Exponent®

NFPA 660 and DHAs

Convey ‘23

June 20, 2023

Tim Myers, Ph.D., P.E., CFEI

Principal Engineer and Office Director
Natick, MA
tmyers@exponent.com

Experience with NFPA Combustible Dust Committees

- Agricultural Dust Committee (61)
  - Member 2009
  - Chair 2012
- Combustible Dust Correlating Committee (660)
- Explosion Protection Systems (67, 68, 69)
- Combustible Metals (484)
- Electrical Equipment (496, 497, 499)
- Fundamental of Combustible Dust (652)
- Wood and Cellulosic Dusts (664)

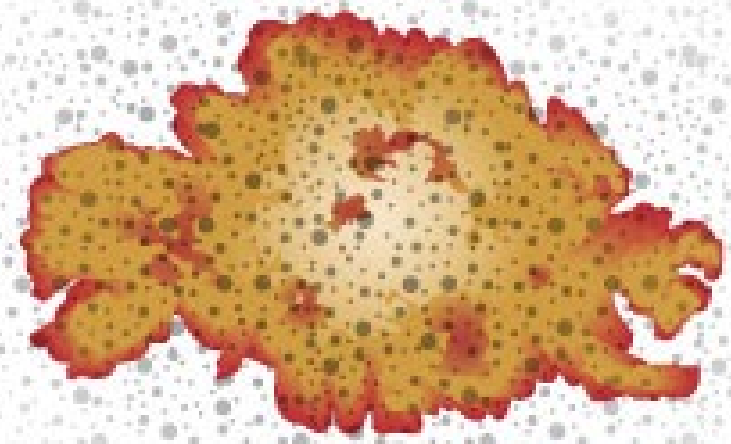
Notes:

- *Speaking from my own perspectives and not representing the NFPA or NFPA Technical committees.*
- *NFPA 660 is a proposed standard and is still in revision process and has not been approved.*

Combustible Dusts - Effect of Particle Size

Log
Slow Combustion

Wood Kindling
Fast Combustion



Wood Dust
Dust Fireball or Explosion

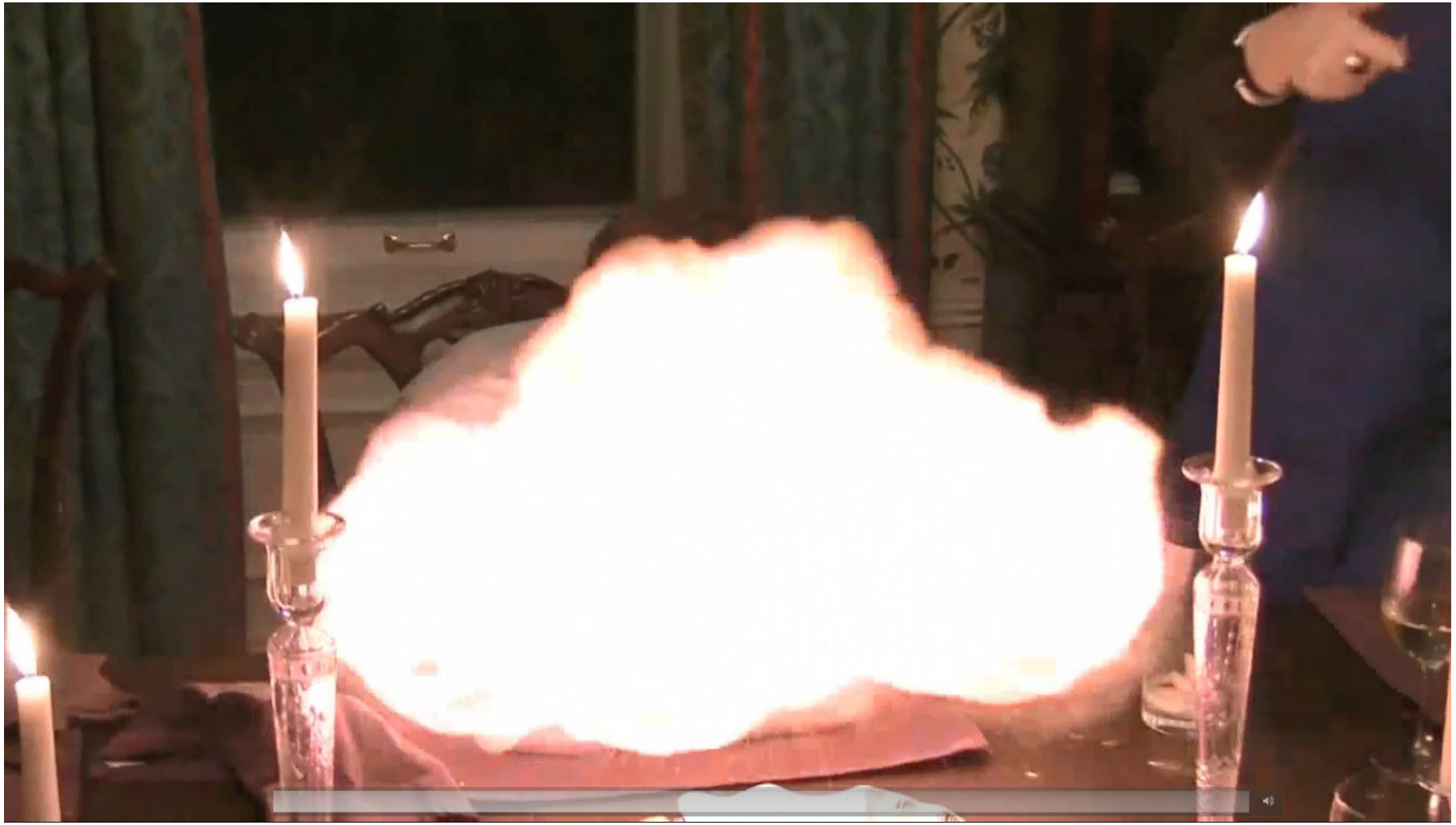
Source: After Eckhoff, “Dust Explosions in the Process Industries” (2003).

Birthday Cake Analogy

Birthday Cake Analogy

Birthday Cake Analogy

Birthday Cake Analogy



Birthday Cake Analogy

Agenda

- How did we get here?
  - 100 Years of Combustible Dust Standards
- NFPA 660 Consolidation
- Dust Hazard Analyses (DHAs)
- What can you do?
- Q&A

NFPA Standards

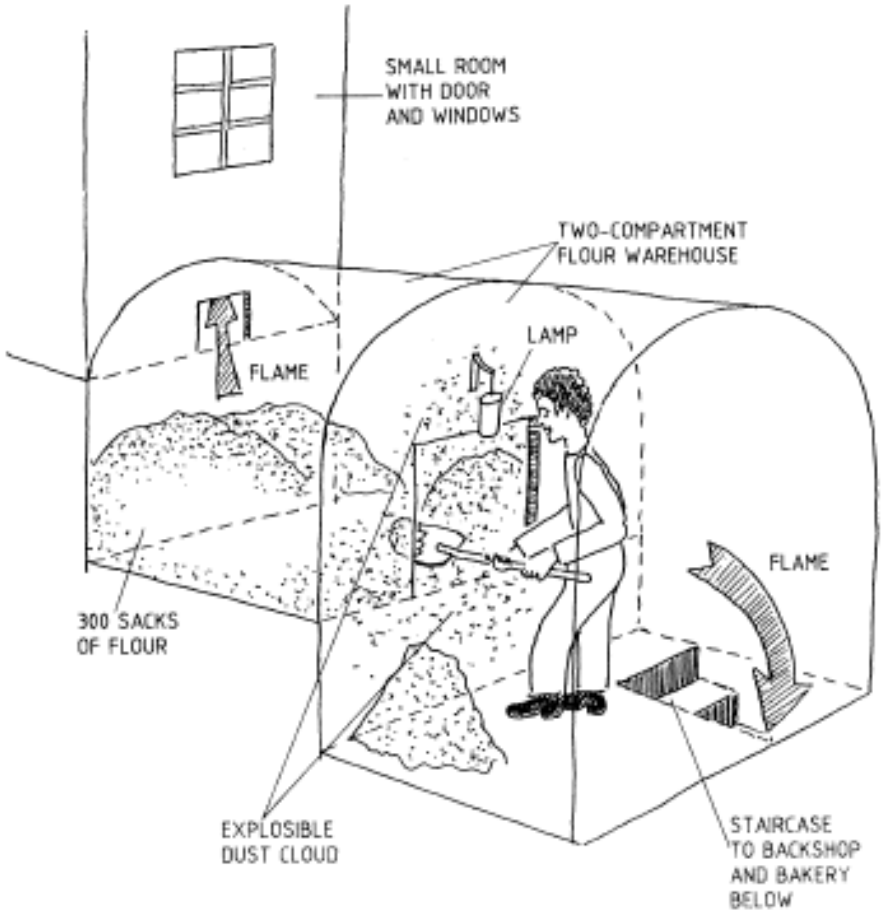
- NFPA = National Fire Protection Association
- NFPA 61 *Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities*
- NFPA 652 *Standard on the Fundamentals of Combustible Dust*
- *NFPA 660 Standard for Combustible Dust*

How did we get here?

100 Years of Combustible Dust Standards

First Documented Dust Explosion

- Mr. Giacomelli's Bakery
- Turin, Italy
- December 14, 1785
- 2 injuries
- Blew out windows and window frames
- Reported cause: grain flour dust ignited by lamp



Source: Eckhoff, Dust Explosions in the Process Industries (2003).

