# *Electrical Equipment in Chemical Atmospheres Committee*

**ROC Meeting on NFPA 497 & 499**
**Intertek Testing Services**
**Plano, TX**
**March 22-24, 2011**

**DRAFT AGENDA**

**1.** Chair Stallcup calls meeting to order at 8:30 AM on March 22$^{nd}$

**2.** Welcome & Self-Introduction of Committee Members & Guests

**3.** Chair & Staff Liaison Remarks

**4.** Technical Committee Update:
a. Review changes in Membership (See Attachment A)

**5.** Approve TC minutes from ROP meeting in Norwood, MA in August 24-26, 2010 (See Attachment B)

**6.** Review of Fall 2011 document revision cycle and procedures for this meeting (including PowerPoint Presentation).

**7.** Committee Correspondence

**8.** Act on public comments to NFPA 497; prepare Committee actions and any Committee comments, as necessary

**9.** Act on public comments to NFPA 499; prepare Committee actions and any Committee comments, as necessary

**10.** Old Business

**11.** New Business & Determination of next meeting date and location. Not needed for this revision cycle unless the document receives a NITMAM.

**12.** Adjournment

# Sort Listing

| Comm # | Log# | Seq# | | Comm. Action | Tech. Comm. | Section | |
|---|---|---|---|---|---|---|---|
| 497- | 2 | | | | EEC-AAA | - (Table 4.4.2 and 4.4.3 ): | F2011 |
| 497- | 9 | | | | EEC-AAA | - (Table 4.4.2 and 4.4.3 ): | F2011 |
| 497- | 10 | | | | EEC-AAA | - (Table 4.4.2 and 4.4.3 ): | F2011 |
| 497- | 6 | | | | EEC-AAA | - (5.7.5 ): | F2011 |
| 497- | 1 | | | | EEC-AAA | - (Figure 5.9.8(b) ): | F2011 |
| 497- | 5 | | | | EEC-AAA | - (A.5.4.3 ): | F2011 |
| 497- | 8 | | | | EEC-AAA | - (A.5.4.3 ): | F2011 |
| 497- | 7 | | | | EEC-AAA | - (A.5.5.1 (New) ): | F2011 |

497- Log #2 **Final Action:**
**(Table 4.4.2 and 4.4.3)**

**Submitter:** David Wechsler, Dow Chemical
**Comment on Proposal No:** 497-5
**Recommendation:** Retain existing Tables 4.4.2 and 4.4.3.
**Substantiation:** Table 4.4.2 principally, and Table 4.4.3 which is simply a cross reference, should be retained as the data information is of historical and active use within the US which currently is using the Class I, Division methodology.

The proposed revised data is coming from Zone methodology work and hence the Zone Group to Division Group correlation reflect only the application of the defined Group definitions and are not test data values in many instances.

The published Committee action was to strip out the Table 4.4.2 table notes, but as was seen in the balloting comment, this was not the directed action to the Chair appointed subteam. Again because of the historic nature of this data, these notes need to be retained.

Table 4.4.2 is provided as a guideline as discussed in Annex A.4.4.2. Providing a new table might be understood that this information is the standard information to be used for all designs using one of the named materials. Again as indicated in the Annex, users need to be certain of the chemical data information being applied. In many cases this review is best done external to the actions of this Committee.

497- Log #9 **Final Action:**
**(Table 4.4.2 and 4.4.3)**

**Submitter:** David Wechsler, Dow Chemical
**Comment on Proposal No:** 497-5
**Recommendation:** Make the following revisions in Table 4.4.2 and as appropriate in Table 4.4.3:

****Insert 497_L9_revisions for Table 4.4.2 and Table 4.4.3_Rec Here****

**Substantiation:** CAS numbers were corrected using AIChe DIPPR as the guide for CAS numbers.
Methyl Isobutyl has a flash point of 13 per the AICHe DIPPR data system
Process Gas is a generic term and it may have a number of components. Hence it does not have a CAS number.

| | | | |
|---|---|---|---|
| n-Butane | ~~3583-47-9~~<br>106-97-8 | | |
| | | | |
| Methyl Isobutyl Ketone | ~~141-79-7~~ | | |
| | 108-10-1 | Dd | I ~~31~~ |
| | | | 13 |
| | | | |
| Process Gas > 30% H2 | ~~1333-74-0~~ | | |
| | | | |

497- Log #10 Final Action:
(Table 4.4.2 and 4.4.3)

Submitter: David Wechsler, Dow Chemical
Comment on Proposal No: 497-5
Recommendation: If the committee is of the mind that Tables 4.4.2 and 4.4.3 are going to be changed from being simple an alphabetical listing of Selected Chemicals to one of a chemical data base structured to address any chemical, the following new additions are offered:

****Insert 497_L10_Tb 4.4.2 & Tb 4.4.3 new additions_Rec Here*****

Substantiation: If the committee is of the mind that Tables 4.4.2 and 4.4.3 are going to be changed from being simple an alphabetical listing of Selected Chemicals to one of a chemical data base structured to address any chemical, the following new additions. These are commonly used chemicals.

