National Fire Protection Association
The authority on fire, electrical, and building safety

NFPA Standards Overview

Combustible Dusts, Electrical Classification, PPE

July 20, 2015| Guy R. Colonna, PE, NFPA

Agenda

- Combustible Dusts
  - NFPA Adopts new standard on fundamentals
  - OSHA update on regulatory development
- Electrical Area Classification
  - National Electrical Code® and NFPA 497 and 499
- Personal Protective Equipment
  - Fire-resistant clothing

NFPA Standards Making Process

- Voluntary consensus standards developing organization (SDO)
  - Adoption through state or local fire and building codes
  - Fire codes in all 50 states (ICC IFC or NFPA 1)
  - Incorporation by reference into federal regulations
    - Not currently combustible dust standards
- Developed by technical committees served by over 6500 volunteers
  - Process is open – anyone can attend meetings and propose changes
  - Process is balanced – limit number of members from interest categories to maintain balance and prevent dominance

Accessing NFPA Document Information Pages

- Home page
  - www.nfpa.org
  - Codes and Standards tab
  - List of documents
- From web browser
  - www.nfpa.org/664
- Next edition tab

Document information page

NFPA 664: STANDARD FOR THE PREVENTION OF FIRES AND EXPLOSIONS IN WOOD PROCESSING AND WOODWORKING FACILITIES

Current Edition: 2012 Next Edition: 2017

Free access to the 2012 edition of NFPA 664

About free access

Alerts: Receive e-mail updates on this document Manage my alerts

Committee members: Sign in to view your documents.

About | Current & Prior Editions | Next Edition | Technical Committee | Technical Questions | Products & Training

Revision cycle information

Revision Cycle: Annual 2016
Revised Edition Date: 2017

First Draft (previously Report on Proposals (ROP))

Public Input Closing Date for Online Submission: 7/7/2014 View Public Inputs
Public Input Closing Date for Paper† Submittal: 6/6/2014
† Paper Submittals are considered any submission other than the online submission system
First Draft Report Posting Date: 3/6/2015

First Draft Meeting Notices (previously ROP Meeting Notices)

Combustible Dusts Correlating Committee (CMD-AAC)

January 6-9, 2015 Correlating Committee First Draft Meeting, Dallas/Fort Worth Airport Marriott, 8440 Freeport Parkway, Irving, TX 75063, 888-236-2427 (PDF, 358 KB) RSVP

Wood and Cellulosic Materials Processing(CMD-WOO)

August 19-20, 2014, Hilton Garden Inn--Chicago O'Hare Airport, Des Plaines, IL 60018, (847) 296-8900 (PDF, 76 KB)

First Draft Meeting Agendas (previously ROP Meeting Agendas)

Wood and Cellulosic Materials Processing(CMD-WOO)

August 19-20, 2014, Hilton Garden Inn--Chicago O'Hare Airport, Des Plaines, IL 60018, (847) 296-8900 (PDF, 469 KB)

First Draft Meeting Minutes (previously ROP Meeting Minutes)

Wood and Cellulosic Materials Processing(CMD-WOO)

Dust Standards – Revision Cycles

NFPA Document	Revision Cycle	Status
NFPA 61	Annual 2016	First Draft posted Second Draft meeting
NFPA 484	Annual 2017	2015 edition available First Draft meeting
NFPA 654	Annual 2016	First Draft posted Second Draft meeting
NFPA 655	Fall 2016	First Draft posted
NFPA 664	Annual 2016	First Draft posted Second Draft meeting
NFPA 652	Annual 2015	2016 edition issued August 20, 2015

New Committee Structure

- New committee structure approved
  - Correlating Committee
  - Technical Committee on Fundamentals of Combustible Dusts
- CMD-FUN developing draft NFPA 652
  - Completed Second Draft
    - New standard scheduled to be issued August 2015
    - Commodity-specific standards implementing NFPA 652

Fundamental Safeguards Against Combustible Dust Fire and Explosion Hazards

- If the solid is, or can form, a combustible dust, then establish one or more of the following protections:

1. Control the fuel – limit the generation or formation of the dust, its release, and its accumulation
2. Control ignition sources – identify potential ignition sources and keep ignition sources from the dust (either dust clouds or dust layers)
3. Limit the spread of any combustion event – if propagating combustion occurs, use construction features or explosion protection and prevention measures (venting, isolation, suppression) to prevent extensive spread of the combustion zone

