

Recent NFPA updates

Presented by:

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Biography

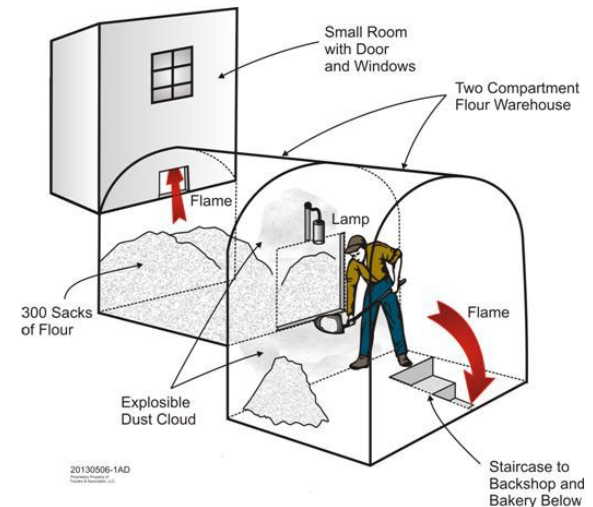
- B.Sc. Chemistry – Dalhousie University
- MBA – Saint Mary's University
- Master of Applied Science – Technical University of Nova Scotia
- Ph.D. Chemical Engineering– Dalhousie University
- 29 years research in the field of dust & gas/vapor explosions
- Safety Consulting Engineers, Inc. 2001–2007
- Fauske & Associates, LLC 2007–
- Memberships – AIChE, ASTM, NFPA
- Editorial Advisory Board of Powder/Bulk Solids and Journal of Loss Prevention in the Process Industries
- Chairperson of the ASTM E27 Committee on Hazard Potential of Chemicals
- Chairperson of the ASTM E27.05 Subcommittee on Dust Explosion Test Methods
- NFPA Technical Committee 61, 664, & 484
- Chairperson of NFPA 654, 655 and 91



Turin, Italy

December 14th

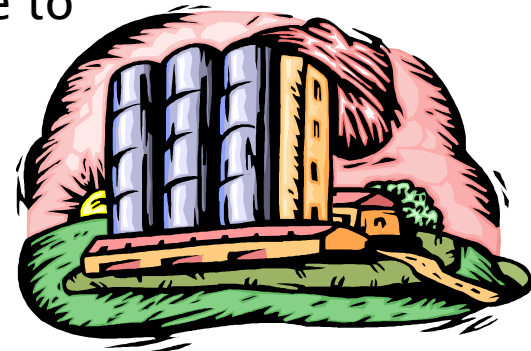
- Bakers Shop/Flour Warehouse
- Flame traveled in two directions – to the small room in the back and to bakery below
- Baker who was below saw the room catch on fire before he felt the explosion
- Two injuries; one had burns from the fire, the other jumped to get away and broke his leg



1785

Grain Dust Explosions in USA

- Inland Grain Terminal, St. Joseph, MO, April 1980
 - Killed 1 person
 - Injured 4
 - \$ 2 M
 - Electric arc from damaged level indicator in one of the silos. Explosion traveled through head house to other silos
- River Grain Terminal, St. Paul, MN, June 1980
 - No fatalities
 - 13 injured
 - \$300K
 - Electrician working on live electrical while loading operations were taking place
 - Explosion traveled along tunnel to head house and then to bucket elevators and on into other tunnels



Grain Dust Explosions in USA (continued)

- Train-Loading Country Grain Terminal, Fonda, IA, July 1980
 - No fatalities or injuries
 - \$ 30 K
 - Electrical welding on a bucket elevator
 - Hot work as ignition source
 - Traveled to other bucket elevators
- Large Export Grain Silo Plant, Corpus Christi, TX, April 1981
 - 9 killed
 - 30 injured
 - \$30 M
 - Smoldering lumps of grain entering bucket elevator
 - Propagated to other elevators – head house – tunnels – silos and conveyers
- OSHA 29CFR 1910.272 in 1987



West Pharmaceutical Services, Inc.

