through connecting pathways from one volume to another, thus damaging a large portion of the facility in one incident. The easiest pathway for an explosion to propagate through an array of bins or tanks would be any structural openings which are available between adjacent bins. Even if a bin/tank was provided with ample explosion venting, the lack of any resistance to flow through the silo-to-silo openings would ensure that some of the explosion would be propagated in this direction.

It is fundamentally unsound to provide such a pathway for explosion propagation when building a brand new array of bins or silos. To neglect the known life safety hazard and property loss potential in favor of creating a low-cost method to allow air displacement during silo filling is an unacceptable trade-off that should certainly not be sanctioned by an NFPA standard.

The prohibition against structural openings between bulk raw grain bins and tanks existed in the revisions of the standard prior to the 1995 edition. Apparently, it was well agreed by the previous members of this committee that such a prohibition was warranted. There has been no change in technology nor data provided to support the elimination of that prohibition back in 1995. As such, the prohibition should be reinstated before additional new facilities are built which would have the potential for one explosion incident to cause explosion damage to all or a substantial portion of the storage facility.

(Log #CP32)

61-9 - (4-2.1 Exception No. 2): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Modify Section 4-2.1, Exception No. 2.

The section will read as follows:

4-2.1* If a dust explosion hazard exists in rooms, buildings, or other enclosures, such areas shall be provided with explosion relief venting distributed over the exterior walls (and roof, if applicable). These are locations (1) in which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitable mixtures; or (2) where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitable mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electrical equipment, operation of protection devices, or from other causes. The design of such explosion relief venting shall consider the limitations imposed by the structural design of the area and shall offer the least possible resistance to explosion pressures.

Exception No. 1: Tunnels and pits where explosion venting is not practical due to confinement by soil, building constraints, or both.

Exception No. 2: Bins and silos.

SUBSTANTIATION: The text was removed because it was redundant to 2-5.2.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 21

NEGATIVE: 2

NOT RETURNED: 2 Baker, Fawbush

EXPLANATION OF NEGATIVE:

NELSON: See my Explanation of Negative on Proposal 61-5 (Log #CP31).

VALIULIS: The 1995 version of 4-2.1 mandated the provision of explosion venting for bins or silos which had an explosive atmosphere under normal operating conditions and where the provision of such venting was not made impractical by the structure's geometry or other building constraints. The effect of the proposed change to Exception No. 2 is to exempt all bins or silos (except dust bins, covered by 8-3.9) from ever requiring explosion venting.

There is no technical justification provided for creating this blanket exemption. If anything, loss history shows that bins and silos in the food products industries do have a significant dust explosion hazard which should be addressed. Data collected by Kansas State University, Dept. of Grain Science and industry

reports that from 1980 to 1997, 42 explosions involved storage bins and silos as the primary location. This gives an average of 2.3 bin/silo explosions per year. In some years (e.g., 1996), the Kansas State University data³ shows that storage bins were the most frequent location of agricultural dust explosions, even ahead of bucket elevators. A detailed study⁴ of food industry dust explosions in Germany over a five-year period showed that 23 percent of explosions occurred in silos, second only to bucket elevators (27 percent).

Factory Mutual loss history provides an indication of the relative destruction produced by dust explosions in bins and silos. For the period 1977-1997, 19 losses were recorded involving bulk agricultural storage facilities (mostly grain storage), creating \$205 million in property damage, for an average loss of \$10.7 million per incident. There were also 8 explosion losses involving storage of finished agricultural products (flour, sugar, starch, cocoa) in bins and silos. These created \$20.5 million in damage, for an average loss of \$2.6 million per incident.

The substantiation provided with the proposal indicates that the new blanket exemption was created because the old Exception No. 2 was redundant to 2-5.2. In fact, it is not redundant to 2-5.2 from the 1995 version. However, there would in fact be some redundancy with the proposed new 2-5.2 (Proposal 61-5), which is also completely lacking in technical justification (see my Explanation of Negative on Proposal 61-5). Consistency with another unsupported change is not an acceptable basis for a reduction in the level of safety afforded by this standard.

³<http://www.grainnet.com/dust.htm>

⁴BIA - Report 2/87, (ISSN 0173-0487), Dokumentation Staubexplosionen, Analyse and Einzelfalldarstellung, Berufsgenossenschaftliches Institut Für Arbeitssicherheit, Sandrt Augustin, Germany

(Log #CP24)

61-10 - (4-2.1 and A-4-2.1): Reject

SUBMITTER: Technical Committee on Agricultural Dusts
RECOMMENDATION: Modify existing 4-2.1 to read as follows:

4-2.1* If a dust explosion hazard exists in rooms, buildings, or other enclosures, such areas shall be provided with explosion relief venting distributed over the exterior walls (and roof, if applicable). These are locations (1) in which combustible dust is in the air under normal operating conditions in quantities sufficient to produce explosive or ignitable mixtures; or (2) where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitable mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electrical equipment, operation of protection devices, or from other causes; or (3) The room or building contains a hazardous dust accumulation under normal operating conditions. The design of such explosion relief venting shall consider the limitations imposed by the structural design of the area and shall offer the least possible resistance to explosion pressures.

Exception No. 1: Tunnels and pits where explosion venting is not practical due to confinement by soil, building constraints, or both.

Exception No. 2: Bins and silos where explosion venting is not practical due to bin or silo geometry, building constraints, or both.

Add to the beginning of existing A-4-2.1:

A-4-2.1 A relatively small initial dust deflagration can disturb and suspend in air dust that has been allowed to accumulate on the flat surfaces of a building or equipment. This dust cloud provides fuel for the secondary deflagration, which can cause damage. Reducing significant additional dust accumulations is, therefore, a major factor in reducing the hazard in areas where a dust hazard can exist.

Using a bulk density of 75 lb/ft³ (1200 kg/m³) and an assumed concentration of 0.35 oz/ft³ (350 g/m³), it has been calculated that a dust layer averaging 1/32 in. (0.8 mm) thick covering the floor of a building is sufficient to produce a uniform dust cloud of optimum concentration, 10 ft (3 m) high, throughout the building. This is an idealized situation and several factors should be considered.

