Report of the Committee on Electrical Equipment in Chemical Atmospheres

Richard Y. LeVine, Chairman
Stamford, CT

Mark C. Ode, Secretary
National Fire Protection Association
(Nonvoting)

Alonza W. Ballard, Crouse-Hinds ECM

Albert A. Bartkus, Underwriters Laboratories Inc.
Michael K. Baucom, BEBCO Industries, Inc.
Carol M. Borin, US Dept. of Labor
David H. Byford, Unocal Corp.

Rep. American Petroleum Institute
William G. Lawrence, Factory Mutual Research Corp.

Ernest C. Magison, Honeywell Inc.
Rep. Instrument Society of America

Richard C. Masek, Bailey Controls
Robert E. Mckenney, City of Tacoma, WA, Dept. of Public Utilities

Charles R. Prasso, Industrial Risk Insurers
Milton H. Ramsey, Chevron USA Inc.

Rep. Institute of Electrical & Electronics Engineers, Inc.

R. F. Schwab, Allied-Signal Inc.
George H. St. Onge, Bernardsville, NJ
Daniel E. Vanover, United States Testing Co., Inc.


Alternates

Edward M. Briesch, Underwriters Laboratories Inc.
(Alt. to A. A. Bartkus)

James A. Robertson, Dow Chemical Co., USA
Rep. Institute of Electrical & Electronics Engineers, Inc.
(Alt. to M. H. Ramsey)

Staff Liaison: Mark C. Ode

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.

The Report of the Committee on Electrical Equipment in Chemical Atmospheres is presented for adoption.

This Report was prepared by the Technical Committee on Electrical Equipment in Chemical Atmospheres and proposes for adoption a revision to NFPA 497A, Recommended Practice on Classification of Class I Hazardous Locations in Chemical Plants. NFPA 497A is published in Volume 11 of the 1990 National Fire Codes and in separate pamphlet form.

This Report has been submitted to letter ballot of the Technical Committee on Electrical Equipment in Chemical Atmospheres which consists of 17 voting members; 1 ballot was not returned (Mr. Baucom). The results of the balloting can be found in the report.
497A-1 - (2-3.2.1): Accept
SUBMITTER: Yonggang Chen, Worcester, MA
RECOMMENDATION: The last sentence "which also enhances dispersion" should be deleted.
SUBSTANTIATION: For mass diffusion process, mass diffusion rate \( \dot{m} \) should directly proportional to the concentration (density) gradient \( (2C_i/2X) \). The code states that when the density of the mixture approaches that of air, it enhances the dispersion, this is contrary to the theory.
COMMITTEE ACTION: Accept.

497A-2 - (3-3.2.1): Accept in Principle
SUBMITTER: Carl C. Koslowski, Warren, MA
RECOMMENDATION: Add new text:
("Are pressure relief valves located within the process equipment?"
SUBSTANTIATION: In the event that a process failure produces high pressures, a significant discharge of flammable vapors may result. The large quantity of turbulent vapors will quickly form a flammable mixture. Whenever pressure relief valves are present, consideration must be given to escaping vapors.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: Change to "(I) Are pressure relief valve discharges located within the area?"
VOTE ON COMMITTEE ACTION: Unanimous.

497A-3 - (Chapter 3, Section 3-4): Reject
SUBMITTER: David N. Bishop, New Orleans, LA
RECOMMENDATION: Following the paragraph "Figure 3-4.9 shows... flammable liquid. (From API RP500A.)", Add the following underlined words inside the parentheses:
(From API RP500A, applicable to those locations in which petroleum gases and volatile flammable liquids are processed, stored, or loaded, unloaded, or otherwise handled in petroleum refineries.)

SUBSTANTIATION: The American Petroleum Institute has three separate publications dealing with the classification of locations for electrical installations: RP500A, for refineries; RP500B, for producing and drilling facilities; and RP500C for pipeline facilities. The referenced figures are applicable only to refineries. The 497A publication as now worded causes confusion to some users. For example, API RP500B must be used for classifying offshore facilities in the OCS area as specified by the Minerals Management Service (MMS), Department of the Interior. I see no need to add the note each time RP500A is cited; once should suffice.
COMMITTEE ACTION: Reject.
COMMITTEE STATEMENT: Figure and index have been revised and no longer show API reference.
VOTE ON COMMITTEE ACTION: Unanimous.