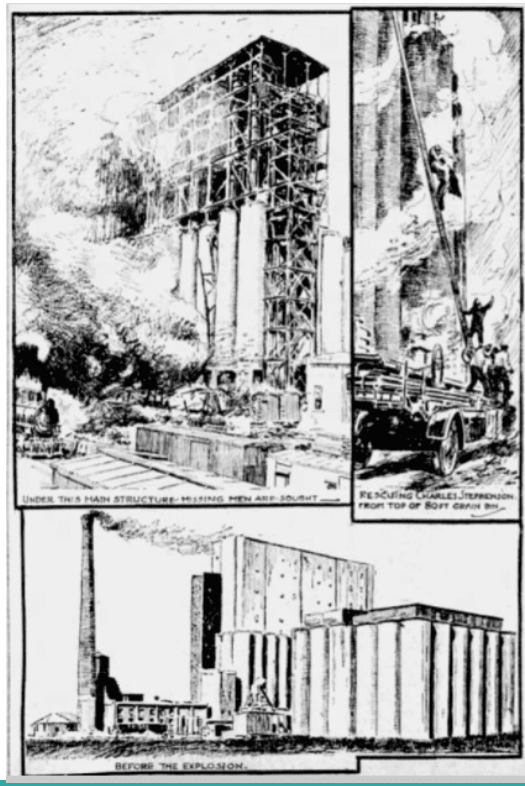
Great Mill Disaster of 1878

- Washburn A Mill
- Minneapolis, MN
- World's largest grain mill
- 18 fatalities

Source: NFPA Journal "A Century of Dust" March 7, 2023

Dust Explosions of 1919

- Smith-Parry Grain Elevator Explosion
  - Milwaukee, WI
  - 3 fatalities
- Douglas & Company Starch Works
  - Cedar Rapids, IA
  - 43 fatalities
- Murray Grain Elevator
  - Kansas City, MO
  - 14 fatalities



Sources: https://dustsafetyscience.com/, NFPA Journal “A Century of Dust”

Focus on Dust Explosions

SAFETY CODES FOR THE PREVENTION OF DUST EXPLOSIONS

Introduction

Dust explosions have been responsible for a series of disasters involving large losses of life and property extending over a long period of years. It is only recently, however, that the seriousness of this hazard has been generally recognized and measures for its control undertaken. Following extensive research into the phenomena of dust explosions by the Bureau of Chemistry of the United States Department of Agriculture, the National Fire Protection Association organized, in January, 1922, a committee on dust explosion hazards charged with the preparation of recommended regulations for the prevention of fires and dust explosions in occupancies subject to this hazard. This committee was formed with the cooperation of the United States Department of Agriculture, the present joint sponsors thus having been closely associated in this work since the inception of the project. The committee of the National Fire Protection Association on dust explosion hazards proceeded with the preparation of the regulations which form the basis of this pamphlet, the reports of the committee being adopted by the association and published as the recommended regulations of the National Fire Protection Association. These standards as prepared were also adopted by the National Board of Fire Underwriters.

Dust Explosions

Theory and Nature of, Phenomena, Causes and Methods of Prevention

DAVID J. PRICE

Engineer in Charge, Dust Explosion Investigations, Bureau of Chemistry, U. S. Dept. of Agriculture
Member N. F. P. A.

AND

HAROLD H. BROWN, PH.D.

Organic and Physical Chemist
Bureau of Chemistry, U. S. Dept. of Agriculture
Member N. F. P. A.

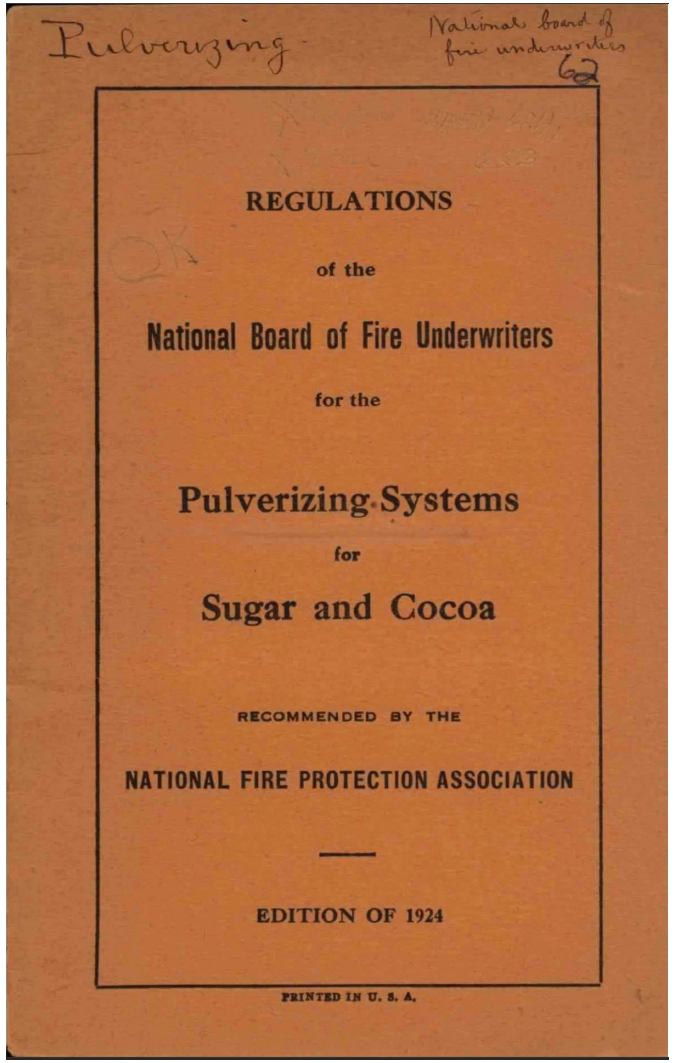
Assisted by
HYLTON R. BROWN and HARRY E. ROETHE

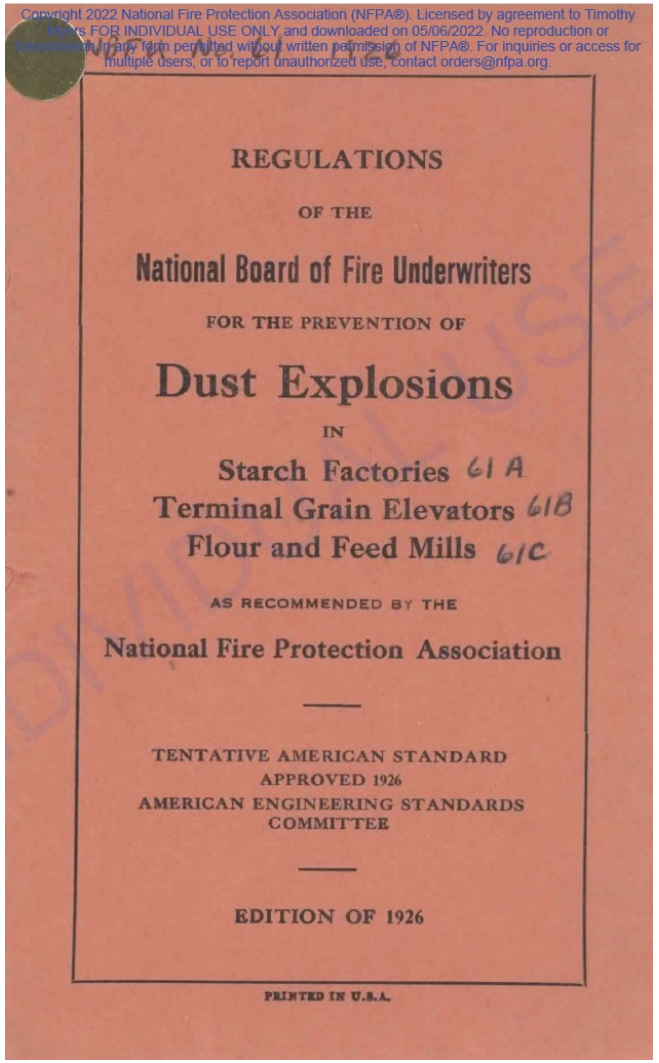
Assistant Engineers in Dust Explosions, Bureau of Chemistry, U. S. Dept. of Agriculture

Published by Permission of the
United States Department of Agriculture
Washington, D. C.

National Fire Protection Association
Boston, Mass.