OSHA

- Currently, no federal standard for general industry that addresses comprehensive safeguards to protect workers from combustible dust fire and explosion hazards
- Proposed rule – October 2009
- National Emphasis Program (NEP) – March 2008
  - Uses NFPA combustible dust standards for reference in identifying hazards and to establish that feasible means for hazard abatement exists
  - Inspections and citations – housekeeping, hazard communication, electrical
  - Cannot cite employer for not complying with NFPA standards as these have not been adopted
- Hazard Communication Standard (29 CFR 1910.1200) revised March 2012 to include combustible dust in definition for hazardous chemical

Incidents and Contributing Factors

- Hot work (ignition source)
- Housekeeping – accumulation exceeds action threshold and methods used stir up dust into cloud (fuel source)
- Mechanical equipment malfunction (ignition source)
- Engineering control – dust collector not protected (limit spread)
- Electrical equipment – not approved for use in an area where dust cloud or dust layers present (ignition source)
- Facility design – drop ceiling creates inaccessible area where fine dust accumulation can occur (fuel source)

Electrical Ignition Sources

- AC or DC electrical equipment faults
  - Design, install, and maintain equipment per NFPA 70, *National Electrical Code*®
  - Area electrical classification, details later…
- Static electricity
  - Guidance in NFPA 77
- Lightning
  - Lightning protection per NFPA 780

NFPA Electrical Area Classification

- Assesses the likelihood that hazardous amounts of combustibles will be present
  - Higher probabilities dictate more stringent requirements for design, installation, and maintenance of electrical equipment
  - The design of electrical equipment must be appropriate to the Class, Division, and Group
  - Intent… low probability that equipment will present an ignition source at the same time a hazardous amount of dust is present

Class II, Division 1

- Dust is present under normal operating conditions, or
- Mechanical failure or abnormal operation might cause release of dust mixtures and provide source of ignition, or
- Combustible dusts of an electrically conductive nature (Group E) may be present in hazardous quantities

Class II, Division 2

- Dust not normally present and insufficient accumulations, but dust may be in suspension due to infrequent malfunctioning equipment, or
- Dust accumulations on, in, or in the vicinity of the electrical equipment may interfere with dissipation of heat from electrical equipment or may be ignitable by abnormal operation or failure of electrical equipment

Material Groups

- Group E - Combustible metal dusts, including aluminum, magnesium, and their commercial alloys
- Group F - Combustible carbonaceous dusts with more than 8 percent total entrapped volatiles (coal, carbon black, charcoal, and coke dusts)
- Group G - Other combustible dusts; including flour, grain, wood flour, plastic, and chemicals

Table 500.8(C) Classification of Maximum Surface Temperature

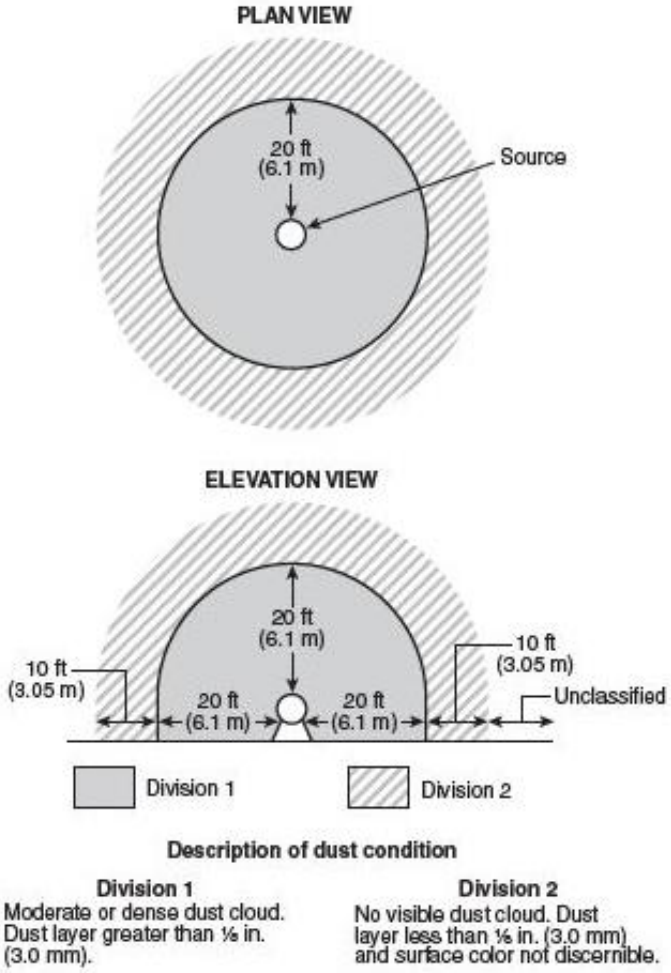
Maximum Temperature		Temperature Class (T Code)
°C	°F	
450	842	T1
300	572	T2
280	536	T2A
260	500	T2B
230	446	T2C
215	419	T2D
200	392	T3
180	356	T3A
165	329	T3B
160	320	T3C
135	275	T4
120	248	T4A
100	212	T5
85	185	T6

Exception: Equipment of the non–heat-producing type, such as junction boxes, conduit, and fittings, and equipment of the heat-producing type having a maximum temperature not more than 100°C shall not be required to have a marked operating temperature or temperature class.