- North Carolina, 2003
- Plastic molding manufacturer
- Polyethylene powder
- 6 workers killed
- Hundreds of injuries
- Plant destroyed
- Facility was the major employer in area



Source: U.S. Chemical Safety & Hazards Investigations Board (USCSB)

CTA Acoustics, Inc.

- Kentucky, 2003
- Acoustic board manufacturer
- Phenolic resin dust
- 7 workers killed
- 37 injuries



Source: USCSB

Hayes Lemmerz International, Inc.

- Indiana, 2003
- Aluminum casting facility
- Aluminum dust
- 1 worker killed
- Several injuries



Source: USCSB

Hayes Lemmerz International, Inc.



Source: USCSB



Source: USCSB



Source: USCSB

Fugitive Dust Buildup Cause of Secondary Explosions



Source: USCSB



Source: USCSB



Source: USCSB

Imperial Sugar

- Georgia, 2008
- Agricultural industrial facility
- Sugar dust
- 14 workers killed
- 38 Injuries
- Milling and packaging



Source: USCSB



Source: USCSB

Work Done by the OSHA

- Select OSHA Regulatory & Enforcement Activity
- 2007 – OSHA Announces Combustible Dust National Emphasis Program
- 2008 – OSHA Announces Revised NEP After Imperial Sugar Explosion
- 2009 – OSHA Announces initiation of comprehensive rulemaking
- 2009 – OSHA publishes Advanced Notice of Proposed Rulemaking
- 2015 – OSHA Releases policy memo on accumulation depth for combustible dusts
- 2016 – OSHA Downgrades standard
- 2017 – OSHA Withdraws rulemaking
- 2020 – OSHA Technical Manual – Section IV, Chapter 6, Combustible Dusts
- 2023 – OSHA Announces Re-Released Combustible Dust NEP



Currently NO national standard for worker protection; OSHA has 29CFR 1910.272 (1987) & CPL 03-00-008 Combustible Dust NEP (2008)

Current State

- Current state – (key findings from U.S. Chemical Safety & Hazards Investigations Board (USCSB) report)
- At least 281 combustible dust fires and explosions occurred in general industry between 1980 and 2005, which
 - Caused at least 119 fatalities and 718 injuries in the United States
 - Occurred in a wide range of industries and involved many types of combustible dusts

Year	Investigation	Finding
2010	AL Solutions (New Cumberland, WV)	Zr flash fire – 3 fatalities and 1 injury
2011	Hoeganaes Corporation (Gallatin, TN)	Metal dust fire and explosion – 5 fatalities
2012	US Ink (East Rutherford, NJ)	Ink Dust - 7 injured
2017	Didion Milling (Cambria, WI)	Corn milling – 5 dead and 14 injured