First Combustible Dust Standards – 1923



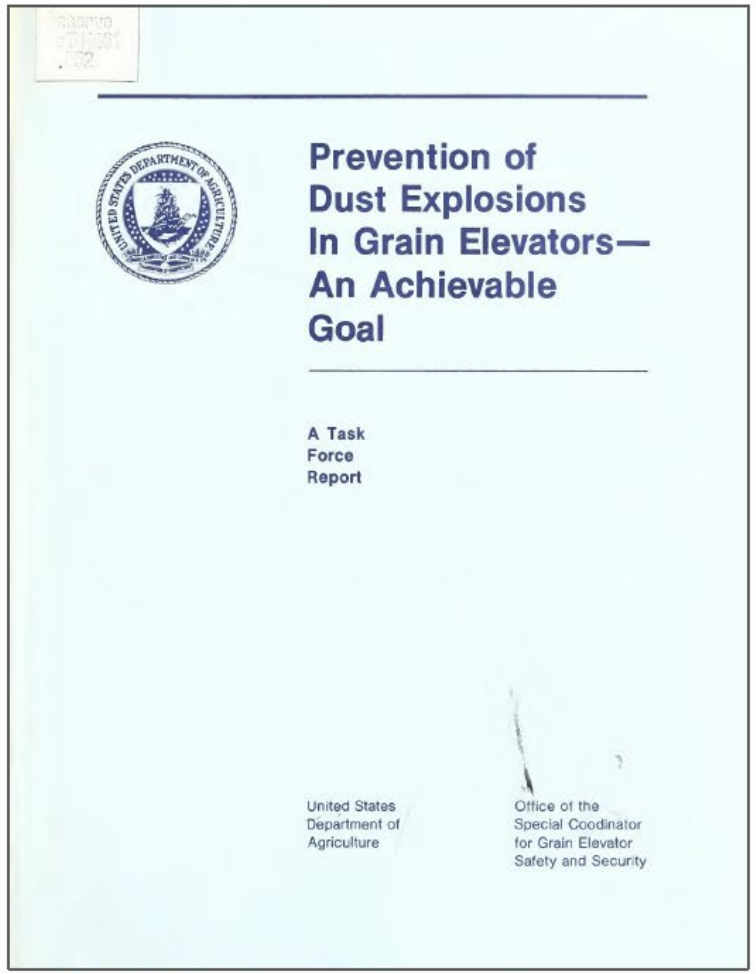


CONTENTS

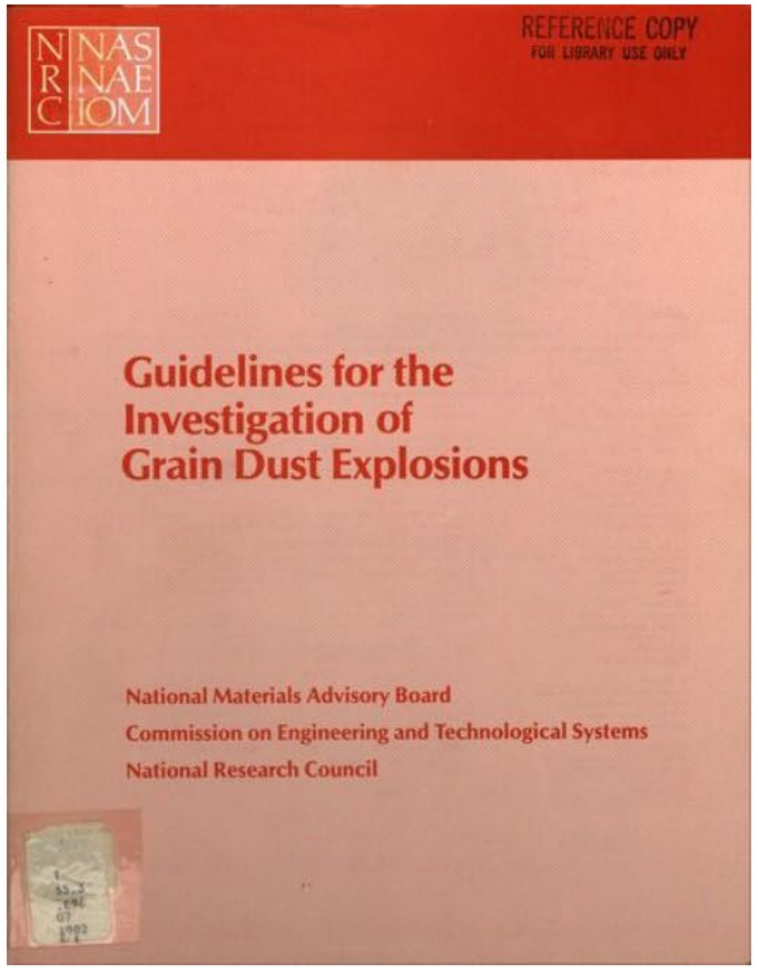
1970s Dust Explosions

- Goodpasture Grain Elevator
  - 2/22/76
  - Houston, TX
  - 9 fatalities
- Continental Grain Elevator
  - Westwego, LA
  - 12/22/77
  - 36 fatalities
- Farmer's Export Grain Elevator
  - Galveston, TX
  - 12/28/77
  - 18 fatalities

Grain Dust Explosions 1975 - 1988



1980 (190 Page Report)



1983 Report

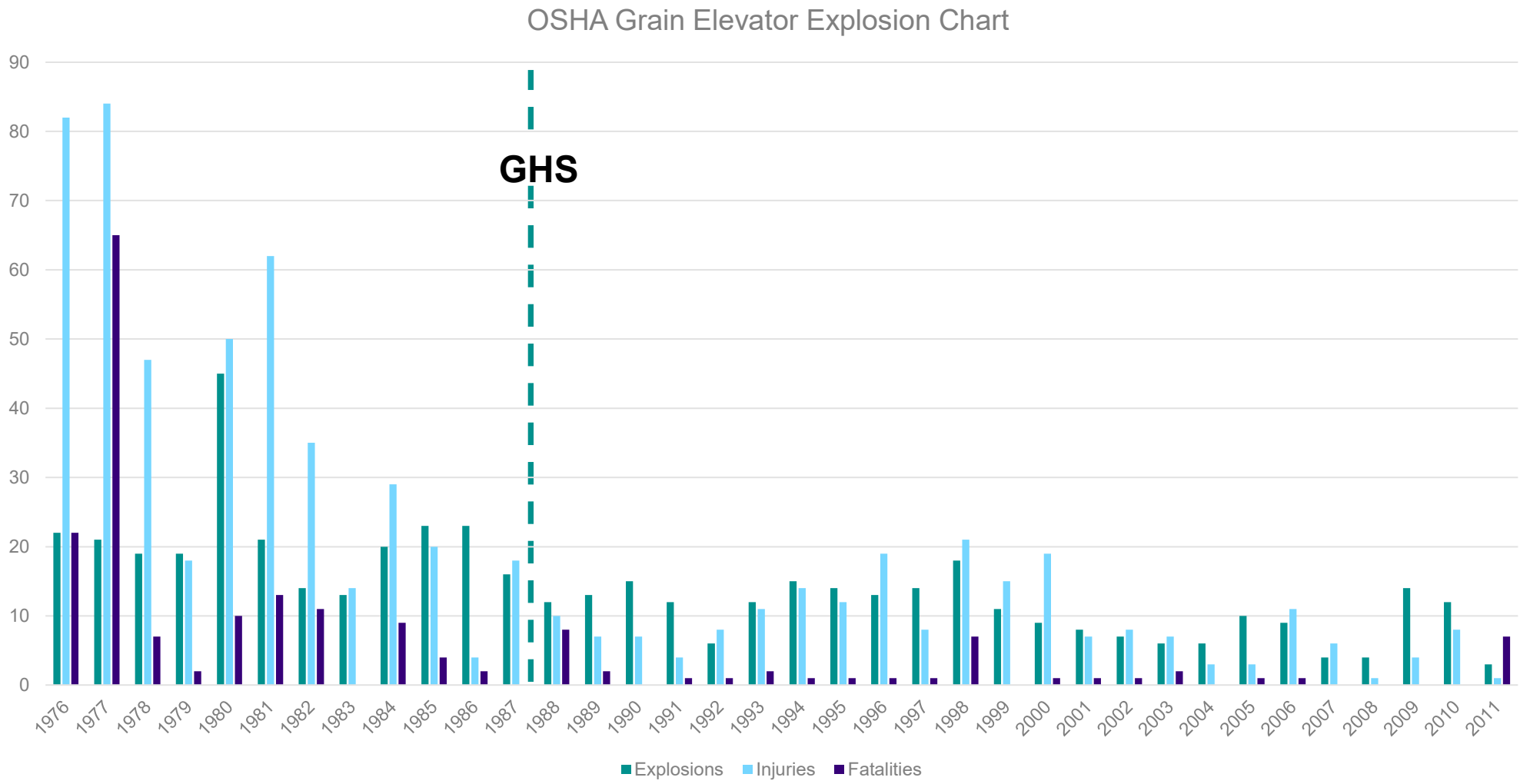
OSHA Published Notice of Proposed Rulemaking on January 6, 1984

OSHA Grain Handling Standard Published December 31, 1987

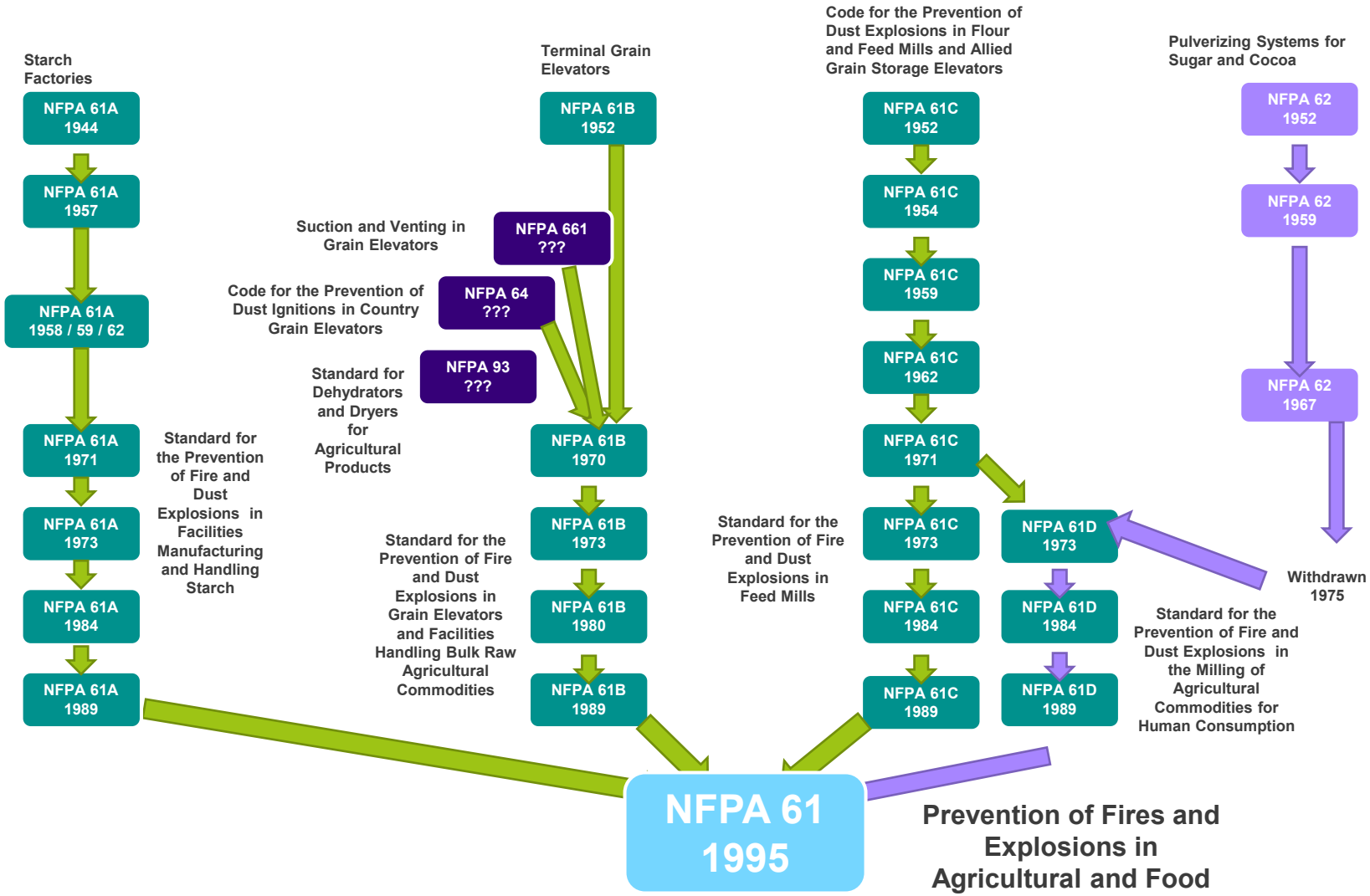
Extensive Work from NGFA, USDA, Kansas State University, International Partners and Others During this time