497- Log #6 Final Action:
(5.7.5)

Submitter: David Wechsler, Freeport, TX
Comment on Proposal No: 497-7
Recommendation: Revise text to read as follows:
5.7.5 The majority of chemical plants fall in the moderate range of size, pressure, and flow rate for equipment and piping that handles combustible materials. However, because all cases are not the same, sound engineering judgment is required. ~~For diagrams in Sections 5.9 and 5.10 where the equipment size is indicated as medium to large and the actual equipment is in the small range in Table 5.7.4, it would be appropriate for the indicated distances to be reduced somewhat. Similar situations would apply for pressure and flow rate. On the other hand, for diagrams where equipment size is indicated as small to medium and the actual equipment falls in the large category, the user should consider the API recommendations as more applicable. When applying the diagrams in Sections 5.9 and 5.10, the user should also understand that the distances presented are for a typical hydrocarbon having an LFL on the order of a few percent or less. When the process material LFL is significantly higher, it would be appropriate to reduce the classification distances proportionately.~~
Add new Section 5.6.6 and add new text to read as follows:
<u>The use of terms Small, Medium and Large in the figures below come from the application of Table 5.7.4. In some cases such as in perhaps diagrams in Sections 5.9 and 5.10 where the equipment size is indicated as medium to large and the actual equipment is in the small range in Table 5.7.4, it may be appropriate for the indicated extent distances to be reduced. Similar situations may also apply for pressure and flow rate. On the other hand, for diagrams where equipment size is indicated as small to medium and the actual equipment falls in the large category, the user may need to consider diagrams having greater extent distances. The user should also understand that the extent distances presented may be for a typical hydrocarbon having a smaller LFL's on the order of a few percent or less. Some process material in which the LFL is higher, and a reduction in the extent distance could be applied.</u>
Substantiation: The changes better address the application of the appropriate sections within NFPA 497.

| Chemical | CAS No. | Cl Group | Flash Point (°C) | AIT (°C) | Vapor Density (Air=1) | Class I Zone |
|---|---|---|---|---|---|---|
| Diethanolamine | 111-42-2 | C | 174 | 662 | 3.6 | IIB |
| Diethylenetriamine | 111-40-0 | C | 99 | 357 | 3.5 | IIB |
| Ethylenediamine | 107-15-3 | D | 33 | 385 | 2.1 | IIA |
| Methyldiethanolamine | 105-59-9 | D | 126 | 305 | 1.4 | IIA |
| Piperazine | 110-85-0 | C | 82 | 320 | 1.3 | IIB |
| Propylene Glycol | 57-55-5 | D | 98 | 371 | | IIA |
| Di Propylene Glycol | 25265-71-8 | D | 137 | (T2) | | IIA |
| Tri Propylene Glycol | 24800-44-0 | D | 140 | (T2) | | IIA |
| Triethanolamine | 102-71-6 | C | 179 | 316 | | IIB |

497- Log #1 **Final Action:**
**(Figure 5.9.8(b))**

**Submitter:** Sergio Vieira de Mello, Praxair - Brazil
**Comment on Proposal No:** 497-8
**Recommendation:** Revise text to read as follows:
Figure 5.9.8(b) to be revised showing the potential leak location at bottom of classification area sphere, instead of, location at center of classification area sphere, due hydrogen gas never go down at outdoor installation.
**Substantiation:** To avoid classify more area than necessary, saving money in field installations with more compact layouts.

497- Log #5 **Final Action:**
**(A.5.4.3)**

**Submitter:** David Wechsler, Freeport, TX
**Comment on Proposal No:** 497-10
**Recommendation:** Delete A.5.4.3.
**Substantiation:** Paragraph 5.4.3 deals with fired vessels and has nothing to do with process seals. Additionally as annex material the term `shall' used in the revised text is not permitted.

497- Log #8 **Final Action:**
**(A.5.4.3)**

**Submitter:** David Wechsler, Dow Chemical
**Comment on Proposal No:** 497-10
**Recommendation:**
Delete all of the proposed A. 5.4.3 new text as follows:

~~A.5.4.3 Equipment that depends on a single compression seal, diaphragm, or tube to prevent flammable or combustible fluids from entering the equipment shall be identified for a Class I, Division 2 location even if installed in an unclassified location. Equipment installed in a Class I, Division 1 location shall be identified for the Class I, Division 1 location.~~
~~Note: Equipment used for flow measurement is an example of equipment having a single compression seal, diaphragm, or tube. [70: 500.8(B)(4), 2011] See also Section 501.17 of the NEC.~~

**Substantiation:** Revisions as stated in the proposal substantiation to the NEC have addressed the installation of process seals. Duplication with respect to the installation of electrical equipment is not needed in this practice especially since the scope of this practice deals with materials being processed and handled and not installation.
Paragraph 5.4.3 deals with open flames and hot surfaces associated with the operation of fired vessels and has nothing to do with process seals. The suggested annex material dealing with process seals has nothing to do with the content of paragraph 5.4.3.
With Annex material the term `shall' is not permitted.