- 105 events since 2005 with 59 fatalities and 303 injuries

Current State

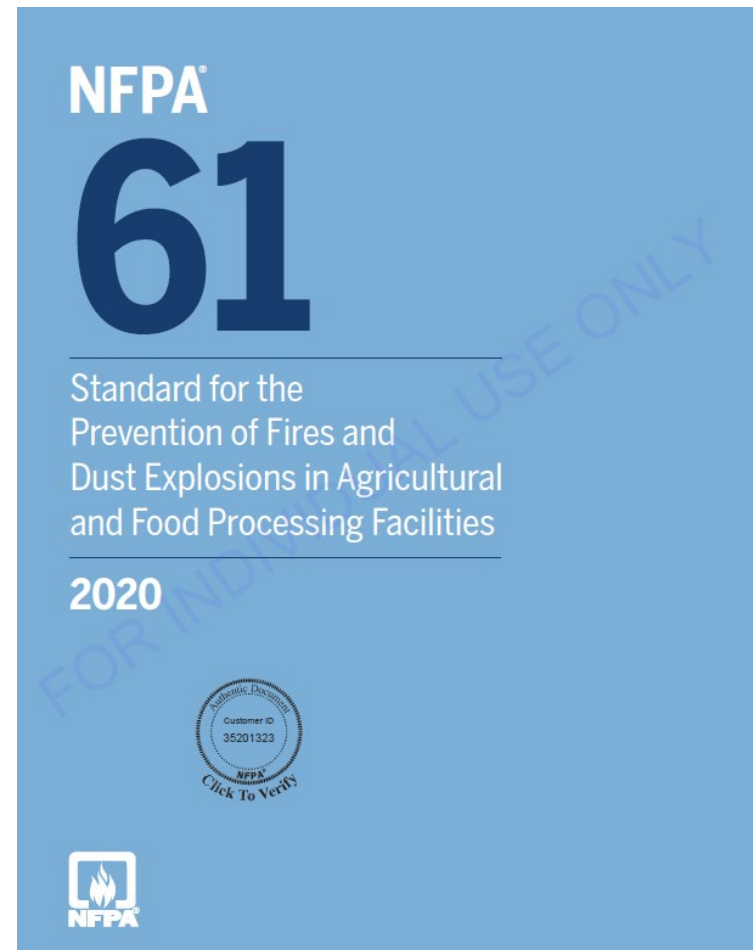
- Consensus standards, developed by the NFPA, that provide detailed guidance for preventing and mitigating dust fires and explosions are widely considered to be effective, however:
 - These standards are voluntary, unless adopted as part of a fire code by a state or local jurisdiction — and have not been adopted in many states and local jurisdictions, or have been modified
 - NFPA standards are part of the International Fire Code and Uniform Fire Code
 - Also, some regions have adopted NFPA 1: FIRE CODE – see Chapter 40
 - These codes are also Recognized And Generally Accepted Good Engineering Practices (RAGAGEP)

NFPA Standards

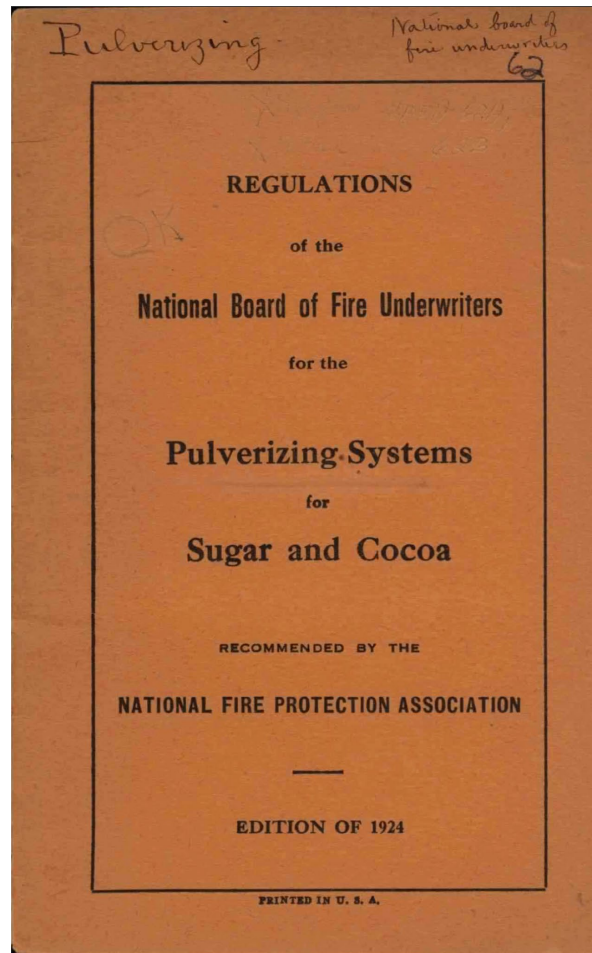
- NFPA 61: Standard For The Prevention Of Fires And Dust Explosions In Agricultural And Food Processing Facilities
- NFPA 664: Standard For The Prevention Of Fires And Explosions In Wood Processing And Woodworking Facilities
- NFPA 484: Standard For Combustible Metals
- NFPA 655: Standard for Prevention of Sulfur Fires and Explosions
- NFPA 654: Standard For The Prevention Of Fire And Dust Explosions From The Manufacturing, Processing, And Handling Of Combustible Particulate Solids
- NFPA 652: Standard of the Fundamentals of Combustible Dusts