Source: https://dustsafetyscience.com/

Decline in Number and Severity of Incidents



Past Consolidation of Agricultural Standards




SEARCH
Two missing, 22 hurt in factory blast
LONDON, Kentucky (CNN) -- An explosion and fire at a plastics factory Thursday morning injured 22 workers and left at least two others unaccounted for, a state emergency official said.
Jahn Foundry
Massachusetts 1999
he Vicksburg Post.
News
Firefighters douse blaze at rubber-recycling plant
By Sam Knowlton
Staff writer
Home
Last Week's Summary
News
Sports
Classifieds
Obituaries
Contact Us
Subscriptions
TV Tonight
Internet Directory
Local News
E-mail this story to a friend.
Printer
Story ran : 01/29/2003
2 dead, 3 missing in plant explosion
By Jason Spencer and Sandy Walls
The Free Press
At least two people were killed and three remained missing
after a massive explosion destroyed a pharmaceuticals factor
Kinston.
CTA Acoustics,
Corbin, KY, 2003
Rouse Polymerics,
Vicksburg, MS, 2002
West Pharmaceuticals, Kinston, NC, 2003

Recent U.S. Combustible Dust Incidents

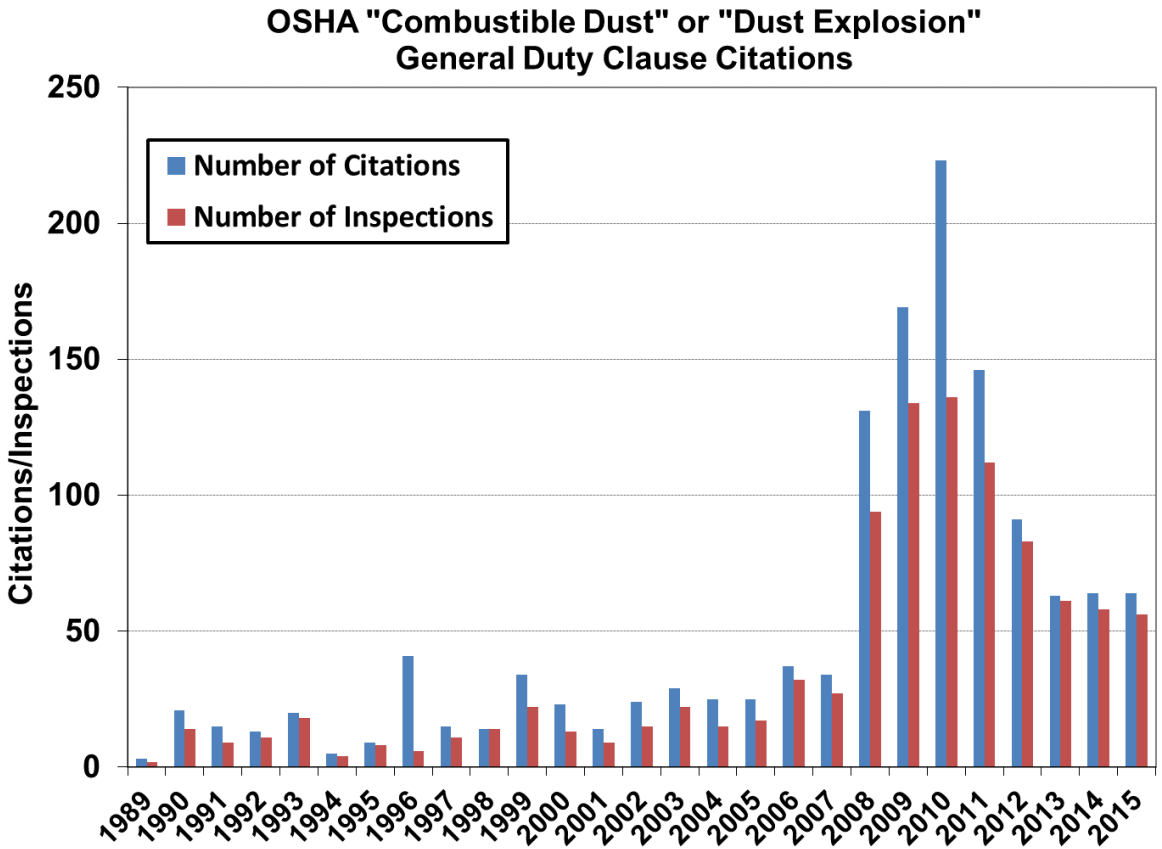
Year	Facility	State	Dust	Fatalities
1999	Gray Iron Casting Foundry	MA	Phenolic Resin	3
2003	**Rubber Drug Delivery Products**	**NC**	**Polyethylene Dust**	**6**
2003	**Fiberglass Insulation Plant**	**KY**	**Phenolic Resin**	**7**
2003	**Automotive Wheel Foundry**	**IN**	**Aluminum Dust**	**1**
2008	**Sugar Refinery**	**GA**	**Sugar**	**14**
2011	Grain Elevator	KS	Grain Dust	6
2011	Metal Powder Manufacturer	TN	Iron Dust	5
2016	Grain Elevator	IN	Grain Dust	2
2017	Corn Mill	WI	Corn Dust	5

CSB 2006 Combustible Dust Study

- Findings
  - **Facilities did not fully comply with recognized guidelines and standards**
  - Insurance and government inspectors did not recognize dust explosion hazards
  - OSHA has limited regulations related to dust explosion hazards and has not adopted a comprehensive standard for the prevention and mitigation of dust explosions
- Impact to NFPA Standards
  - Started process to align and **consolidate** standards
  - Led to requirement to perform **Dust Hazard Analysis (DHA)** Retroactively
  - 2015 – First Edition of NFPA 652 *Fundamentals of Combustible Dust* published

Increased Regulatory Focus on Combustible Dust

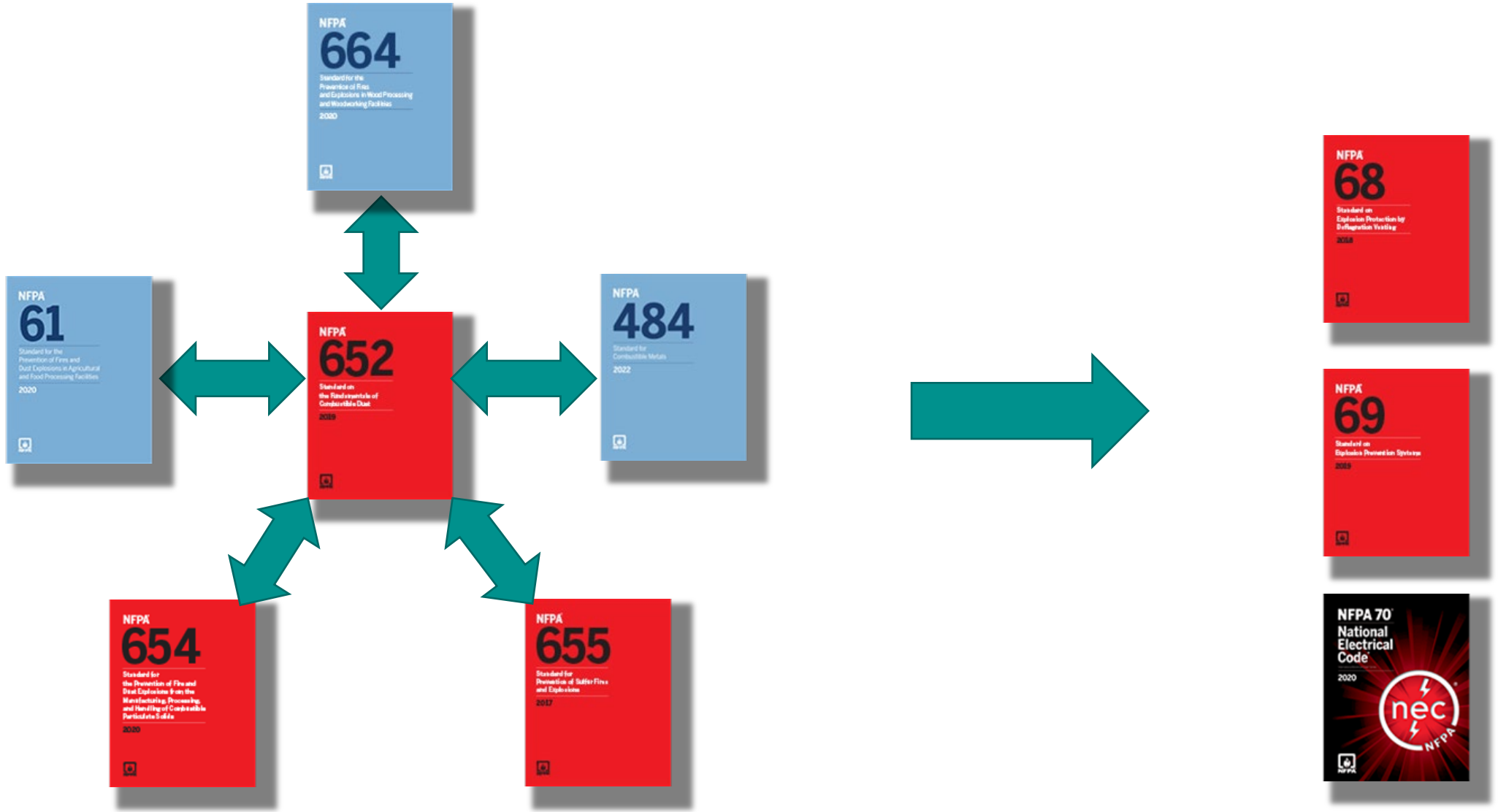
- 2007 – OSHA Combustible Dust NEP
- 2008 – OSHA Revised NEP After Imperial Sugar Explosion
- 2009 – OSHA publishes ANPR for General Industry Combustible Dust Regulation
  - Later withdrawn