497- Log #7 Final Action:
(A.5.5.1 (New) )

**Submitter:** Samuel A. Rodgers, Honeywell, Inc.
**Comment on Proposal No:** 497-7
**Recommendation:** Add new text to read as follows:

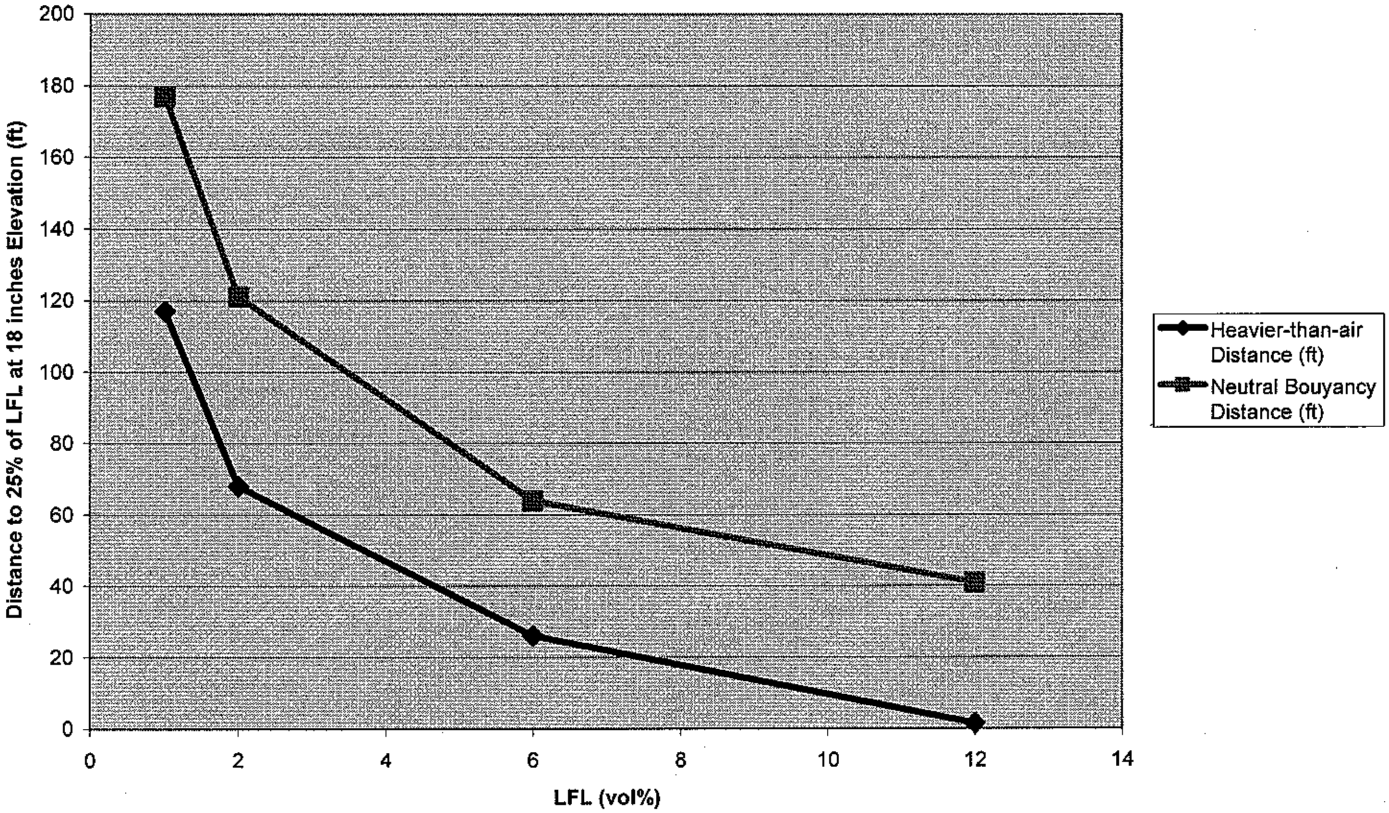
A.5.5.1 One approach to evaluating the extent of a classified area would be to model the release using air dispersion software. Such software is not considered reliable at short distance, but comparisons can be made by looking at larger distances. Consider a release of a typical heavier-than-air flammable material, similar to n-hexane (LFL 1.2 vol%), during early evening with "D" wind stability, 3 meters per second wind speed, and air temperature of 77F. A continuous 1 lb mole/min vapor release at 3 feet above grade would reach 0.3 vol% (25% of LFL) at 18 inches above grade at a downwind distance of approximately 120 ft. Under the same weather conditions, a 1 lb mole/min vapor release of flammable material with density close to air, similar to ethane (LFL=3.0 vol%), would reach 0.75 vol% (25% of LFL) at approximately 105 ft. Figure A.5.5.1 below shows predicted distances to 25% of LFL for both heavier-than-air and neutral buoyancy materials. The extent of a classified area for heavier-than-air materials with LFLs over 6 vol% could be between 30 and 50% of the distances for lower LFL materials.