497A-4 - (Figures 3-4.15, 3-4.15 through 3-4.20, 3-4.26, 3-4.30 through 3-4.32): Accept.
SUBMITTER: Richard K. Kaminski, Pittsburgh, PA
RECOMMENDATION: Review figures for dimensions and radii:
Review Figures 3-4.15, 3-4.15, 3-4.15, 3-4.16, 3-4.17, 3-4.17, 3-4.18, 3-4.19, 3-4.20, 3-4.21, 3-4.22, 3-4.26, 3-4.30, 3-4.30, 3-4.31, 3-4.32.
SUBSTANTIATION: Figures need review of dimensioning and notes. Arrowhead corrections are needed. Div. 1 should be added to some Div. 2 areas. The following marked up figures should be self explanatory.
COMMITTEE ACTION: Accept. Complete revision of drawings.
EXPLANATION OF VOTE: Prasso.
VOTE ON COMMITTEE ACTION: Unanimous.
Below grade location such as a sump or trench.

Figure 3-4.1 Leakage Source Located Outdoors, at Grade.

Below grade location such as a sump or trench.

Figure 3-4.2 Leakage Source Located Outdoors, Above Grade.

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Below grade location such as a sump or trench.

Figure 3-4.3 Leakage Source Located Indoors, at Floor Level. Adequate Ventilation is Provided.

Below grade location such as a sump or trench.

Figure 3-4.4 Leakage Source Located Indoors, Above Floor Level. Adequate Ventilation is Provided.

MATERIAL: Flammable Liquid

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Division 1

Division 2
Figure 3-4.5 Leakage Source Located Indoors, at Floor Level, Adjacent to Opening in Exterior Wall. Adequate Ventilation is Provided.

Figure 3-4.6 Leakage Source Located Indoors, at Floor Level, Adjacent to Opening in Exterior Wall. Adequate Ventilation is NOT Provided.

Note: If building is small compared to size of equipment and leakage can fill the building, the entire building interior is classified Division 1.

**MATERIAL:** Flammable Liquid

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Division 1

Division 2
Figure 3-4.7 Leakage Source Located Outdoors, At Grade.

Figure 3-4.8 Leakage Source Located Outdoors, Above Grade.

MATERIAL: Flammable Liquid, Liquefied Flammable Gas, Compressed Flammable Gas, and Cryogenic Liquid

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Division 1

Division 2
Figure 3-4.9 Leakage Source Located Outdoors, At Grade.

Figure 3-4.10 Leakage Source Located Outdoors, Above Grade.

MATERIAL: Flammable Liquid

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- Division 1
- Division 2
- Additional division 2 location extra precaution where large release of volatile products may occur.
Notes:
1) Apply horizontal distances of 50 feet from the source of vapor or 10 feet beyond the perimeter of the building, whichever is greater, except that beyond unpierced vapor tight walls the area is nonclassified.

Figure 3-4.11 Leakage Source Located indoors, Adjacent to Opening in Exterior Wall. Adequate Ventilation IS NOT Provided.

Figure 3-4.12 Leakage Source Located Indoors, Adjacent to Opening in Exterior Wall. Adequate Ventilation IS Provided.

MATERIAL: Flammable Liquid

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Division 1
Additional division 2 location extra precaution where large release of volatile products may occur.

39
Figure 3-4.13 Multiple Leakage Sources, Both At and Above Grade in Outdoor Process Area.
FIGURE 3-4.14  Multiple Leakage Sources, Both At and Above Grade, in Outdoor Process Area.
Figure 3-4.15 Multiple Leakage Sources, Both At and Above Grade, in Outdoor Process Area.
**Figure 5-4.16** Multiple Leakage Sources, Both At and Above Floor Level, Located Indoors. Adequate Ventilation Is Provided.