First, the layer will rarely be uniform or cover all surfaces, and second, the layer of dust will probably not be dispersed completely by the turbulence of the pressure wave from the initial explosion. However, if only 50 percent of the 1/32-in.- (0.8-mm-) thick layer is suspended, this is still sufficient material to create an atmosphere within the explosible range of most dusts.

Consideration should be given to the proportion of building volume that could be filled with a combustible dust concentration. The percentage of floor area covered can be used as a measure of the hazard. For example, a 10 ft x 10 ft (3 m x 3 m) room with a 1/32-in. (0.8-mm) layer of dust on the floor is obviously hazardous and should be cleaned. Now consider this same 100-ft² (9.3-m²) area in a 2025-ft² (188-m²) building; this also is a moderate hazard. This area represents about 5 percent of a floor area and is about as much coverage as should be allowed in any plant. To gain proper perspective, the overhead beams and ledges should also be considered. Rough calculations show that the available surface area of the bar joist is about 5 percent of the floor area. For steel beams, the equivalent surface area can be as high as 10 percent.

From the above information, the following guidelines have been established:

(a) Dust layers 1/32 in. (0.8 mm) thick can be sufficient to warrant immediate cleaning of the area [1/32 in. (0.8 mm) is about the diameter of a paper clip wire or the thickness of the lead in a mechanical pencil].

(b) The dust layer is capable of creating a hazardous condition if it exceeds 5 percent of the building floor area.

(c) Dust accumulation on overhead beams and joists contributes significantly to the secondary dust cloud and is approximately equivalent to 5 percent of the floor area. Other surfaces, such as the tops of ducts and large equipment, can also contribute significantly to the dust cloud potential.

(d) The 5 percent factor should not be used if the floor area exceeds 20,000 ft² (1860 m²). In such cases, a 1000-ft² (93-m²) layer of dust is the upper limit.

(e) Due consideration should be given to dust that adheres to walls, since this is easily dislodged.

(f) Attention and consideration should also be given to other projections such as light fixtures, which can provide surfaces for dust accumulation.

(g) Dust collection equipment should be monitored to ensure it is operating effectively. For example, dust collectors using bags operate most effectively between limited pressure drops of 3 in. to 5 in. of water (0.74 kPa to 1.24 kPa). An excessive decrease or low drop in pressure indicates insufficient coating to trap dust.

Guidelines (a) through (g) will serve to establish a cleaning frequency.

SUBSTANTIATION: The standard does not require any explosion venting for any facilities that have fugitive dust accumulations capable of creating a full room explosion. The Appendix is existing appendix text in NFPA 654, as well as other NFPA dust standards.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: The Committee believes that Section 8-1.1 requires users to remove the fugitive dust accumulations concurrent with operations.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 20

NEGATIVE: 2

ABSTENTION: 1

NOT RETURNED: 2 Baker, Fawbush

EXPLANATION OF NEGATIVE:

JANZ: Eliminating a hazard is always preferable to protecting it. Section 8-1 indicates that dust should be removed concurrently with operation which in essence eliminates the hazard. It is felt that the appendix section has merit since it provides guidance in determining when a hazard exists and can serve as guidance in determining when cleaning is necessary. Consideration should be given to adding these paragraphs as an appendix item to Section 8-1 in the future.

VALIULIS: The essence of the rejected proposal was the addition of an Item (3) in 4-2.1, "The room or building contains a hazardous dust accumulation under normal operating conditions.", and of explanatory information as appendix material. This proposal was rejected based on a substantiation that "This standard does not require any explosion venting for any facilities that have fugitive dust accumulations capable of creating a full room explosion". This is an inaccurate statement, and as such should be considered to be an unacceptable substantiation.

The text of 4-2.1 states that explosion venting is required in locations "... (2) where mechanical failure or abnormal operation of machinery or equipment might cause such explosive and ignitable mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electrical equipment, operation of protective devices, or from other causes;". This statement is directly from the NEC, and is part of the definition of a Class II, Division 1 area. It is generally accepted

(Log #CP15)

that this definition does include areas with significant fugitive dust accumulations. For example, the NFPA book "Electrical Installations in Hazardous Locations" by Schram and Early states "There is no minimum depth of accumulation used in any standard to specify an area classification. A rule of thumb of 1/8 in. of accumulation has been used to divide between the Division 1 and Division 2 hazardous locations. If 1/8 in. or more of accumulation exists in a given area, the location can be classified as a Class II, Division 1 location." This interpretation of the NEC wording is also used in other NFPA standards. For example, NFPA 499, Section 3-1.2 states "If a dust layer greater than 1/8 in. thick is present under normal conditions, the area should be classified as Division 1".

Based on Section 4-2.1, this standard already requires explosion venting for facilities that have fugitive dust accumulations capable of creating a full room explosion. The addition of the item (3) to 4-2.1 would make this clear to those who are not familiar with the intent of the National Electrical Code wording which is used for item (2) of 4-2.1. Obviously, even members of this committee are unclear about what the NEC words are normally interpreted to include. The addition of the item (3) would remove any possible ambiguity. The proposed appendix material would provide the user of the standard with useful information regarding when a room explosion hazard does or does not exist, so that judgment can be applied in evaluating specific situations.

EXPLANATION OF ABSTENTION:

WODZINSKI: The appearance of this log item in the ballot is in conflict with Section 4-3.2.2 of the Regulations Governing Committee Projects, because a majority of the committee did not vote in the affirmative at the meeting. This Committee Proposal should not be included in the Report on Proposals.

(Log #CP35)

61-11 - (4-3.3): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Modify 4-3.3 to read as follows:

4-3.3* Venting shall be directed to a safe, outside location away from platforms, means of egress, or other potentially occupied areas or directed through a listed Flame Arresting and Particulate Retention Device.

SUBSTANTIATION: This option was added to recognize new technology, already recognized by NFPA 68. The text regarding "return of dust" was deleted because it is redundant to existing 9-4.2.2. An exception was added for consistency with the new text allowing small cyclones inside buildings as proposed in Committee Proposal 61-32 (Log #CP14).

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

(Log #1)

61-12 - (5-2.1, 5-3.2, 5-4.2.12, 9-5.2): Reject

Note: This Proposal appeared as Comment 61-44 which was held from the Annual 95 ROC on Proposal 61-1.