******Insert Figure A.5.5.1 Here******

**Substantiation:** The ROP statement does not provide any suggestion as to how the user could assess the effect of LFL on the appropriate extent of electrical classification.

Log 7
Sam Rodgers

**Predicted Concentrations [Release of 1 lb mole/min at 3 ft Elevation in EPA Alternate Meteorology]**




**5. Statement of Problem and Substantiation for Comment:** The ROP statement does not provide any suggestion as to how the user could assess the effect of LFL on the appropriate extent of electrical classification.

**6. Copyright Assignment**

X a) **I am the author of the text or other material (such as illustrations, graphs) proposed in this Comment.**

**b) Some or all of the text or other material proposed in this Comment was not authored by me. Its source is as follows:** (please identify which material and provide complete information on its source).

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Signature (Required) Samuel A. Rodgers

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# Sort Listing

| Comm # | Log# | Seq# | | Comm. Action | Tech. Comm. | Section | |
|---|---|---|---|---|---|---|---|
| 499- | 5 | | | | EEC-AAA | - (Entire Document ): | F2011 |
| 499- | 12 | | | | EEC-AAA | - (Entire Document ): | F2011 |
| 499- | 2 | | | | EEC-AAA | - (3.3.3 Combustible Dust ): | F2011 |
| 499- | 3 | | | | EEC-AAA | - (3.3.3 Combustible Dust ): | F2011 |
| 499- | 4 | | | | EEC-AAA | - (3.3.3 Combustible Dust and 3.3.x Flash Fire ): | F2011 |
| 499- | 16 | | | | EEC-AAA | - (3.3.3 Combutible Dust, 4.2.1, A.3.3.3, and ): | F2011 |
| 499- | 1 | | | | EEC-AAA | - (3.3.4.3 Group G ): | F2011 |
| 499- | 6 | | | | EEC-AAA | - (4.1.4.4 (4.7.2 former) ): | F2011 |
| 499- | 8 | | | | EEC-AAA | - (Table 4.2.1.1 and 4.1.4.4 ): | F2011 |
| 499- | 7 | | | | EEC-AAA | - (4.2.3 and 6.3.2 ): | F2011 |
| 499- | 13 | | | | EEC-AAA | - (4.2.3.4 ): | F2011 |
| 499- | 14 | | | | EEC-AAA | - (4.2.4.3 ): | F2011 |
| 499- | 15 | | | | EEC-AAA | - (4.4.6.2 ): | F2011 |
| 499- | 11 | | | | EEC-AAA | - (5.5.7 ): | F2011 |
| 499- | 10 | | | | EEC-AAA | - (A.4.2.4.3 ): | F2011 |
| 499- | 9 | | | | EEC-AAA | - (A.4.4.3.1 ): | F2011 |

499- Log #5 **Final Action:**
**(Entire Document)**

**Submitter:** David Wechsler, Freeport, TX
**Comment on Proposal No:** 499-1
**Recommendation:** Delete the items added to provide tracking between the former NFPA 499 document and the proposed revised document. For example, see 5.1.7 [4.1.7, 4.1.7.1.....] that information within the brackets should not be retained in the final NFPA 499 document.

5.1.7 Electrical equipment in Division 2 locations is designed so that normal operation of the electrical equipment does not provide a source of ignition. ~~[4.1.7, 4.1.7.1, 4.1.7.2, 4.1.7.3]~~

**Substantiation:** The bracketed information was provided to track existing texts with the revised document to better assure no loss of existing texts. This tracking is not needed in the final draft of NFPA 499 and should be removed as an editorial correction.

499- Log #12 **Final Action:**
**(Entire Document)**

**Submitter:** David Wechsler, Dow Chemical Company
**Comment on Proposal No:** 499-1
**Recommendation:** SI units use ohm/m and not ohm/cm. See A 3.3.4.
**Substantiation:** Correct units for SI are ohm/m and not ohm/cm.