Classifying Locations for Electrical Installations

- NFPA 499, *Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas*
- No such document currently exists for Class III areas

Example Guidance from NFPA 499



Dust accumulation and ignition sources – mechanical or electrical

Use approved electrical equipment

Combustible Dust and Flash Fire Hazard

- Combustible dust National Emphasis Program (NEP) CPL-03-00-008, Section 9.g instructs that citations are permitted for failing to protect employees with flame-resistant clothing in areas of a facility where employees might be exposed to dust flash fire hazard (29 CFR 1910.132 (a))
- References NFPA 2113 for selection

CSB Investigation – iron dust flash fires

- Gallatin, TN - 2011
  - 3 incidents, 5 fatalities
  - Iron dust
  - No explosions
  - Flash fires
- Protective clothing experience
  - Worn in one incident
  - Burn injuries sustained, but no fatality
- Lessons learned regarding FR Clothing

2011 Iron Dust Flash Fire – Gallatin, TN

CSB Investigation – Ink Manufacturing

- Patterson, NJ – October, 2012
- Process – black ink manufacturing which involves mixing solid and liquid ingredients in the pre-mix room, the location of the incident
  - Solid ingredients include carbon black
- Incident – flash fire caused burn injuries to 7 workers
  - Initial fire near bag dump station
  - Flash fire from mixing tank
- Causal factors
  - Dust collector design and operation
  - No FRC clothing required for workers

US Ink

Flame-Resistance

- **Flame Resistance.** The property of a material whereby combustion is prevented, terminated, or inhibited following the application of a flaming or nonflaming source of ignition, with or without subsequent removal of the ignition source.
  - Inherent property of a material
  - Specific treatment

Flash Fire

- **Flash Fire.** A fire that spreads by means of a flame front rapidly through a diffuse fuel, such as dust, gas, or the vapors of an ignitible liquid, without the production of damaging pressure.
  - Usually accompanied by fireball
  - Heat flux of ≥ 84 kW/m^2
  - Time specification – typically less than 3 seconds

Arc Flash

- When electric current passes through air between ungrounded conductors and grounded conductors, temperatures can reach 35,000 ˚F
  - Burns the skin directly
  - Ignition of clothing
- Clothing protecting against arc flash exposure is tested to different standard than flash fire protection

NFPA 2112, Standard on Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire

- Scope
  - Design
  - Performance
  - Certification requirements
  - Labeling
  - Test methods

NFPA 2113, Standard on Selection, Care, Use, and Maintenance of Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire

- Scope
  - Selection
  - Care
  - Use
  - Maintenance

Workplace Hazard Assessment

- Evaluation of work environments
  - General workplace hazards
  - Flammable chemicals in use and potential to generate flash fire
  - Proximity of work performed to a potential flash fire hazard
  - Accident history
  - Controls in use

Selection of Flame-Resistant Garments

- Thermal protective characteristics of the fabric
- Physical characteristics of the fabric
- Garment construction and components
- Static charge generation potential*
- Design type of the garment
- Conditions intended for garment wear
- Comfort properties of the fabric and garment
- Cleaning and maintenance

Specific Requirements for Wearing FR Garments

- Materials with NFPA 704 hazard rating 4 for flammability where vapors are present in normal operations
- Materials with hazard rating 3 at temperatures above flash points
- Materials with hazard rating 2 or 1 where heating above boiling points
- Combustible dust

Best Practice Issues

- Other clothing worn with FR Garments
  - CAUTION about wearing non-FR, synthetic items of clothing either over or under FR Garments
- Proper wearing of garment
  - Avoid opening closures as this has potential to expose unprotected skin
- Heat Stress issues
  - Those garments that achieve FR performance without use of synthetic material allow more cooling
- Use flash fire protection for flash fires, not arc flash

National Fire Protection Association
The authority on fire, electrical, and building safety

Questions

National Fire Protection Association
The authority on fire, electrical, and building safety

Thank You