SUBMITTER: Steven E. Kroon, Continental Grain Company

RECOMMENDATION: Replace 1 or 100 megohms with "300 or less megohms" in each section and paragraph referenced above.

SUBSTANTIATION: NGFA research in the 1980's showed that resistivity of 300 megohms or less is sufficient to safely dissipate electrostatic charges on belting used in grain handling facilities. Also, NGFA research found that static electricity could not be shown to ignite typical grain dusts.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: The Committee respectfully believes the Submitter may have some confusion regarding resistance and resistivity. Past research has indicated that resistance for v-belt materials and other drive connections of less than 1 megohm do not present an ignition hazard. Further, sheet materials such as conveyor belting, lagging or bucket elevator belting do not present an ignition hazard if the resistivity is less than 100 megohm/square.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

61-13 - (5-2.2): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Modify existing 5-2.2 to read as follows:

"Where a drive belt is used, the drive train shall be designed with a minimum service factor of 1.5, or higher if the manufacturer of the drive components recommends a higher service factor for continuous service for the type of equipment to be driven."

Exception: Line shaft drives as used in the milling industry.

SUBSTANTIATION: If a manufacturer recommends a higher service factor, this should be followed.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NEGATIVE: 1

NOT RETURNED: 2 Baker, Fawbush

EXPLANATION OF NEGATIVE:

WODZINSKI: The proposal deleted the wording "...and shall be designed to stall the drive with less than 3 percent slippage." No substantiation for the deletion was provided.

(Log #CP26)

61-14 - (Figure 5-4(a) and (b) (new) and 5-4.1.2 and 5-4.2.2):

Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Add the two figures as Figures 5-4(a) and 5-4(b) as follows:

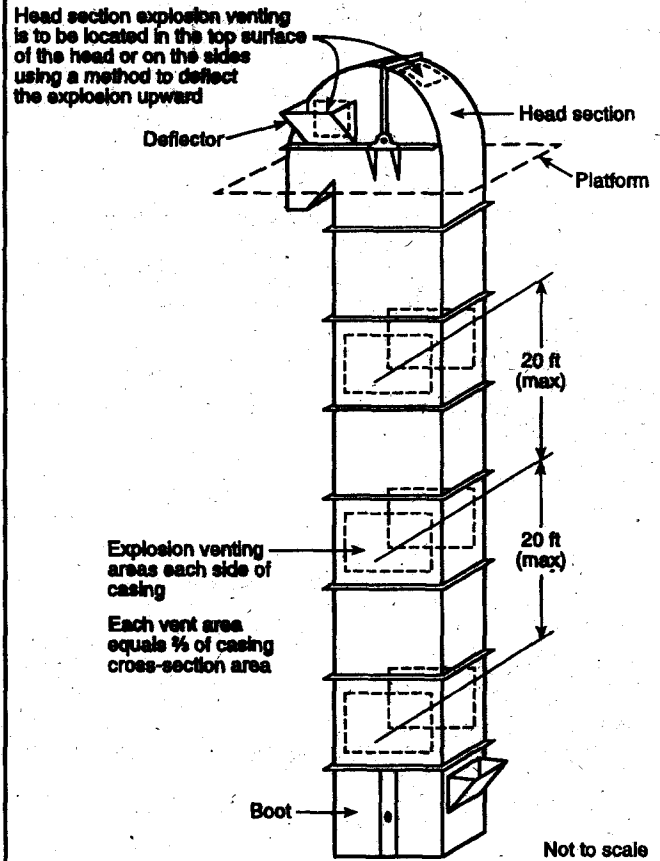


Figure 5-4(a) Typical elevator explosion venting.

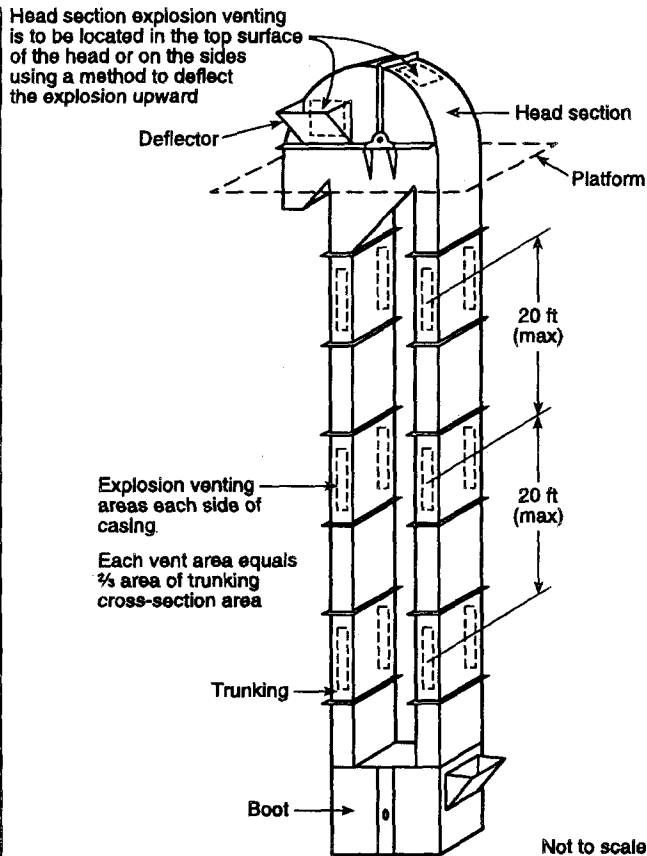


Figure 5-4(b) Typical elevator explosion venting.

Accordingly, modify text of existing Sections 5-4.1.2 and 5-4.2.2 to include the text (at the end of the existing text) to read as follows: Figures 5-4(a) and (b) illustrate two typical elevator explosion venting designs.

SUBSTANTIATION: The figures were added to provide additional clarification of the requirements of existing Section 5-4. **COMMITTEE ACTION:** Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25 **VOTE ON COMMITTEE ACTION:**

AFFIRMATIVE: 23
NOT RETURNED: 2 Baker, Fawbush

(Log #CP28)

61- 15 - (5-4.1.1): Accept

SUBMITTER: Technical Committee on Agricultural Dusts
RECOMMENDATION: Modify existing 5-4.1.1 to read as follows: "Only outside legs, as defined by this standard, shall be used for handling bulk raw grain."