NFPA 660

Consolidation of NFPA Combustible Dust Standards

Current Standards Relationships



Consolidated NFPA 660 *Standard For Combustible Dusts*

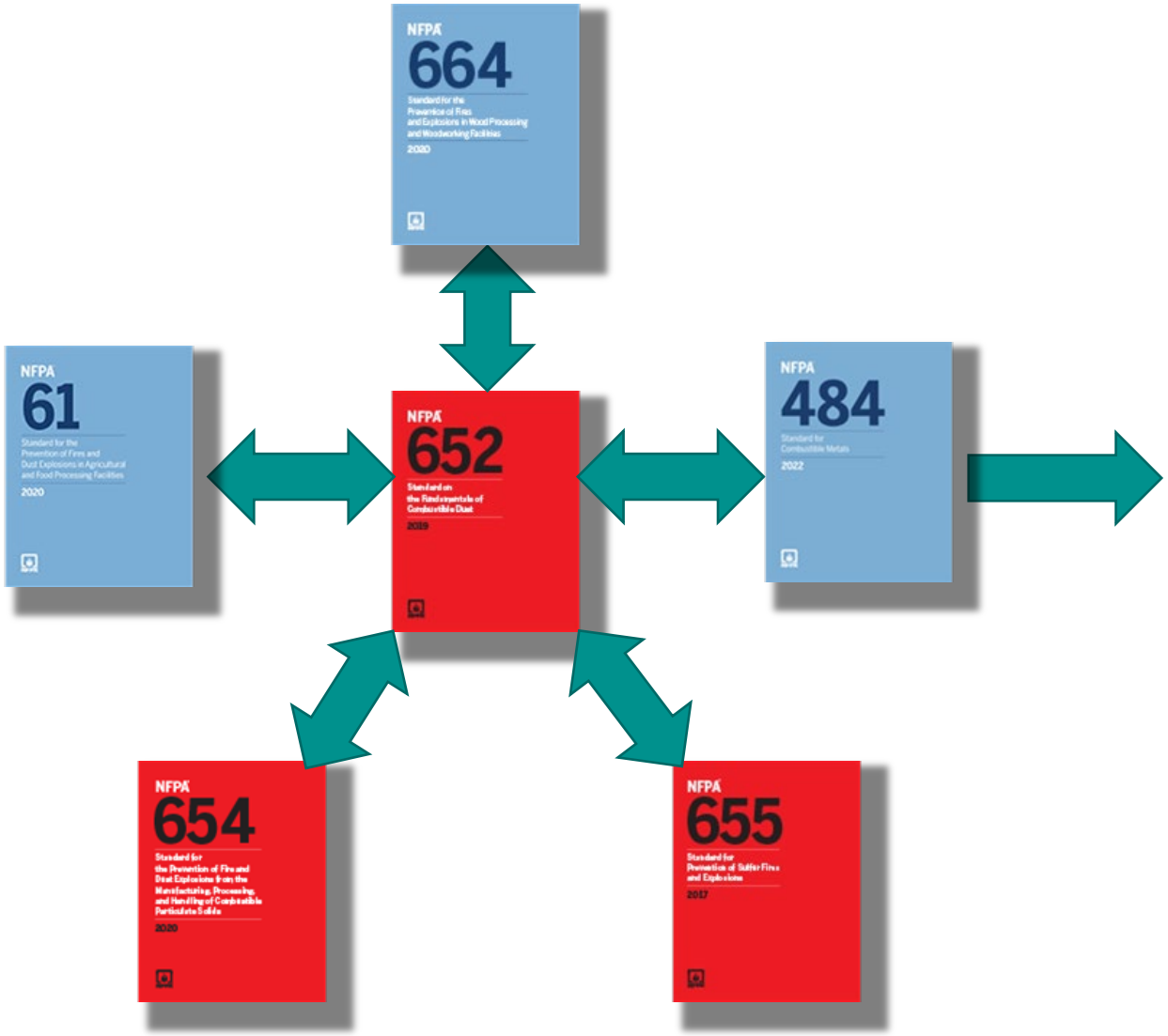
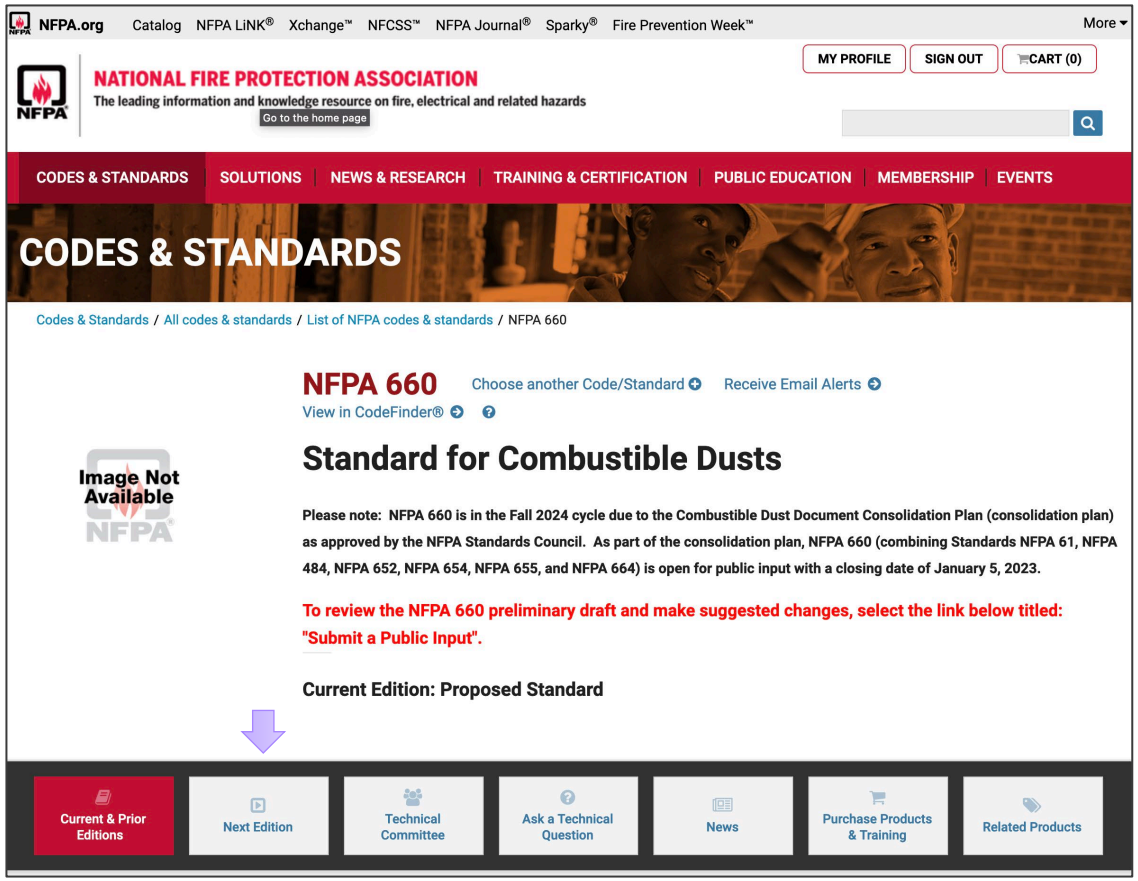