NFPA 61

- Originated in 1923 to prevent dust explosions in grain terminals and flour mills.
- Before 1970 there were 4 standards
 - NFPA 61B, Code for the Prevention of Dust Explosions in Terminal Grain Elevators
 - NFPA 64, Code for the Prevention of Dust Ignitions in Country Grain Elevators;
 - NFPA 66, Suction and Venting in Grain Elevators
 - NFPA 93, Standard for Dehydrators and Dryers for Agricultural Products
- These evolved into four standards; 61A, 61B, 61C and 61D
- In 1995 combined into NFPA 61

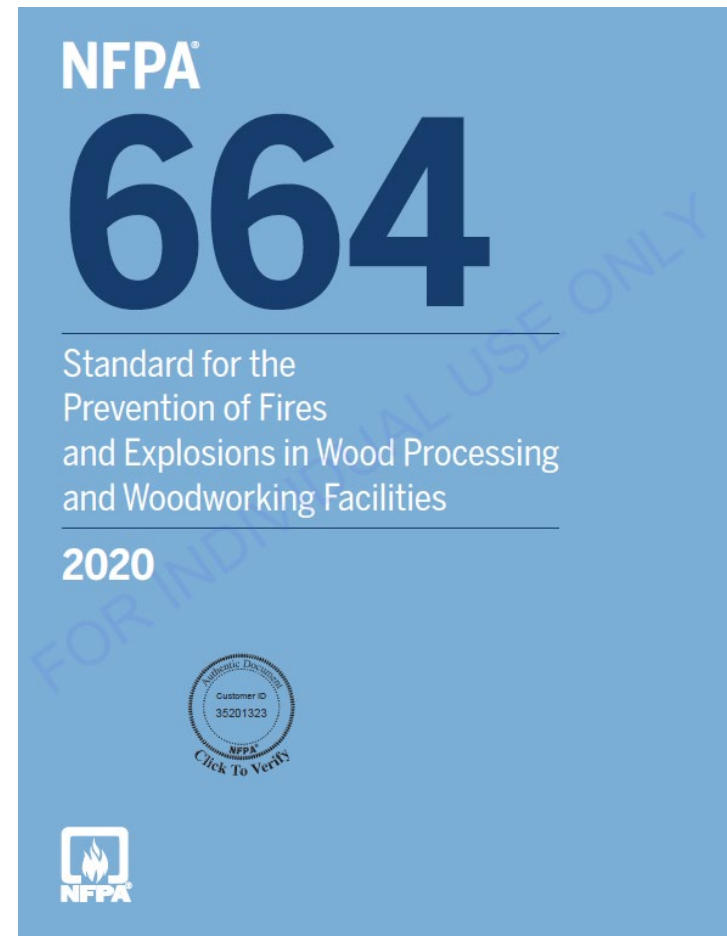


Agricultural Standard



NFPA 664

- NFPA 662 Code on Wood Flour Manufacturing – 1930
- NFPA 663 Code on Woodworking Plants – 1934
- In 1960 combined to NFPA 664 Code for the Prevention of Dust Explosions in Woodworking and Wood Flour Manufacturing Plants
- In 2002 Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities
 - Expanded to include all fire hazards in woodworking facilities



NFPA 484

- In 2002 NFPA 484 Standard for Combustible Metals, Metal Powders, and Metal Dusts created by combining:
 - NFPA 480, Standard for the Storage, Handling, and Processing of Magnesium Solids and Powders
 - NFPA 481, Standard for the Production, Processing, Handling, and Storage of Titanium
 - NFPA 482, Standard for the Production, Processing, Handling, and Storage of Zirconium
 - NFPA 485, Standard for the Storage, Handling, Processing, and Use of Lithium Metal
 - NFPA 65, Standard for the Processing and Finishing of Aluminum
 - NFPA 651, Standard for the Machining and Finishing of
 - Aluminum and the Production and Handling of Aluminum Powders
- In 2006 title changed to current one.