Exception: As permitted in 5-4.1.3.
SUBSTANTIATION: This new text reflects the addition of a new definition for clarity.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25 **VOTE ON COMMITTEE ACTION:**

AFFIRMATIVE: 23
NOT RETURNED: 2 Baker, Fawbush

(Log #CP21)

61- 16 - (5-4.1.2 Exception and 5-4.2.2 Exception (New)): Accept
SUBMITTER: Technical Committee on Agricultural Dusts
RECOMMENDATION: 1. Add the following new Exception to 5-4.1.2 to read as follows:

Exception: Legs that have both belt speeds below 500 fpm (2.5 m/s) and capacities less than 3750 ft³/hr (106 m³/hr).

2. Modify 5-4.1.3.(c) to read as follows:
"Legs that have both belt speeds below 500 fpm (2.5 m/s) and capacities less than 3750 ft³/hr (106 m³/hr)."

3. Add a new Exception to 5-4.2.2 to read as follows:
Exception: Legs that have either belt speeds below 500 fpm (2.5 m/s) or capacities less than 3750 ft³/hr (106 m³/hr).
4. Modify Exemptions 5-4.2.3 and 5-4.2.8 and 5-4.2.13 to read as follows:

Exception: Legs that have either belt speeds below 500 fpm (2.5 m/s) or capacities less than 3750 ft³/hr (106 m³/hr).

SUBSTANTIATION: Grains are an exception to the normal commodity so the Committee is requiring more stringent criteria be met before the elevator can qualify for the exemptions. The wording was changed slightly for clarification.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25 **VOTE ON COMMITTEE ACTION:**

AFFIRMATIVE: 21
NEGATIVE: 2
NOT RETURNED: 2 Baker, Fawbush

EXPLANATION OF NEGATIVE:
JENSEN: Change "both" to "either" and "and" to "or" in the recommended Exceptions to 5-4.1.2 and 5-4.1.3(c). Research has shown that special "deep projection" buckets on legs operating at 450 fpm and bulk grain capacities of 60,000 Bu/hr (75,000 ft³/hr) have dust concentrations less than 100 g/m³ which is 60-70 percent lower than conventional legs and should be permitted.

WODZINSKI: I agree with Items 1 and 2 of the Recommendation. However, Items 3 and 4 of the Recommendation permit exceptions for legs having either belt speeds below 500 fpm or capacities less than 3750 ft³/hr. The justification provided in Proposal 61-39 indicates that "The exemption is based on reports that low belt speeds with large buckets substantially reduce dust concentrations." The wording in Items 3 and 4 conflicts with this justification.

(Log #CP27)

61- 17 - (5-4.1.2 Exception and 5-4.2.2 Exception (new) (New)): Accept

SUBMITTER: Technical Committee on Agricultural Dusts
RECOMMENDATION: Add the following new Exception to the existing Sections 5-4.1.2 and 5-4.2.2 to read as follows:

Exception: Those portions of outside legs, as defined in this standard, below grade or passing through ground-level buildings do not require explosion venting.

SUBSTANTIATION: These exceptions were added to clarify where venting is required on outside legs.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25 **VOTE ON COMMITTEE ACTION:**

AFFIRMATIVE: 22
NEGATIVE: 1
NOT RETURNED: 2 Baker, Fawbush

EXPLANATION OF NEGATIVE:
JANZ: Not required infers not necessary. It is my understanding that existing research on venting of legs did not exclude a segment of a leg because 20 percent of the leg could be in a building. By eliminating the necessity of venting that portion of the leg in the building, we seriously compromise the effectiveness of the venting. By requiring that portion of legs in buildings to be vented outside, we may be limiting the effectiveness of the vent however, some is still better than none. Additionally with the listing of Flame Arresting and Particulate Retention Devices a means now exists to safely vent equipment in buildings.

Adding "newly" to the text is ambiguous. If we want to insure that authorities having jurisdiction do not retroactively enforce these standards than we should indicate so by specifying a date. By adding newly to the text someone could assume the requirement was established with the issuance of the revised standard when in fact, the requirement could have been added to the standard 3 or more years prior to the current standard.

COMMENT ON AFFIRMATIVE:
WODZINSKI: I agree with the Exception in Principle, however, the wording does not adequately address the fact that the portions of the legs exempted may need to be considerably stronger than those vented sections of the legs outside of these areas. This is to prevent failure of the exempted leg sections into potentially occupied spaces in the event of an explosion within the leg.

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(Log #CP17)

61- 18 - (5-4.1.2 and A-5-4.1.2): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Modify existing 5-4.1.2 and its Appendix to read as follows:

5-4.1.2* All newly installed outside legs handling bulk raw grain shall be provided with explosion relief panels opposite each other, located at intervals no greater than 20 ft (6 m) along both sides of the up and down leg casings, and each vent shall have a minimum area equivalent to 2/3 the cross sectional area of the leg casing. Explosion venting for outside legs should start between 8 and 12 ft above grade or the bottom of the explosion vent within 1 to 4 ft after leg penetrates the building roof. Explosion relief shall be provided in the top of the head section, not directed toward access platforms or work areas.

A-5-4.1.2 Vents should deploy when an internal pressure of 0.5 psig to 1.0 psig (3.4 kPa to 6.9 kPa) occurs. Vent materials should be of lightweight construction and meet the guidelines given in NFPA 68, Guide for Venting of Deflagrations.

Bucket elevator head sections are recommended to have 5 ft³ (0.5 m³) of vent area for each 100 ft³ (2.8 m³) of head section volume.

For many leg configurations, explosion venting should be made in the top of the head section to avoid exposing personnel on maintenance platforms. If the recommended venting areas cannot be achieved, some venting is better than none, since it can greatly reduce explosive pressures and damage.

SUBSTANTIATION: Some Appendix text was moved to the body in order to make it mandatory instead of advisory. This text described the only proven method based on full scale tests that the Committee is aware of. The modifications also improve usability. In addition, text was added to provide the maximum venting and minimize personnel exposure.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NEGATIVE: 1

NOT RETURNED: 2 Baker, Fawbush

EXPLANATION OF NEGATIVE:

ELLSWORTH: This rule defines exact locations of the vent on leg trunking based on test results, however, it is my understanding the test did not state that face mounting was not effective, only that it was not as effective as side mounted vents.