499- Log #2 **Final Action:**
**(3.3.3 Combustible Dust)**

**Submitter:** David B. Wechsler, The Dow Chemical Company
**Comment on Proposal No:** 499-1
**Recommendation:** Revise text to read as follows:

**3.3.3* Combustible Dust.** Finely divided solid particles that present a ~~dust flash-fire or~~ dust explosion hazard when dispersed and ignited in air. The term 'solid particles' addresses particles in the solid phase and not those in a gaseous or liquid phase and can include hollow particles. Dust which can accumulate on equipment and includes particles of 420 microns or smaller (material passing a U.S. No. 40 Standard Sieve) is considered to present a ~~dust flash-fire or~~ dust explosion hazard unless testing shows otherwise. (See ASTM E1226 or ISO 6184/1.)

Delete 3.3.x Flash Fire and A.3.3.x Flash Fire.

**Substantiation:** NFPA 499 does not provide any testing or criteria to address 'flash-fire'. NFPA 499 is dealing with a combustible dust, whose primary potential hazard is an overpressure condition developed by a dust in a cloud. While a fire which spreads rapidly may be a significant concern, this specific NFPA recommended practice does not address this specific fire condition.

499- Log #3 **Final Action:**
**(3.3.3 Combustible Dust)**

**Submitter:** David Wechsler, Dow Chemical / Rep. American Chemistry Council
**Comment on Proposal No:** 499-1
**Recommendation:** Revise the third sentence of the revised Combustible dust definition to read:
Dust ~~which can accumulate on equipment and includes~~ particles of 500 ~~420~~ microns or smaller (material passing a U.S. No. 40 Standard Sieve as defined in ASTM E 11-04) are ~~is~~ considered to present a ~~dust flash-fire or~~ dust explosion hazard unless determined ~~testing shows~~ otherwise. (See ASTM E1226 or ISO 6184/1.)
**Substantiation:** The revised text provides a historic perspective that correctly addressed a combustible dust and yet still permits a determination which may be testing, published data or other information as to why dust particles of small size (500 microns or less) should not be considered a combustible dust. Making some type of correlation about the dusts accumulating on equipment really has no bearing on whether or not the dust is a combustible dust. As an example, a process operation may have outstanding housekeeping so that there is no dust accumulations and yet the material being processed may still be a combustible dust.

499- Log #4 **Final Action:**
**(3.3.3 Combustible Dust and 3.3.x Flash Fire (New) )**

**Submitter:** David Wechsler, Freeport, TX
**Comment on Proposal No:** 499-1
**Recommendation:** Replace 3.3.3* Combustible Dust with the following:
Combustible Dust. Any finely divided solid material, less than 420 microns in diameter (material passing a US No. 40 Standard Sieve), that presents a fire or deflagration hazard. If a sample of the dust that is at least 95% by weight less than 74 microns in diameter (US 200 mesh) explodes when tested in accordance with ASTM E1226 "Standard Test Method for Pressure and Rate of Pressure Rise for Combustible Dust" it is termed "explosible" and should be considered a dust explosion hazard.
Delete 3.3.x Flash Fire and A.3.3.x Flash Fire.
**Substantiation:** Flash fire is not addressed in the Hazardous Area Classification assessment for combustible dusts and therefore should not be addressed in a definition under this code.
The modified definition improves that suggested by the document revision.

499- Log #16 **Final Action:**
**(3.3.3 Combutible Dust, 4.2.1, A.3.3.3, and A.4.2.1)**

**Submitter:** Marcelo M. Hirschler, GBH International
**Comment on Proposal No:** 499-1
**Recommendation:** Revise text to read as follows:

**3.3.3* Combustible Dust.** Finely divided solid particles that present a dust flash fire or dust explosion hazard when dispersed and ignited in air. ~~Particles in the solid phase and not those in a gaseous or liquid phase and can include hollow particles. Dust that can accumulate on equipment and includes particles of 420 microns or smaller (material passing a U.S. No. 40 Standard Sieve) is considered to present a dust flash fire or dust explosion hazards unless testing shows otherwise. (See ASTM E 1226, *Standard Test Method for Pressure and Rate of Pressure Rise for Combustible Dusts*, or ISO 6184/1, Explosion Protection Systems – Part 1: Determination of Explosion Indices of Combustible Dust in Air.)~~

**4.2.1*** Testing under this section can be done to verify if the dust is a combustible dust.

**A.4.2.1** The following materials do not require testing:

(1) Noncombustible materials – Noncombustible materials should be established by a recognized test procedure or self-evident chemical structure (e.g., completely oxidized metal, silicate talc, etc.).

(2) Resilient pellets – Pellets or other coarse material significantly greater than 420 microns, which are nonfrangible (which will not break into smaller particles during normal handling or pneumatic conveying), do not require testing.