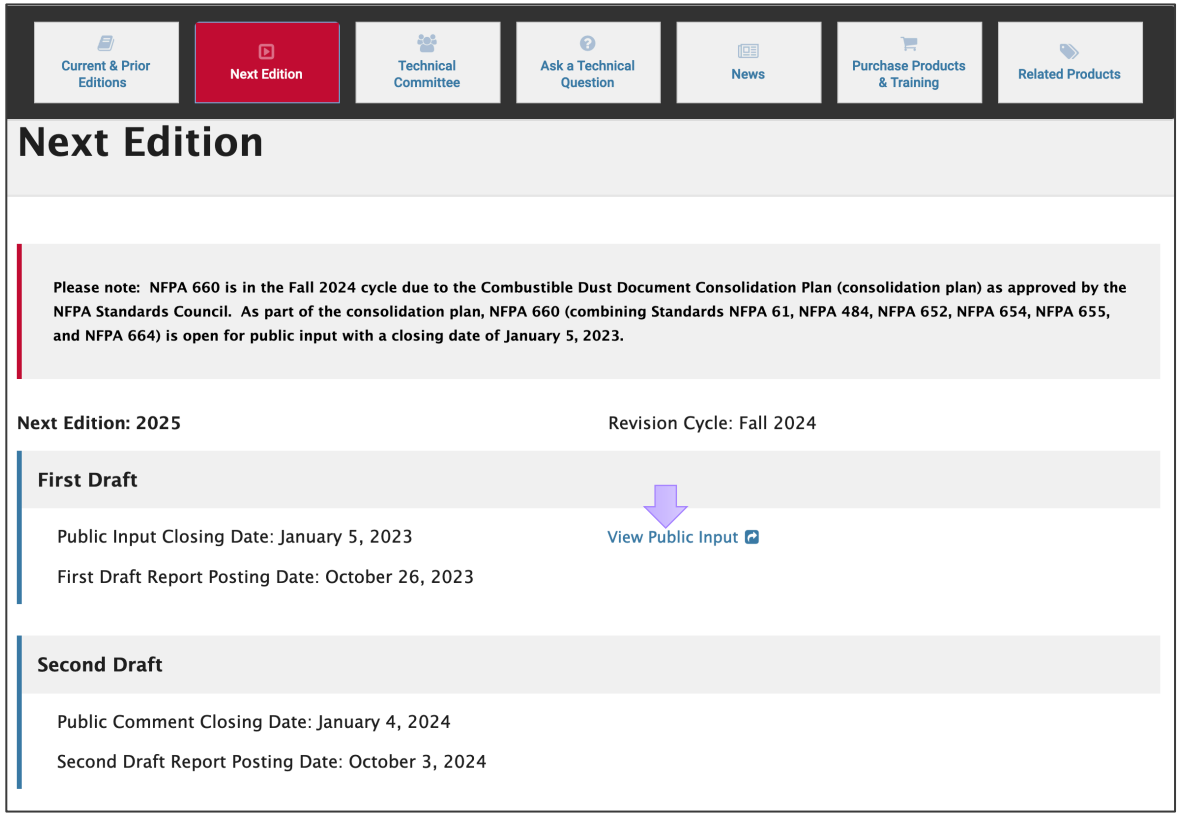
Table of Contents: NFPA 660

Anticipated Timeline

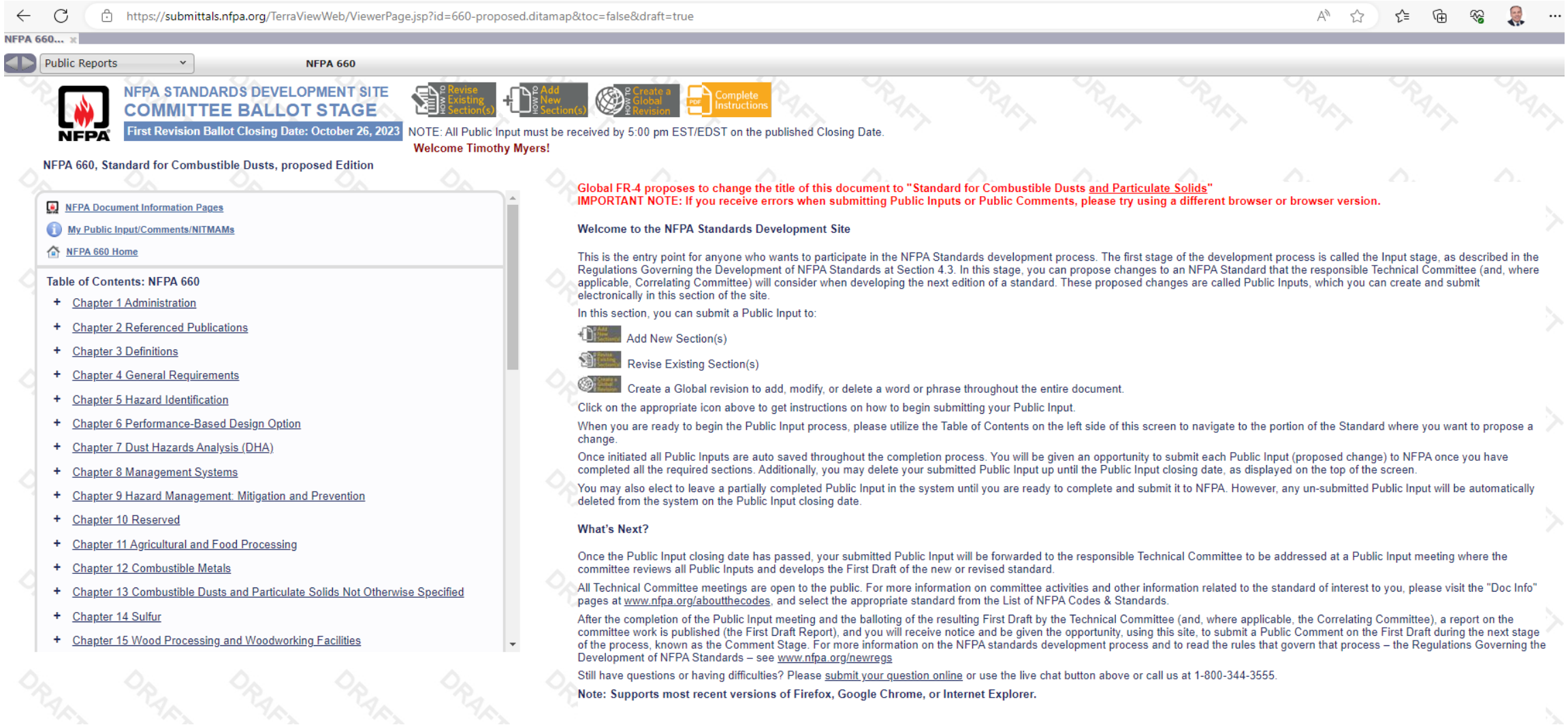
- 2020-2022 – Development of Draft Proposed Standard
- 1/5/2023 – Public Input Due
  - First Draft meetings, created revisions, committee inputs, balloted
  - 8/15-16/2023 – Correlating Committee meets, provide notes to Technical Committees
- 10/26/2023 – First Draft Report Posted
- **1/6/2024 – Public Comment Due**
  - Second Draft meetings, create revisions, ballot
  - Correlating Committee meets
- 10/31/2024 – NITMAMs Due
- 2024-2025 – Standard Published

How to View Current Draft of NFPA 660 www.nfpa.org/660





How to View Current Draft of NFPA 660



Structure of 660

NFPA Document Information Pages

My Public Input/Comments/NITMAMs

NFPA 660 Home

Table of Contents: NFPA 660

Chapters 8 and 9

- Chapter 8 Management Systems
  - 8.1 Retroactivity.
  - 8.2 General.
  - + 8.3 Operating Procedures and Practices.
  - + 8.4 Housekeeping.
  - + 8.5 Hot Work.
  - + 8.6 Personal Protective Equipment.
  - + 8.7 Inspection, Testing, and Maintenance.
  - + 8.8 Training and Hazard Awareness.
  - + 8.9 Contractors.
  - + 8.10 Emergency Planning and Response.
  - + 8.11 Incident Investigation.
  - + 8.12 Management of Change.
  - + 8.13 Pre-Startup Safety Review.
  - + 8.14 Documentation Retention.
  - + 8.15 Management Systems Review.
  - 8.16 Employee Participation.

- Chapter 9 Hazard Management: Mitigation and Prevention
  - 9.1 Inherently Safer Designs. (Reserved)
  - + 9.2 Risk Assessment.
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  - + 9.4 Equipment Design.
  - + 9.5 Dust Control.
  - + 9.6 Ignition Source Control.
  - 9.7 Pyrophoric Dusts. (Reserved)
  - + 9.8 Explosion Prevention/Protection.
  - + 9.9 Fire Protection.

Conflicts between Fundamentals and Industry- or Commodity-Specific Chapters

- Main
  - Sul
  - Sul
- Main
  - Sul
  - Sul

1.6 Conflicts.

1.6.1

For the purposes of this standard, the industry- or commodity-specific NFPA chapters shall include the following:

(1) Chapter 11, Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities
(2) Chapter 12, Combustible Metals
(3) Chapter 13, Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
(4) Chapter 14, Prevention of Sulfur Fires and Explosions
(5) Chapter 15, Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities

CI-178-NFPA 660-2023 submitted by [Laura Moreno] on Mon Jan 23 14:07:43 EST 2023 **COMMITTEE INPUT**

View

Committee Input No. 178-NFPA 660-2023

Section No. 1.6.2

Related Input: N/A

FR-14 Hide Deleted

1.6.2*

Where a requirement in an industry- or commodity-specific chapter differs from the requirement specified as a basic requirement in Chapters 1 through 10, the requirement in the industry- or commodity-specific chapter shall be permitted to be used.

1.6.3

Where an industry- or commodity-specific chapter specifically prohibits a basic requirement specified in Chapters 1 through 10, the prohibition in the industry- or commodity-specific chapter shall be applied.

1.6.4

Where an industry- or commodity-specific chapter neither prohibits nor provides a requirement, the basic requirements in Chapters 1 through 10 shall be applied.