Some installations become very difficult to vent away from ladders and platforms when the only location is on sides. Also, in rare cases one side could be next to a structure making it impossible to vent from one side. Based on the listed reasons, I vote no on this and feel it should allow the alternative to side mounting, the face mounting of vents, but the preferred method on the sides. Also, the top venting should be on the discharge side so that premature discharge will not wear out the explosion vent.

COMMENT ON AFFIRMATIVE:

ELZEY: The venting areas of 5 ft and (.05 m) should be square not cube.

(Log #CP19)

61- 19 - (5-4.1.3): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Modify the existing 5-4.1.3 to read as follows:

5-4.1.3* Inside legs handling bulk raw grain shall be permitted if:
(a) Legs are located within 10 ft (3 m) of an exterior wall and are vented as outlined in Section 5-4.1.2 to the outside of the building, or

(b) Legs are provided with explosion protection as outlined in Section 4-3, or

(c)* Legs have belt speeds below 500 ft/min (2.5 m/sec) or capacities less than 3750 ft³/hr (106 m³/hr).

SUBSTANTIATION: A section reference was added in (a) for clarity and ease of use and was removed in (b) to avoid redundancy.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 21

NEGATIVE: 2

NOT RETURNED: 2 Baker, Fawbush

EXPLANATION OF NEGATIVE:

JANZ: If I were a designer looking at subsection (a) I would be very confused. The paragraph indicates that legs can be located inside if vented outside and then refers us to Section 5-4.1.2

indicating that the portion of legs in a building need not be vented. In essence we are allowing legs in a building without venting.

I believe there is a clerical error in subsection (c). It was my understanding that the sentence was to read "Legs have belt speeds below 500 ft/min and capacities less than 3750 ft³/hr."

VALIULIS: The wording of subsection (c) conflicts with the wording adopted in 61-16 (Log #CP21) for the very same paragraph. It is my recollection that the wording in Proposal 61-16 is the one which the committee intended to adopt. However, if I voted positive on this one, I am afraid that the incorrect wording could get adopted.

(Log #CP6)

61- 20 - (5-4.2.2): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Add a statement to the end of 5-4.2.2 to read:

Appendix A-5-4.1.2 provides guidance for explosion venting design guidelines.

SUBSTANTIATION: The Appendix provides more complete guidance on the design of explosion venting.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

(Log #CP7)

61- 21 - (5-4.2.7 and A-5-4.2.7): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Modify the existing Sections 5-4.2.7* and A-5-4.2.7 to read as follows:

5-4.2.7* Each leg shall be independently driven by motor(s) and drive train(s) capable of handling the full-rated capacity of the elevator without overloading. Multiple motor drives shall be interlocked to prevent operation of the leg upon failure of any single motor. The drive shall be capable of starting the unchoked leg under full (100 percent) load.

Exception: Line shaft drives as used in the milling industry.

A-5-4.2.7 Any motor or combination of motors utilized should be no larger than the smallest standard motor(s) capable of meeting this requirement.

SUBSTANTIATION: The term "independent" was added to accommodate new technology, which may utilize multiple motors and/or drive trains on one leg.

The Appendix item was modified to also incorporate new technology and to prevent oversized motors.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

(Log #CP18)

61- 22 - (5-4.2.2): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Modify 5-4.2.2 to read as follows:

"Newly installed outside legs shall be equipped with explosion venting in accordance with Section 5-4.1.2."

SUBSTANTIATION: This was modified for consistency with the new text of Section 5-4.1.2.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

COMMENT ON AFFIRMATIVE:

WODZINSKI: It is felt that the wording is not clear in making reference to Section 5-4.1.2. A number of exceptions have been made to Section 5-4.1.2. The proposal is not clear if the exceptions are included in the reference.

(Log #CP8)

61- 23 - (5-5.1.1): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Modify existing 5-5.1.1 to read:

5-5.1.1 Receiving systems prior to the leg shall be equipped with one or more devices such as grating, wire mesh screens, permanent magnets, listed electromagnets, pneumatic separators, or specific gravity separators to minimize or eliminate tramp material from the product stream.

Exception: Barge and ship receiving systems using legs as the primary reclaiming systems shall be allowed to have the tramp material protection after the unloading leg, but prior to being handled in another leg or processing equipment.

SUBSTANTIATION: The term "tramp material" was added to emphasize what is to be removed. The term "prior to the leg" was added to define the hazard point. An exception was added to recognize that legs are used as reclaiming systems in barge and ship receiving systems, and it is not possible to have tramp material protection prior to the leg. Other text was added editorially for clarification.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

(Log #CP11)

61- 24 - (6-3.1): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Move existing 6-3.1 and corresponding unchanged Appendix to a new section, 6-1.3, renumbering accordingly, with the following modifications to the existing text:

6-1.3* Dryers and auxiliary equipment shall be designed, operated, cleaned, and maintained to minimize combustible accumulations on those inside surfaces intended to be free of grain or product during drying.

SUBSTANTIATION: The text applies to all dryers, therefore was moved to be a general requirement under 6-1 to apply to all dryers. The text was changed slightly to be applicable to all dryers.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

(Log #CP1)

61- 25 - (8-1 (New)): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Insert a new Section 8-1 to read as follows, and renumber the subsequent sections accordingly:

8-1* General. Dust control as used in this chapter is the control of emission of airborne combustible dusts from process and conveying equipment or material transfer points.

A-8-1 Dust collection systems are designed to handle airborne dust as distinguished from pneumatic conveying for product transport that are covered in Chapter 9 of this standard.

SUBSTANTIATION: This text clarified the application of Chapter 8 to address dust collectors used to collect airborne dust.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

(Log #CP9)

61- 26 - (8-3.1): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Part of the existing text for existing 8-3.1 will be separated and renumbered to be 8-3.1 and 8-3.8. The existing 8-3.8 and subsequent sections will be renumbered accordingly.