**A.3.3.3 Combustible Dust.** ~~Materials not requiring testing as follows:~~

~~(1) Noncombustible materials – Noncombustible materials should be established by a recognized test procedure or self-evident chemical structure (e.g., completely oxidized metal, silicate talc, etc.).~~

~~(2) Resilient pellets – Pellets or other coarse material significantly greater than 420 microns, which are nonfrangible (which will not break into smaller particles during normal handling or pneumatic conveying), do not require testing.~~

Combustible dust includes particles in the solid phase and not those in a gaseous or liquid phase and can include hollow particles. Dust that can accumulate on equipment and includes particles of 420 microns or smaller (material passing a U.S. No. 40 Standard Sieve) should be considered to present a dust flash fire or dust explosion hazards unless testing shows otherwise. (See ASTM E 1226, *Standard Test Method for Pressure and Rate of Pressure Rise for Combustible Dusts*, or ISO 6184/1, Explosion Protection Systems – Part 1: Determination of Explosion Indices of Combustible Dust in Air.)

Prior to the 1981 edition of the *National Electrical Code* (NEC) (1978 and prior editions), all Group E dusts (metal dusts such as aluminum, magnesium, and their commercial alloys) and Group F dusts (carbonaceous dusts such as carbon black, charcoal, or coke dusts having more than 8 percent total volatile materials) were considered to be electrically conductive. As a result, areas containing Group E or Group F dusts were all classified Division 1, as required by the definition of a Class II, Division 1 location . It was only possible to have a Division 2 location for Group G dusts.

The 1984 edition of the NEC eliminated Group F altogether. Carbonaceous dusts with resistivity of less than 105 ohm/cm were considered conductive and were classified as Group E. Carbonaceous dusts with resistivity of $10^5$ ohm/cm or greater were considered nonconductive and were classified as Group G. This reclassification allowed the use of Group G, Division 2 electrical equipment for many carbonaceous materials.

The 1987 edition of the NEC reinstated Group F because the close tolerances in Group E motors necessary for metal dusts are unnecessary for conductive carbonaceous dusts, and the low temperature specifications in Group G equipment necessary for grain, flour, and some chemical dusts are unnecessary for nonconductive carbonaceous dusts. This imposed an unwarranted expense on users.

This change allowed the use of Group F, Division 2 electrical equipment for carbonaceous dust with a resistivity greater than $10^5$ ohm/cm.

The problem with this work was that the resistivity value, a number that related to the dust's ability to conduct an electric current, was not a constant and varied considerably based on dust particle size and extent of oxidation, the moisture content, voltage applied, temperature, and test apparatus and technique. No standardized test method for the resistivity value considering long-term environmental effects has been developed. Finally, the resistivity value is not directly related to the explosion hazard.

The 1990 edition of the NEC removed the low temperature consideration for Group G.

*Also revise the title and date of ASTM E 1226 in Chapter 2 to read as follows:*

ASTM E 1226, *Standard Test Method for* Explosibility of Dust Clouds, 2010. ~~*Pressure and Rate of Pressure Rise for Combustible Dusts*, 2005~~.

*Also, add ASTM E 1226, Standard Test Method for* Explosibility of Dust Clouds, 2010. *into a new section B.1.2.1 on*

*ASTM publications*

*Also: remove section 2.3.2 on ISO Publications and ISO 6184 from Chapter 2 and add into a new section B.1.2.4 in a non mandatory Annex,*

*ISO 6184/1, Explosion Protection Systems — Part 1: Determination of Explosion Indices of Combustible Dust in Air, 1985.*

**Substantiation:** The proposed definition is in conflict with the manual of style for two reasons: (a) multiple sentences are not allowed in definitions and (b) requirements are not allowed in definitions.

The information regarding testing is more appropriately placed in the annex under 4.2.1 and not under the definition of combustible dust.

ASTM E 1226 has a 2010 date and a revised title.

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499- Log #1 **Final Action:**
(3.3.4.3 Group G)

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**Submitter:** David B. Wechsler, The Dow Chemical Company

**Comment on Proposal No:** 499-1, 499-4

**Recommendation:** Replace existing text of 3.3.4.3 with the following:

<u>Group G: Atmospheres containing combustible dusts not included in Group E or F, including flour, grain, wood, plastic, and chemicals.</u>

**Substantiation:** As noted in another log 499-4, this committee became aware of the apparent difference in the NEC and NFPA 499 definition for Group G. Acceptance of this comment will align the definitions for Group G in the NEC and in this document which was the intent of this Committee and action by the NFPA Standards Council.