How is Chapter 11 Agricultural and Food Processing Applied?

FR-11 Hide Deleted

Global FR-12

1.3.10

Where an industry- or commodity-specific chapter exists, the industry- or commodity-specific requirements of the appropriate chapter within this standard shall be applied in addition to the ~~general requirements~~fundamental requirements specified in Chapters 1 through 9.

11.1.2 Purpose. (Reserved)

11.1.3 Application.

11.1.3.1*

This chapter shall apply to all of the following:

(1) All facilities that receive, handle, process, dry, blend, use, mill, package, store, or ship dry agricultural bulk materials, their by-products, or dusts that include grains, oilseeds, agricultural seeds, legumes, sugar, flour, spices, feeds, dry dairy/food powders, and other related materials

(2) All facilities designed for manufacturing and handling starch, including drying, grinding, conveying, processing, packaging, and storing dry or modified starch, and dry products and dusts generated from these processes

(3) Those seed preparation and meal-handling systems of oilseed processing plants not covered by NFPA 36

FR-321 Hide Deleted

11.1.3.2

This chapter shall modify and augment the requirements in Chapters 1 through 9.

Example – Use of Portable Equipment – Fundamentals

8.5 Hot Work.

8.5.1*

In addition to the requirements of NFPA 51B, all hot work activities shall comply with the requirements in 8.5.2 through 8.5.5.

8.5.2*

The area affected by hot work shall be thoroughly cleaned of combustible dust prior to commencing any hot work.

8.5.3

Equipment that contains combustible dust and is located within the hot work area shall be shut down, shielded, or both.

8.5.4

When the hot work poses an ignition risk to the combustible dust within equipment, the equipment shall be shut down and cleaned prior to commencing such hot work.

8.5.5

Floor and wall openings within the hot work area shall be covered or sealed.

8.5.6 Use of Portable Equipment.

Use of portable electrical equipment that does not comply with the electrical classification of the area where it is to be used shall be authorized and controlled in accordance with the hot work procedure as outlined in Section 8.5.

Example – Use of Portable Equipment – Agricultural

11.8.5.6 Use of Portable Equipment.

11.8.5.6.1*

Work activities that could present an ignition source but do not fit the definition of hot work, such as drilling, sawing, or use of hand-operated portable electrical equipment that does not comply with the electrical classification of the area where it is to be used, shall be permitted in accordance with 11.8.5.6.1.1 through 11.8.5.6.1.6.

11.8.5.6.1.1

The area affected by the work shall be thoroughly cleaned of combustible dust prior to commencing the work.

11.8.5.6.1.2

The area affected by the work shall be free from airborne combustible dust.

11.8.5.6.1.3

Equipment that contains combustible dust and is located near the work area shall be protected from the work.

11.8.5.6.1.4

When the work poses an ignition risk to the combustible dust within equipment, the equipment shall be shut down and cleaned prior to commencing such work.

11.8.5.6.1.5

Floor and wall openings within the work area shall be covered or sealed.

11.8.5.6.1.6

The work shall be performed on surfaces and equipment not directly handling combustible dusts.

11.8.5.6.2

Spark-producing portable power tools and propellant-actuated tools shall not be used where combustible dust is present.

11.8.5.6.3

When the use of spark-producing or propellant-actuated tools becomes necessary, the following procedures shall be performed:

(1) All dust-producing machinery in the area shall be shut down.

(2) The use of spark-producing or propellant-actuated tools shall be authorized by the use of a hot work permit.

11.8.5.6.4

After completion of the work requiring the use of propellant actuated tools, a check shall be made to be sure that no cartridges or powder charges are left on the premises where they could enter equipment or otherwise be accidentally discharged.

Example DHA Requirements - Agricultural

11.7.3 Methodology.

11.7.3.1 General.

11.7.3.1.1

The requirement in 11.7.3.1.2 shall be permitted to be used in lieu of those in 7.3.1 .

11.7.3.1.2

The DHA shall include the following:

(1) Identification and evaluation of the process or facility areas where fire, flash fire, and explosion hazards exist shall be included.

(2) Where such a hazard exists, identification and evaluation of specific fire and deflagration scenarios shall include the following:

(a) Identification of the safeguards that are in place to manage fire, flash fire, and explosion events

(b) Recommendation of additional safeguards

(3) It shall be permitted to use a checklist to complete a DHA on an agricultural combustible dust. *(See Annex F for a sample checklist.)*

11.7.3.2 Reserved.

11.7.3.3 Process Systems.

It shall be permitted to omit the requirements in 7.3.3 .

11.7.3.4 Building or Building Compartments.

11.7.3.4.1

The requirements in 11.7.3.4.2 and 11.7.3.4.3 shall be permitted to be used in lieu of those listed in 7.3.4 .

11.7.3.4.2

Each building or building compartment where combustible dust is present shall be evaluated.

11.7.3.4.3

The housekeeping program shall be evaluated for effectiveness and compliance with 11.8.4 as a part of the DHA.

Committee Inputs Under Consideration - Fundamentals

Committee Input No. 178-NFPA 660-2023 [Section No. 1.6.2]

1.6.2

Where a requirement in an industry- or commodity-specific chapter differs from the requirement specified as a basic requirement in Chapters 1 through 10, the requirement in the industry- or commodity-specific chapter shall be ~~permitted to be used~~ applied .

Submitter Information Verification

Committee: CMD-FUN

Submittal Date: Mon Jan 23 14:07:43 EST 2023

Committee Statement

Committee Statement: The committee will be considering making this a "shall be applied" statement. If the industry- or commodity-specific chapter imposes a requirement that is more stringent than the basic requirement in Chapters 1 through 10, the user should not be permitted to avoid the industry- or commodity-specific requirement by applying the more lenient basic requirement.

Response Message: CI-178-NFPA 660-2023

Committee Inputs Under Consideration - Agricultural

Submitter Information Verification

Committee: CMD-AGR

Submittal Date: Wed Feb 15 12:36:01 EST 2023

Committee Statement

Committee Statement: At the Second Draft stage, the committee will review this checklist and update section numbers/cross references as needed. The committee may also add additional checklist examples for specific facility types.

Response Message: CI-349-NFPA 660-2023

DHAs

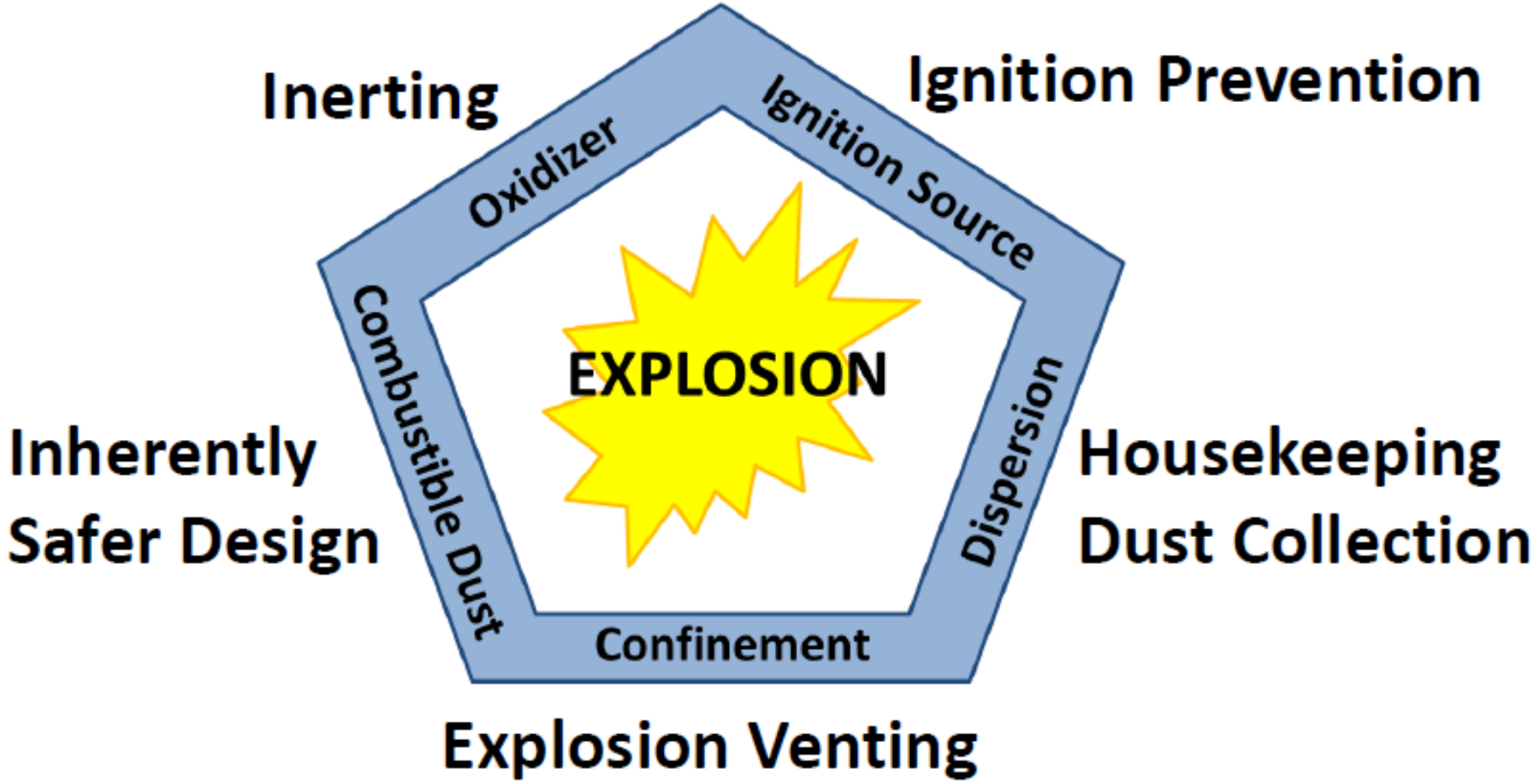
Dust Hazard Analysis

What is a DHA?