8-3.1* Fans and blowers designed to convey combustible dusts through them shall be of spark-resistant construction and shall comply with all requirements of NFPA 91, Standard for Exhaust Systems for Air Conveying of Materials.

8-3.8 Filter media dust collectors shall have a monitoring device (such as a differential pressure gauge) to indicate pressure drop across the filter media.

SUBSTANTIATION: There are currently two requirements with two topics in one section. It was separated into two sections for clarity.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

(Log #2)

61- 27 - (8-3.2): Accept in Principle

Note: This Proposal appeared as Comment 61-91 which was held from the Annual 95 ROC on Proposal 61-1.

SUBMITTER: David A. de Vries, Schirmer Engineering Corporation

RECOMMENDATION: Revise text to read:

"Dust collectors shall be located outside of buildings and shall be protected in accordance with Section 4-3.1."

SUBSTANTIATION: Dust collectors by their very nature are likely to contain combustible dust/air mixtures within the explosive range. A single failure, i.e., an ignition source, is likely to result in an explosion. Although distinctly preferable over indoor installation, outdoor dust collectors without explosion protection can fail in an unpredictable and catastrophic fashion, presenting a hazard to both property and personnel. Explosion venting is a commonly installed and readily available means for dissipating the dust explosion energy in a controlled fashion. Alternate means for protection are available per Section 4-3.1.

COMMITTEE ACTION: Accept in Principle.

Modify existing 8-3.2 as follows:

8-3.2 Dust collectors shall be located outside of buildings and shall be protected in accordance with Section 4-3.

Exception No. 1:* Dust collectors shall be permitted inside of buildings if located adjacent to an exterior wall and vented to the outside through straight ducts not exceeding 20 ft (6 m) in length, and designed so that the explosion pressures will not rupture the ductwork or the collector.

Exception No. 2: Dust collectors shall be permitted to be located inside of buildings if equipped with an explosion suppression system designed according to NFPA 69, Standard on Explosion Prevention Systems.

Exception No. 3: Centrifugal separators, without bags, used for removing moisture from coolers handling pelleted, extruded, or flaked grain and feed products shall be permitted inside or outside buildings without explosion protection.

Exception No. 4: Bin vent dust collectors directly mounted without a hopper on a tank or bin, whose primary function is to filter air displaced during filling or blending operations and return dust directly to the bin, shall be permitted inside or outside of buildings without explosion protection. Filters that return air to inside of buildings shall be capable of a minimum efficiency of 99.9 percent at 10 microns.

Exception No. 5: Filters used for classifying food products with air (product purifiers) shall be permitted to be located inside or outside of buildings without explosion protection.

COMMITTEE STATEMENT: In Exception 1, 10 ft was changed to 20 ft to be consistent with the new design parameters allowed in NFPA 68, published in the A98 Report on Proposals.

NFPA 68 will provide design guidance on how to adjust the explosion vent design to compensate for the explosion vent duct.

In Exceptions No. 3, No. 4, and No. 5, the terms "or outside" and "without explosion protection" were added to adjust the exceptions to agree with the proposal in principal.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

(Log #CP10)

61- 28 - (8-3.8): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Move existing 8-3.8* and associated appendices and subsections to a new Section, 8-3.11.

8-3.11* Filtered Air.

8-3.11.1 Recycling of air from collectors to buildings shall be permitted if the system is designed to prevent both a return of dust and transmission of energy from a fire or explosion to the building. (For bin vents, see 8-3.2, Exception No. 4.)

8-3.11.2 Filters that return air to inside of buildings shall be capable of a minimum efficiency of 99.9 percent at 10 microns.
SUBSTANTIATION: The filtered air section was separated from the other sections in 8-3 that provide equipment requirements.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 21
 NEGATIVE: 2
 NOT RETURNED: 2 Baker, Fawbush

EXPLANATION OF NEGATIVE:
 JANZ: I believe there are several clerical errors. The first line should read "to a new Section 8-4.11 not 8-3.11."

Line two should read 8-4.11 not 8-3.11.
 Line three should read 8-4.11.1 not 8-3.11.1.
 Line four should read 8-4.11.2 not 8-3.11.2.

JENSEN: An Exception to 8-3.11.1 should be added to read:
 Exception No. 1: Those dust collectors allowed to be located inside without explosion protection under 8-3.2 are exempt from the transmission of energy prevention requirement.

Dust collectors located inside without explosion protection as permitted do not pose any additional risk of energy in the room with or without flame deflector or dust suppression.

(Log #3)

61- 29 - (8-3.9): Reject
 Note: This Proposal appeared as Comment 61-100 which was held from the Annual 95 ROC on Proposal 61-1.

SUBMITTER: Paul A. Luther, Purina Mills, Inc.
RECOMMENDATION: Revise text:
 "...be located adjacent to an external wall and be equipped with explosion venting panels or be located external to the buildings..."

SUBSTANTIATION: If a bin located next to an exterior wall is equipped with explosion panels, then using it to store grain dust should be allowed. It is not common current design practice to construct an outside bin for this dust.

COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: The Committee believes that separate storage of dusts within the facility is a greater hazard due to concerns with secondary explosions. The magnitude of an explosion in a dust bin is much greater than that of a grain bin. The storage of grain dust as an ingredient in a feed mill is not intended to be covered in Chapter 8.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23
 NOT RETURNED: 2 Baker, Fawbush

(Log #CP3)

61- 30 - (8-3.9): Accept
SUBMITTER: Technical Committee on Agricultural Dusts
RECOMMENDATION: Revise the existing 8-3.9* to read:

8-3.9* Bins and tanks for the storage of grain dust shall be dusttight, be constructed of noncombustible materials, and be located outside the buildings or structures. The dust bins and tanks shall have transfer systems that are separated from the upstream operations by rotary valves, choke seals, or other methods to reduce the likelihood of propagation of an explosion in accordance with NFPA 69, Standard on Explosion Prevention Systems.

SUBSTANTIATION: The change in the text offers a practical means to mitigate the secondary explosion hazards by preventing upstream propagation of the explosion. The removal of the text "...and be equipped with explosion venting" was done to eliminate the difficulty of venting bins with high aspect ratios (ratio of height to diameter).

