

NFPA Standards for Combustible Dust Hazard Process Safety

Guy R. Colonna, P.E.
FPRF Combustible Dust Symposium
Kansas City, KS
October 20 – 21, 2010



Presentation Overview

- Introduction and background
- NFPA combustible dust standards
- Pending changes
 - Key definitions
 - Dust hazard characterization and assessment
 - Dust hazard control measures
- Timeline for revisions
- Consolidation of dust standards?
- Review and closing

Code For The Prevention Of Dust Explosions In The Plastics Industry

- This Code was tentatively adopted by the National Fire Protection Association at the annual meeting in May 1944. It is subject to revision before final adoption in 1945 and any readers having suggestions for consideration of the Committee may file communications with the Chairman, Mr. Hylton R. Brown, U. S. Bureau of Mines, Eastern Experiment Station, College Park, Maryland.

Building Construction

- Section II. Plant Arrangement.
- 201. Buildings...dry material processing and handling...should be detached or cut off by standard fire walls
- *202. If...processes cannot be carried on...as recommended in Article 201,...the plant...shall be segregated*
- Chapter 6 of NFPA 654-2006 addresses building construction

Interior Surfaces

- 302. To facilitate cleaning, interior surfaces should be as smooth as possible...
- Window ledges, girders, beams...shall have the tops sharply inclined, or other provision shall be made to minimize the deposit of dust...
- Overhead steel I-beams or similar structural shapes shall be "boxed" with concrete or other fire resistive material.

Housekeeping

- 801. Good housekeeping...an important factor
- Accumulations of dust shall not be tolerated
- Surfaces...cleaned...to minimize the scattering of dust to other places
- Cleaning that...results in production of dust clouds shall not be done while machinery is in operation

NFPA 61 Prevention of Dust Explosions in Flour and Feed Mills

- 1924 edition
- Building construction
 - Detached or fire-resistive
 - Smooth surfaces, minimize flat surfaces
- Control and removal of suspended dust
- Removal of static dust
- Prevention of ignition

OSHA Activities

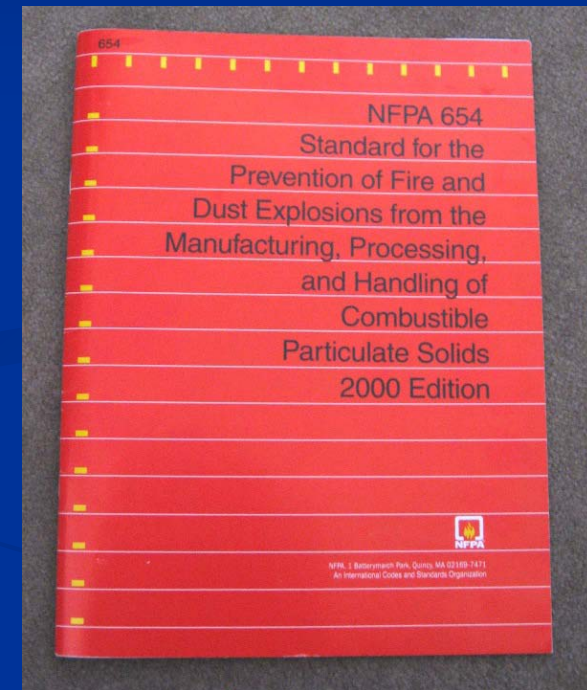
- Combustible Dust National Emphasis Program (NEP) – revised March 2008
 - Hazard communication
 - Housekeeping
 - Hazardous (classified) locations for electrical safety
- Advanced Notice of Proposed Rulemaking (ANPRM) – published October 2009

NFPA Dust Specific Documents

- NFPA 61, Agricultural and food processing
- NFPA 91, Pneumatic conveying and noncombustible particulate solids
- NFPA 120, Coal Mines
- NFPA 484, Combustible metals
- NFPA 654, Combustible Particulate Solids
- NFPA 655, Sulfur
- NFPA 664, Wood processing & woodworking
- NFPA 850, Electric generating plants

NFPA Standards Form Basis for Safety

- Hazard analysis
 - Prevent or limit formation of hazardous atmosphere
 - Prevent ignition of the hazardous atmosphere
 - Limit the consequences of a deflagration to acceptable levels (mitigation or control)
 - Includes secondary explosion protection



Combustible Particulate Solid

- Any combustible solid material, composed of distinct particles or pieces, regardless of size, shape or chemical composition.
(NFPA 654-2006)

Combustible Dust

- Combustible Dust* “A combustible particulate solid that presents a fire or deflagration hazard when suspended in air or other oxidizing medium over a range of concentrations, regardless of particle size or shape.” [NFPA 654-2006]

Variations on “Combustible Dust”

- Agricultural dust – NFPA 61
- Combustible metal dust – NFPA 484
- Sulfur dust – NFPA 655
- Wood dust – NFPA 664
 - Deflagrable wood dust
 - Dry nondeflagrable wood dust

General Requirements

■ Hazard Analysis

- Examine the facility, process, and fire and explosion hazards
- Actual test data required to support analysis

■ Management of Change

- Equipment, materials, process, procedures, technology
- Applied retroactively (in NFPA 654 and 664)

Dust Explosion Hazard Area

- Hazard area includes –
 - Areas where dust accumulations exceed a specified layer thickness
 - $\geq 1/32$ in (0.8 mm) in NFPA 654 for example
 - Areas where dust clouds of a hazardous concentration exist

- Prorating dust thickness layer:

Allowable Thickness (in.) = $((1/32)(75))/\text{bulk density (lb/ft}^3\text{)}$

Layer Thickness Criteria

Dust type (Document)	Thickness	Comment
Agricultural (NFPA 61)	None specified	29 CFR 1910.272 specifies 1/8 in (3.2 mm)
Combustible metals (NFPA 484)	$\geq 1/8$ in (3.2 mm)	Only in Chapter 12 which applies to other metals
Chemical, pharmaceutical, rubber, miscellaneous (NFPA 654)	$\geq 1/32$ in (0.8 mm)	Option to pro-rate the layer thickness based on bulk density for specific material
Sulfur (NFPA 655)	$\geq 1/32$ in (0.8 mm)	Specified in definition
Wood (NFPA 664)	$\geq 1/8$ in (3.2 mm)	

Electrical Equipment

- All electrical equipment and installations
 - NFPA 70, *National Electrical Code*®
 - NFPA 496, *Standard for Purged and Pressurized Enclosures for Electrical Equipment*
- Hazardous (classified) locations (Class II, Division 1 or 2)
 - See NFPA 499, *Recommended Practice for Classification of Combustible Dusts and Hazardous (Classified) Locations*

Fugitive Dust Control and Housekeeping

- Limit release of dust
 - Continuous suction directed to dust collectors
- Design of surfaces – prevent accumulation
- Cleaning method – does not generate dust
 - Hierarchy among methods

Document Revision Status

Standard	Revision Cycle	Status
NFPA 61	A2012	Proposal closing 11/23/10
NFPA 484	A2011	ROP published; ROC in process
NFPA 654	A2012	ROP meeting 11/15/10
NFPA 655	F2011	ROP published; comment closing 3/4/11; ROC meeting 3/28/11
NFPA 664	A2011	ROP published; ROC in process

NFPA 654 Revision

- June 2010 revision – returned to Committee
 - ROP meeting (A2012) – November 15 – 17
- TIA #1002 proposed by Technical Committee
 - Passed letter ballot
 - Review and action by Standards Council October 19 – 20, 2010
 - Clarifies the layer thickness approach

Any Questions?



Guy Colonna

gcolonna@nfpa.org