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499- Log #6 **Final Action:**
**(4.1.4.4 (4.7.2 former))**

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**Submitter:** David Wechsler, Dow Chemical Company
**Comment on Proposal No:** 499-1, 499-9
**Recommendation:** Add as Annex/appendix material the following:
*4.1.4.4
As stated in 4.1.3.2 combustible dust layers can cause electrical equipment to overheat as these layers tend to act as insulation. In many instances, the increased temperature resulting from overheating can also cause moisture in the dust to be driven off. This is what happens when a dust dehydrates. Further heating of the dust may additionally result in the formation of a carbonized dust layer. Both these conditions are known to cause the layer ignition temperature to decrease. Unfortunately the lack of standardized tests prevents having a means to correlate how the layer ignition temperature may decrease due to dehydrating or carbonization effects.

The solution therefore when the combustible dust may be known to result in carbonization or dehydration has been the use of a conservative design to apply the lower of either the layer ignition temperature by test or 165°C. However in nearly all cases for organic combustible dusts the 165°C will be the lower values and this then raises the question about the practical value of some of the data presented in Table 5.6.2 (former 4.5.2) and the benchmark basis for the 165°C value.

It is the general belief that the 165°C layer surface temperature design value came from the US Bureau of Mines (USBM) testing in which the two lowest test results found from testing Bruceton bituminous coal (like Pittsburgh coal) dust at 170°C and No 7. Illinois bituminous coal dust at 160°C were averaged. Coal dust is also a dust which has undergone aging, which is another condition not addressed in standardized testing methods for combustible dusts. Therefore, while a conservative design as addressed in this recommended practice and in the National Electrical Code both reflect the use of the lower of the actual layer ignition temperature or 165°C, by performing additionally analysis of the combustible dust users should be better able to select ignition temperature designs which are more representative of the specific combustible dust hazards.

**Substantiation:** Some combustible dusts may be prone to dehydration and carbonization. Both of these conditions in a layer, will decrease the layer temperature. However no standardized testing has been established to address how the onset of these conditions will affect the layer ignition temperature of any given time period. Therefore, users are really left with only applying the 165°C temperature for these types of combustible dusts. What most users do not know, is that this 165°C comes from coal testing and therefore the use of this lower layer ignition temperature may in fact be too conservative. With this modified material users may be able to make better decisions. Additionally, since the NEC contains 'the lower of the actual layer ignition temperature or 165°C' language and it refers to NFPA 499 as a reference, correction here seems an appropriate first step.

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499- Log #8 **Final Action:**
**(Table 4.2.1.1 and 4.1.4.4)**

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**Submitter:** David Wechsler, Dow Chemical Company
**Comment on Proposal No:** 499-1
**Recommendation:** Table 4.2.1.1 seems to conflict with 4.1.4.4 with 4.1.4.4 stating: "The ignition temperature of a layer of organic dust on heat-producing equipment can decrease over time if the dust dehydrates or carbonizes. For such materials the NEC specifies that the surface temperature of the heat-producing equipment not exceed the lower of either the ignition temperature or 165°C (329°F)." Revise the information in the table or that within 4.1.4.4.
**Substantiation:** Resolve the conflict of testing found in Table 4.2.1.1 with statement 4.1.4.4.

499- Log #7 **Final Action:**
**(4.2.3 and 6.3.2)**

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**Submitter:** David Wechsler, Dow Chemical Company
**Comment on Proposal No:** 499-1
**Recommendation:** Resolve the apparent discrepancy between the new 6.3.2 dust layer greater than 1/8 in. and typical sections 4.2.3 in which layer testing is done with ½ in. thickness of dust. It is known that thinner dust layers will often have lower ignition temperatures. Use 1/8 in. for testing.
**Substantiation:** The new 6.3.2 dust layer reflects that greater than 1/8 in. is a Division 1 location. However in the new sections dealing with layer ignition testing like 4.2.3, the testing reflects use of 1/2 in. layer thickness. It is known that thinner dust layers will often have lower ignition temperatures. So why does this practice reflect this significant difference? It seems like the testing should also be done at the Division 1 condition.

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499- Log #13 **Final Action:**
**(4.2.3.4)**

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**Submitter:** David Wechsler, Dow Chemical Co
**Comment on Proposal No:** 499-1
**Recommendation:** Revise text to read as follows:
If the results of the ASTM E2021 test indicate that the material will ignite, then this test temperature would be used in the design critieria for the operating equipment. Temperatures below 450°C could apply the NEC temperature class (T-Code).
Revise A.4.2.3.4 with the following additional statement taken from A.4.2.3.5:
Per NEC 500.8(A) "suitability of equipment" can be used to if equipment would be suitable for the layer ignition temperature. It is not the intent when testing for combustible dust layer ignition temperatures that equipment be marked for the appropriate Temperature Code as a result of such testing. Appropriate equipment surface temperature verifications can be undertaken by users documenting the results of thermal temperature measurements, such as IR, performed by persons trained in the use of such instruments.
Delete 4.2.3.5 and A.4.2.3.5 completely.
Modify Table 4.2 under the diamond "Apply 4.2.3..." by combining the two separate temperature branches which each begin with " Temperature…" into one branch, to read, "Apply the results of the layer ignition temperature test to the design. See 4.2.3.4)" Also revise the first branch to read: "Melts or sublimes before reaching ignition ~~450°C~~"
Renumber 4.2.3.6 to 4.2.3.5 to agree with the other changes made in this section.
**Substantiation:** These changes make the requirement clear. If the material is found to be a combustible dust, then there is a need to understand the characteristics addressed by the layer ignition temperature testing. The rational of having two statements which address the same design temperature in slightly different ways offers little value to users and no overall safety improvement for the installation. The clarification to the Annex for 4.2.3.4 provides an improved method to address the results from the layer ignition temperature testings.