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 21
 NEGATIVE: 2
 NOT RETURNED: 2 Baker, Fawbush

EXPLANATION OF NEGATIVE:
 NELSON: See my Explanation of Negative on Proposal 61-5 (Log #CP31).

WODZINSKI: The proposal removed any requirement for explosion venting of bins and tanks for the storage of grain dust. The substantiation indicates that the proposal "...offers a practical means to mitigate the secondary explosion hazards by preventing

upstream propagation of the explosion." However, it does not appear to consider that the devices mentioned (rotary valves, choke seals, etc.) may be ineffective in preventing propagation unless the area in which the explosion originates is provided with explosion venting. The devices mentioned are not recognized being suitable to prevent the propagation of a dust explosion.

Also, the substantiation indicates that it was done to eliminate the difficulty of venting bins with high L/D ratios. This does not address those bins with low L/D ratios.

Also, see my Explanation of Negative on Proposal 61-41.

(Log #4)

61- 31 - (9-4.1): Accept in Principle in Part
 Note: This Proposal appeared as Comment 61-102 which was held from the Annual 95 ROC on Proposal 61-1.

SUBMITTER: David A. de Vries, Schirmer Engineering Corporation

RECOMMENDATION: Revise text as follows:
 "9-4.1 Air material separators...shall be placed outside of buildings or structures ~~or~~ and shall be protected in accordance with Section 4-3.1."

Exception: Air material separators shall be permitted inside of buildings if located adjacent to an exterior wall and vented to the outside through straight ducts not exceeding 10 ft (3 m) in length and designed so that the explosion pressures will not rupture the ductwork or the collector.

SUBSTANTIATION: Air material separators that handle primarily combustible dusts, as opposed to systems handling grains, present a significant risk of dust explosion. Consequently, to achieve a reasonable level of safety to persons and property, it is necessary to provide the addition features of production found in NFPA 650. That standard anticipates that a single failure, i.e., an ignition source, is all that is needed to begin a dust explosion.

COMMITTEE ACTION: Accept in Principle in Part.

Revise 9-4.1 as follows:

9-4.1 Air-material separators connected to processes that are potential sources of ignition such as hammermills, ovens, and direct-fired dryers, and other similar equipment placed inside or outside of buildings shall be protected in accordance with Section 4-3. Indoor air-material separators protected by explosion venting shall be located adjacent to an exterior wall and vented to the outside through straight ducts not exceeding 20 ft (6 m) in length, and designed so that the explosion pressures will not rupture the ductwork or the separator.

COMMITTEE STATEMENT: The Committee agreed with the submitter that explosion protection is required for both indoor and outdoor separators, but should not be limited to venting.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23
 NOT RETURNED: 2 Baker, Fawbush

(Log #CP14)

61- 32 - (9-4.2): Accept

SUBMITTER: Technical Committee on Agricultural Dusts
RECOMMENDATION: Insert a new section 9-4.2 and renumber subsequent sections accordingly.

9-4.2 Cyclones with a 30 in. (0.76 m) diameter or less used as air material separators shall be allowed to be placed inside buildings without explosion protection when the following conditions are present:

1. The room, building, or other enclosure is not a Class I, Division 1 or 2; or Class II, Division 1 area as defined by Article 500 of the NEC®.
2. Material being processed has a minimum ignition energy of > 10 mJ.
3. System is a closed process, excluding cleaning vacuum systems.
4. Material being processed has a K_{st} of less than 200 bar-m/s.

SUBSTANTIATION: This new section is added to allow small material separators in relatively low hazard locations. This is consistent with the language present in the previous NFPA 61A, 1989 that was incorporated in this standard.

Materials with a K_{st} of 100 would only require 33 in.² (21cm²) venting area using the current VDI (Verein Deutsche Ingenieure) calculations, or 51 in.² (32 cm²) using Factory Mutual calculations. (The current NFPA 68 does not yet include current VDI calculations). An 8 in. inlet/outlet pipe would provide over

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50 in.² of venting area. The Committee realizes that the duct connected to the outlet reduces the explosion venting efficiency of the opening.

The small surface area of a 30 in. diameter cyclone would not allow installation of a vent without adversely affecting the performance of the cyclone, even if the cyclone were installed outside a building.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

(Log #CP36)

61- 33 - (9-4.2.1 and 9-4.2.2): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Modify 9-4.2.1 and 9-4.2.2 to the following:

9-4.2.1 Recycling of air from air-material separators to buildings shall be permitted if the system is designed to prevent transmission of energy from a fire or explosion to the building. (For bin vents, see 8-3.2, Exception No. 4.)

9-4.2.2 Air that is returned inside the building or to makeup air systems shall be filtered to the efficiency of 99.9 percent at 10 microns.

SUBSTANTIATION: The text was modified to clarify the text to be more user-friendly.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

NEGATIVE: 1

NOT RETURNED: 2 Baker, Fawbush

EXPLANATION OF NEGATIVE:

JENSEN: An Exception to 9-4.2.1 should be added to read: Exception No. 1: Those air-material separators allowed to be located inside without explosion protection under 9-3.2 are exempt from the transmission of energy requirement.

Also, see my Explanation of Negative on Proposal 61-28.

(Log #5)

61- 34 - (10-4.1 Exception): Reject

Note: This Proposal appeared as Comment 61-107 which was held from the Annual 95 ROC on Proposal 61-1.

SUBMITTER: Steven E. Kroon, Continental Grain Company

RECOMMENDATION: Move the exception to section 10-4.3 instead.

SUBSTANTIATION: If standpipe and hoses are installed, they must meet NFPA 14 requirements. But wet or dry standpipes are not needed in grain elevator or feed mill warehouses due to limited combustibles, availability of portable fire extinguishers, and exterior hydrants for fire department hoses.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: There is currently no Exception to 10-4.1.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

(Log #6)

61- 35 - (11-11 (New)): Accept in Principle

Note: This Proposal appeared as Comment 61-136 which was held from the Annual 95 ROC on Proposal 61-1.

SUBMITTER: David A. de Vries, Schirmer Engineering Corporation

RECOMMENDATION: Add new text:

11-11 Maintenance.

11-11.1 All equipment installed in accordance with this standard shall be maintained in operable condition.

11-11.2 Water-based extinguishing systems shall be maintained in accordance with NFPA 25, Standard for the Inspection, Maintenance and Testing of Water-Based Extinguishing Systems.