**MATERIAL: Flammable Liquid**

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- Division 1
- Division 2
Figure 3-4.17 Totally Enclosed Product Dryer
Located in Adequately Ventilated Building.
MATERIAL: Solids Wet with Flammable Liquid

Figure 3-4.18 Plate and Frame Filter Press Provided with Adequate Ventilation.
Tank within dike

Tank in open (undiked) area

Division I, 5' R. around vent

Division 2, 10' R from vent

Division 2

10' R

Dike

Surface of tank contents

Grade

10'

Below grade location such as a sump or trench.

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Division 1

Division 2

Figure 3-4.19 Storage Tanks, Outdoors at Grade.
Figure 3-4.20 Tank Car/Tank Loading and Unloading via Closed System. Transfer through Dome Only.

MATERIAL: Flammable Liquid

Division 1

Division 2
Figure 3-4.21 Tank Car Loading and Unloading via Closed System. Bottom Product Transfer Only.

MATERIAL: Flammable Liquid

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Division 1

Division 2
Figure 34.22 Tank Car/Tank Truck Loading and Unloading via Open System. Top or Bottom Product Transfer.

MATERIAL: Flammable Liquid

Figure 34.23 Tank Car/Tank Truck Loading and Unloading via Closed System. Transfer through Dome Only.

MATERIAL: Flammable Liquefied Gas
Flammable Compressed Gas
Flammable Cryogenic Liquid
Below grade location such as a sump or trench.

Diagram:
- **Division 1**: 3' R
- **Division 2**: 5' R
- **Vent**
- **Fill pipe**
- **DRUM**
- **Grade**
- **18''**
- **10'**

MATERIAL: Flammable Liquid

Figure 3-4.24 Drum Filling Station, Outdoors or Indoors with Adequate Ventilation.
NOTE: This diagram does not apply to open pits or open vessels, such as dip tanks or open mixing tanks, that normally contain flammable liquids.

Figure 3-4.25 Emergency Impounding Basin or Oil Water Separator (Top) and Emergency or Drainage Ditch Oil/Water Separator (Bottom).
Figure 3-4.26 Liquid Hydrogen Storage System Located Outdoors or in an Adequately Ventilated Building.

Figure 3-4.27 Gaseous Hydrogen Storage System, Located Outdoors or Indoors in an Adequately Ventilated Building.
MATERIAL: Lighter-than-Air Gas

Figure 3.4.28 Adequately Ventilated Compressor Shelter.

Figure 3.4.29 Inadequately Ventilated Compressor Shelter.
Dike Height Less than Distance from Container to Dike (H Less than X)

Dike Height Greater than Distance from Container to Dike (H Greater than X)

MATERIAL: Liquefied Natural Gas or Other Cryogenic Flammable Liquids

Figure 3-4.30 Storage Tanks for Cryogenic Liquids.
Below grade location such as a sump or trench.

Figure 3-4.31 Leakage Source from Equipment Handling Liquefied Natural Gas, Source is Located Outdoors At or Above Grade.

Indoors with adequate ventilation

- Division 1
- Division 2

MATERIAL: Liquefied Natural Gas or Other Cryogenic Flammable Gas

Figure 3-4.32 Leakage Source from Equipment Handling Liquefied Natural Gas in an Adequately Ventilated Building.
Figure 3-4.33 Leakage Source from Routinely Operating Bleeds, Equipment Handling Liquefied Natural Gas in an Adequately Ventilated Building.

MATERIAL: Liquefied Natural Gas or Other Cryogenic Flammable Gas
Notes:
1. The "source of vapor" shall be the operating envelope and stored position of the outboard flange connection of the loading arm (or hose).

2. The berth area adjacent to tanker and barge cargo tanks is to be Division 2 to the following extent:
   (a) 25 ft (7.6 m) horizontally in all directions on the pier side from that portion of the hull containing cargo tanks.
   (b) From the water level to 25 ft (7.6 m) above the cargo tanks at their highest position.

3. Additional locations may have to be classified as required by the presence of other sources of flammable liquids or by Coast Guard or other regulations.

Figure 3-4.34 Marine Terminal Handling Flammable Liquids

MATERIAL: Flammable Liquids