499- Log #14 **Final Action:**
**(4.2.4.3)**

**Submitter:** David Wechsler, Dow Chemical Co
**Comment on Proposal No:** 499-1
**Recommendation:** Revise text to read as follows:

If the results of the ASTM E1491 test indicate that the material will ignite, then this cloud ignition temperature would be used in the design critieria for the operating equipment. Temperatures below 450°C could apply the NEC temperature class (T-Code).

Revise A.4.2.4.3:

Per NEC 500.8(A) "suitability of equipment" can be used to if equipment would be suitable for the layer ignition temperature. It is not the intent when testing for combustible dust layer ignition temperatures that equipment be marked for the appropriate Temperature Code as a result of such testing. Appropriate equipment surface temperature verifications can be undertaken by users documenting the results of thermal temperature measurements, such as IR, performed by persons trained in the use of such instruments.

Modify Table 4.2 by combining the two separate temperature branches under the diamond Apply 4.2.4 into one branch, to read, "Apply the results of the cloud ignition temperature test to the design. (See 4.2.4.3)"

Delete 4.2.4.4 and 4.2.4.5.

**Substantiation:** These changes make the requirement clear. If the material is found to be a combustible dust, and then from the layer ignition temperature test the material melts, then there is a need to understand the characteristics addressed by the cloud ignition temperature testing. The rational of having two statements which address the same design temperature in slightly different ways offers little value to users and no overall safety improvement for the installation. The clarification to the Annex for 4.2.4.3 provides an improved method to address the results from the ignition temperature tests.

499- Log #15 **Final Action:**
**(4.4.6.2)**

**Submitter:** David Wechsler, Dow Chemical Co
**Comment on Proposal No:** 499-1
**Recommendation:** Revise text to read as follows:

Potential fire hazards such as flash-fires, and other ~~Other~~ sources of potential heat, such as hot process surfaces, smoldering nests, self heating and friction sources, should also be considered independently of the recommended practice.

**Substantiation:** Concerns about potential fire hazards which seem to involve 'flash-fires' considerations exist. While such concerns are valid, they are outside the scope of this practice and this revision makes it clear that these conditions are addressed in other standards. Hot process surfaces are addressed in this practice with a need to control surface temperatures as needed by the process materials.

499- Log #11 **Final Action:**
**(5.5.7)**

**Submitter:** David Wechsler, Dow Chemical Company
**Comment on Proposal No:** 499-1
**Recommendation:** Add new text to read as follows:

Note: See 6.7 Housekeeping.

**Substantiation:** Housekeeping may be an effective means for controlling dust accumulations and through such appropriate designed systems, like localized vacuum pickups, different equipment may be used.

499- Log #10 Final Action:
(A.4.2.4.3)

**Submitter:** David Wechsler, Dow Chemical Company
**Comment on Proposal No:** 499-1
**Recommendation:** Revise text to read as follows:

**A.4.2.4.3** Per NEC 500.8(A) "suitability of equipment" can be used to determine the maximum surface temperature. It is not the intent when testing for combustible dust layer ignition temperatures that equipment be marked for the appropriate Temperature Code as a result of such testing. Appropriate equipment surface temperature verifications can be undertaken by users documenting the results of thermal temperature measurements, such as IR, performed by persons trained in the use of such instruments.

Housekeeping measures which would prevent hazardous accumulation of combustible dust on equipment may also be another control method.

**Substantiation:** This revision clarifies that it is not the intent that with the introduction of specific testing for combustible dusts that equipment surface temperatures need to require replacement equipment. This testing is not a retroactive requirement. Users may verify surface temperature by using testing instruments, like IR. This revision also addresses the use of housekeeping as an alternative control method.

499- Log #9 Final Action:
(A.4.4.3.1)

**Submitter:** David Wechsler, Dow Chemical Company
**Comment on Proposal No:** 499-1
**Recommendation:** Revise line 4 of this table as follows:

Bulking Brush (Cone Discharge) 10-20 correct resistivities to read 10^9 Ohm/m

**Substantiation:** Editorial correction.