SUBSTANTIATION: Equipment installed in accordance with this standard must be maintained in good condition in order that it prevent or suppress fires and explosions. NFPA records recount numerous instances where fires started because of lack of

maintenance or spread out of control because of fire protection equipment that was in an inoperable condition.

COMMITTEE ACTION: Accept in Principle.

Add new text:

11-11 Maintenance. All equipment installed in accordance with this standard shall be maintained in operable condition.

10-7 Maintenance. Water-based extinguishing systems shall be maintained in accordance with NFPA 25, Standard for the Inspection, Maintenance and Testing of Water-Based Extinguishing Systems.

COMMITTEE STATEMENT: The Committee agreed with the submitter's intent, but changed the location of the proposed 11-11.2 to place it in the relevant Chapter, Building Fire Protection.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

(Log #7)

61- 36 - (12-1.1): Reject

Note: This Proposal appeared as Comment 61-137 which was held from the Annual 95 ROC on Proposal 61-1.

SUBMITTER: Steven E. Kroon, Continental Grain Company
RECOMMENDATION: Add "NFPA 395, storage of flammable and combustible liquids at farms and isolated sites - 1993 edition" to this list of referenced NFPA Codes.

SUBSTANTIATION: NFPA 395 provides reasonable protection for small tanks (1100 gal or less) of flammable or combustible liquids. It is much more useful than NFPA 30 at small, remotely located grain handling facilities.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: NFPA 395 does not cover agricultural and food products facilities covered under NFPA 61. NFPA 30 better applies to NFPA 61 facilities for flammable and combustible liquid hazards.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 22

ABSTENTION: 1

NOT RETURNED: 2 Baker, Fawbush

EXPLANATION OF ABSTENTION:

ELZEY: I am not familiar with NFPA 30 and do not know if this is a better document for addressing this area, therefore I abstained. If the Committee believes this is the best document for this issue, I will support the Committee Recommendation.

(Log #CP16)

61- 37 - (A-4-1): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Add a new appendix item A-4-1 to read as follows:

A-4-1 It should be noted that the protections described here may not, in themselves, eliminate explosion or deflagration propagation. Other means, when practicable, such as rotary valves, fast closing valves, conveyor seals or chokes may minimize propagation potential. Ultimately, if adequate explosion venting is provided or equipment fails, explosion propagation may still be possible. Additional information on deflagration isolation can be found in NFPA 69 and in NFPA 654, Appendix A.

SUBSTANTIATION: The Committee believed that explosion isolation should be considered to reduce risk. The Committee wished to advise the user that providing the protection described here may not prevent propagation of the explosion or deflagration.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 23

NOT RETURNED: 2 Baker, Fawbush

(Log #CP33)

61- 38 - (A-4-2.1): Accept

SUBMITTER: Technical Committee on Agricultural Dusts

RECOMMENDATION: Modify Table A-4-2.1 to add a Note 4 to read as follows:

Note 4: The data is from Factory Mutual Research Corporation.

SUBSTANTIATION: This was added for clarification of the source of data for reproducibility.

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(Log #CP2)

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 23
NOT RETURNED: 2 Baker, Fawbush

(Log #CP20)

61- 39 - (A-5-4.1.3(c), A-5-4.2.3 and A-5-4.2.13): Accept
SUBMITTER: Technical Committee on Agricultural Dusts
RECOMMENDATION: Modify A-5.4.1.3(c), A-5-4.2.3, A-5-4.2.13
Exception to remove the sentence, "This exemption is based on no reported industry losses" and replace it with the following:
"This exemption is based on reports that low belt speeds with large buckets substantially reduce dust concentrations."
SUBSTANTIATION: There have been limited industry losses, but these requirements are still justified as a result of a Technical Committee literature search.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 23
NOT RETURNED: 2 Baker, Fawbush
COMMENT ON AFFIRMATIVE:
WODZINSKI: The same Exception currently exists to Section 5-4.2.8. Is this appendix material intended to be attached to that paragraph?

(Log #CP25)

61- 40 - (A-8-1.1 (New)): Accept
SUBMITTER: Technical Committee on Agricultural Dusts
RECOMMENDATION: Add a new Appendix to existing 8-1.1 to read as follows:
A-8-1.1 A relatively small initial dust deflagration can disturb and suspend in air dust that has been allowed to accumulate on the horizontal and vertical surfaces of a building or equipment. This dust cloud provides fuel for the secondary deflagration, which can cause damage. Reducing significant additional dust accumulations is, therefore, a major factor in reducing the hazard in areas where a dust hazard can exist.
SUBSTANTIATION: This added appendix text clarifies the reason for housekeeping.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NEGATIVE: 1
NOT RETURNED: 2 Baker, Fawbush
EXPLANATION OF NEGATIVE:
JANZ: There is a clerical error in this section. Line two under Recommendation should read A-8-2.1 not A-8-1.1.

61- 41 - (A-8-3.9): Accept
SUBMITTER: Technical Committee on Agricultural Dusts
RECOMMENDATION: Add another paragraph to existing Appendix item A-8-3.9:
"Separate storage of dusts within the facility is a greater hazard due to concerns with secondary explosions. The magnitude of an explosion in a dust bin is much greater than that of a grain bin. The storage of grain dust as an ingredient in feed mills or other processes should be in separate outside bins or in bins that have external walls that are equipped with explosion venting."
SUBSTANTIATION: The Appendix text was added as a result of the Committee's deliberations on 61-29 (Log #3.) It provides clarification to the reader on the restriction for the use of bins for grain dust storage.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 25
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 22
NEGATIVE: 1
NOT RETURNED: 2 Baker, Fawbush
EXPLANATION OF NEGATIVE:
WODZINSKI: The appendix material conflicts with the requirement in Proposal 61-30 which deleted the requirement for explosion venting of bins and tanks for the storage of grain dust. That proposal (61-30) specifies that bins and tanks for the storage of grain dust shall be located outside of buildings or structures. The proposed appendix material recommends that such storage "...should be in separate outside bins or in bins that have external walls that are equipped with explosion venting", thus recommending storage of grain dust inside of buildings and recommending explosion venting.