NFPA 655

- Standard was originally adopted in 1940
- Minor revisions in 1946, 1947, 1959, 1968, 1971, 1976, 1982, 1988, 1993, 2001
- In 2007 there was a major revision – expanded dust hazard control



NFPA 654

- Officially adopted in 1945 in and was for the plastics industry
- In 1982 the scope was expanded to include chemical, dye, and pharmaceutical dust.
- In 1994 modifications to include information from NFPA 69.
- 2006 requirement for hazards analysis
- 2017 changed to align with NFPA 652 including DHAs
- Material copied from 654 and placed in 652 was removed.



NFPA 652

- 2016 – Provides the general requirements for management of combustible dust fire and explosion hazards and directs the user to NFPA's industry or commodity-specific standards, as appropriate
- Brought in requirements for DHAs – apply retroactively!
- Based heavily on older NFPA 654.



NFPA Standards (continued)

- NFPA 68: Standard On Explosion Protection By Deflagration Venting
- NFPA 69: Standard on Explosion Prevention Systems
- NFPA 77: Recommended Practice on Static Electricity
- NFPA 13: Standard for the Installation of Sprinkler Systems
- NFPA 15: Standard for Water Spray Fixed Systems for Fire Protection
- NFPA 499: Recommended Practice For The Classification Of Combustible Dusts And Of Hazardous (Classified) Locations For Electrical Installations In Chemical Process Areas
- NFPA 91: Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids
- NFPA 72: National Fire Alarm and Signaling Code®
- NFPA 70: National Electrical Code®

Current Framework

NFPA 652

NFPA 68, 69, 70 etc.

ASTM

NFPA 61

NFPA 484

NFPA 664

NFPA 654

NFPA 660 – future framework on Combustible Dust CODE

- Based on NFPA 652 as the master document
- Material common to all commodity specific standards moved into main section of the Code
- Material unique to a specific commodity will appear in a commodity specific CHAPTER
- Finally – one book on Combustible Dust Hazards since 1920
- Major aid to AHJs and Code Enforcers
 - Also help public in compliance?



Layout of NFPA 660: Standard for Combustible Dusts

- Fundamentals of Combustible Dust
 - Chapter 1 – Chapter 9
 - Chapter 10 (Reserved)
- Industry or Material Specific Chapters
 - Chapter 11: Agriculture and Food
 - Chapter 12: Combustible Metals
 - Chapter 13: Combustible Particulate Solids
 - Chapter 14: Sulfur Processing or Handling
 - Chapter 15: Wood & Woodworking
- Annexes
 - Annex A: Explanatory Material
 - Annex B–Z: Other Resource Material

Recent Work Done by NFPA

<https://www.nfpa.org/660>

- Select NFPA Activity
- 2009 – Discussions begin on the need for comprehensive combustible dust guidance
- 2015 – Release of NFPA 652: Standard on the Fundamentals of Combustible Dust
- 2020 – Deadline for existing facilities not covered by NFPA 61 to complete DHA work
- 2021 – Release of three-part online training series for NFPA 652
- 2022 – Deadline for existing facilities covered by NFPA 61 to complete DHA work
- 2022 – Release of NFPA 660: Standard for Combustible Dusts for Public Input
- 2023 – Release NFPA 660 for Public Comment

Where NFPA Dust Standard Development is at today

- NFPA 660 Development Timeline
- 2022 / July – Release of NFPA 660 for Public Input
- 2023 / October – Rerelease of NFPA 660 for Public Comment
- 2024 / January – Closing of Public Comment Stage
- 2024 / October – Notice of intent to make a motion
- 2025 / June – NFPA Technical Meeting (In Person Public Appeals Process)
- Late 2025 / Early 2026 – NFPA 660 Goes into effect

Final Remarks

- NFPA dust fire and explosibility document framework has changed over time
- Many standards are formed and then combined and may become separated at a later date
- Currently – one year activity to establish what is common in the fundamental standard and reflected in the commodity standards what is unique

Final Remarks

- Some commodity specific standards address other fire hazards beyond Dust – must be addressed NFPA 664 and 655
- Will be sent out for first public comment in ~2022
- Comments addressed in 2022 – 2023 by technical committee vote – Who votes?
- May require a second comment period and resolution?
- CODE may be ready by 2023 but definitely by 2024

END