Reference: NFPA 61-2020 Chapter 3

3.3.12* Dust Hazard Analysis (DHA). A systematic review to identify and evaluate the potential fire, flash fire, or explosion hazards associated with the presence of one or more combustible particulate solids in a process or facility. [**652,** 2019]

Eliminating Sides of the Pentagon



Who Can Lead a DHA?

Reference: NFPA 61-2020 Chapter 7

7.2.2* Qualifications. The DHA shall be performed or led by a qualified person. [**652:**7.2.2]

Who Can Lead a DHA?

Reference: NFPA 61-2020 Annex A

Δ **A.7.2.2** The qualified person who is leading or performing the DHA should be familiar with conducting a DHA. The qualified person should also be familiar with the hazards of combustible dusts. Typically, a team performs a DHA. For some processes this team might be a little as two persons, or for larger and more complex processes, the team might require many more than two persons. This team is made of a variety of persons whose background and expertise can include the following:

(1) Familiarity with the process
(2) Operations and maintenance
(3) Process equipment
(4) Safety systems
(5) History of operation
(6) The properties of the material
(7) Emergency procedures

[**652:**A.7.2.2]

When do I need to Perform these?

- Based upon NFPA 61-2020
  - For new processes, processes that are undergoing significant modification
  - For existing processes and facility compartments that include bucket elevators, conveyors, grinding equipment, spray dryer systems, and dust collection systems by January 1, 2022.
- Other Combustible Dust standards required retroactive DHAs for all processes
- Additional processes have been added to retroactive list in 660 Chapter 11 (all dryers, storage, pneumatic conveying, central vacuums)

What Is Included in a DHA?

Reference: NFPA 61-2020 Chapter 7

7.3* Methodology.

Δ **7.3.1 General.** The DHA shall include the following:

(1) Identification and evaluation of the process or facility areas where fire, flash fire, and explosion hazards exist

(2) Where such a hazard exists, identification and evaluation of specific fire and deflagration scenarios shall include the following:

(a) Identification of safe operating ranges

(b)* Identification of the safeguards that are in place to manage fire, deflagration, and explosion events

(c) Recommendation of additional safeguards where warranted, including a plan for implementation

[**652:**7.3.1]

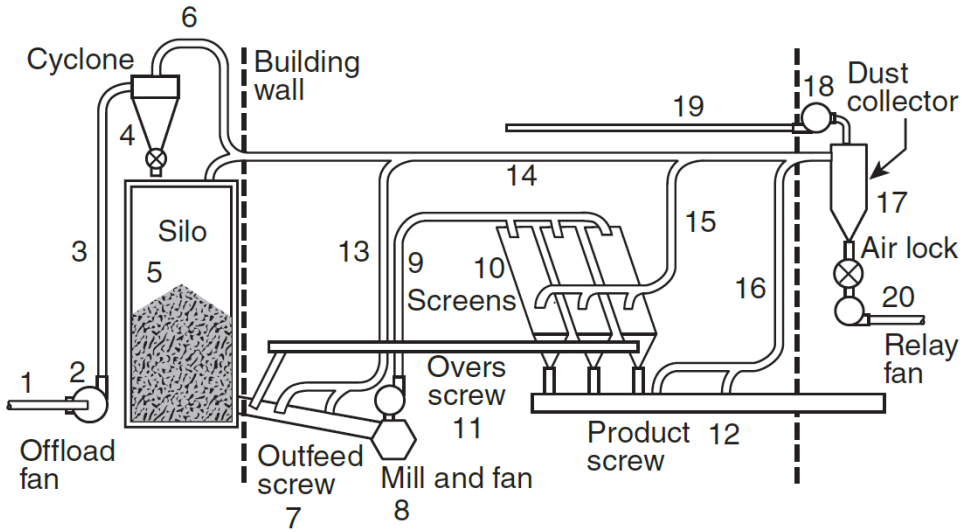
(3) It shall be permitted to use a checklist to complete a DHA on an agricultural combustible dust. *(See Annex F for a sample checklist.)*

How Does a DHA Work in Practice?

1. Identify where in a facility combustible dusts are present or suspected to be present
2. Divide the areas with combustible dust into nodes
3. Evaluate each node for the five elements of the explosion pentagon
4. Where a fire, flash fire, or explosion hazard is present, identify safeguards
5. Compare safeguards to NFPA requirements and best practices
6. Recommend additional safeguards, if necessary.

Dust Hazard Analysis (DHA) Methodologies

- Multiple methodologies can be used
  - Checklist, What-if, FMEA, HazOp, etc.
- Not intended to require PSM for all dusts



Source: NFPA 652

Example DHA Checklist – NFPA 61

AGRICULTURAL AND FOOD DUST HAZARD ANALYSIS (DHA) CHECKLIST

Completed document and associated reference material meets the requirements for documentation of "Dust Hazard Analysis (DHA)." A systematic review to identify and evaluate the potential fire, flash fire, or explosion hazards associated with the presence of one or more combustible particulate solids in a process or facility. [652, 2019]. It can be used at facilities that have simple conversion technologies, such as, but not limited to, grain elevators, flour mills, mix plants, cereal plants, and dough plants.

Date DHA completed: _____

Date DHA modified: _____

Date DHA reviewed: _____

For new processes that will be constructed and facility processes that are undergoing significant modification, the owner/operator shall complete DHAs as part of the project. For existing processes and facility compartments that are not undergoing significant modification, the owner/operator shall schedule and complete DHAs of bucket elevators, conveyors, grinding equipment, spray dryer systems, and dust collection systems by January 1, 2022. [61:7.1]

Facility owner: _____

Facility operator: _____

Person responsible for DHA: _____

Others involved in DHA: _____

The DHA shall be performed or led by a qualified person. [652:7.2.2] The owner/operator of a facility where materials determined to be combustible or explosible are present in an enclosure shall be responsible to ensure a DHA is completed in accordance with the requirements. [652:7.1.2]

1.0 MATERIALS EVALUATION		Yes	No	N/A	Comments	Action	Date Due
1.1	Is there a comprehensive list of all materials at the facility that present a credible combustible dust hazard?						
Hazard identification is based on the most recent Chapter 5 of NFPA 61. The list of materials should be kept in electronic or paper form and should reference the methods used to define hazards. In process, half product and mixes that contain dust less than 500 microns should also be listed and evaluated.							
1.2	Does the list include material data: sieve analysis, K_{St} testing, MIE (if warranted by K_{St} testing), and references used to define material characteristics, etc.?						
1.3	Location of list:						
1.4	Do any of the materials on the list have a K_{St} greater than 200?						
	If yes, where are these materials stored, transported, and used?						
Hazard identification is based on several factors. A higher than 200 K_{St} means the material is more energetic than a typical agricultural or food dust, and therefore these materials should be first on any facilities evaluation list. If all materials have similar K_{St} and other characteristics, the evaluation of the hazard can be simplified to a typical general case.							
1.5	Do any of the materials on the list have an MIE of less than 30 mJ?						
	If yes, where are these materials stored, transported, and used?						
If the MIE is found to be less than 30 mJ, an unusual static energy risk exists, and the facility must be prepared to institute special handling procedures to prevent dust ignition.							
1.6	Have P&IDs or similar documents been used to identify equipment and processes that need to be evaluated?						
Where are the processes and facility areas where flash fire and explosion hazards potentially exist?							
1.7	Location of system P&IDs highlighting equipment to be evaluated:						
1.8	Location of facility drawing illustrating areas of potential concern:						
1.9	Do you have a breakdown of the materials used in each process or facility area?						
	Where is this information kept?						
The DHA shall include the following: (1) Identification and evaluation of the process or facility areas where fire, flash fire, and explosion hazards exist (2) Where such a hazard exists, identification and evaluation of specific fire and deflagration scenarios shall include the following: (a) Identification of safe operating ranges (b) Identification of the safeguards that are in place to manage fire, deflagration, and explosion events (c) Recommendation of additional safeguards where warranted, including a plan for implementation [652:7.3.1]							
4.2.1.2 The objectives stated in NFPA 61, Section 4.2, shall be deemed to be met when, consistent with the goal in 4.2.1 and the provisions in NFPA 61, Sections 1.4 and 1.5, the following have been achieved: (1) The facility, processes, and equipment are designed, constructed, and maintained in accordance with the prescriptive criteria set forth in this standard. (2) The management systems set forth in this standard are implemented.							
If the material evaluated matches that of a typical agricultural or food dust, use of the prescriptive requirements in NFPA 61 meets the minimum requirements for mitigation of the hazard. If not, best practice requires a hazard analysis method appropriate to the size, complexity, and hazards of the process.							
2.0 BUILDING AND FACILITY DESIGN (NFPA 61, Section 9.2)		Yes	No	N/A	Comments	Action	Date Due
NFPA 70 defines location, hazard class, division, and group in Article 500.5. Class II locations are those that are hazardous because of the presence of combustible dust. In Division 1 locations, the hazard is present in quantities sufficient to produce explosive or ignitible mixtures. In Division 2 locations, the hazard might be present under abnormal operations. Group G includes agricultural and food dusts. "Unclassified" is used to describe low-hazard locations and areas with management and sanitation plans that prevent dust accumulation.							
This assessment is a best practice and is seen as a method of understanding what flaws a current structure has compared to NFPA 61 requirements prior to the 2020 edition.							
2.1	Has the construction, modification, renovation, change of use, or change of occupancy classification of all buildings and structures complied with all governing building codes?						
2.2	Has a qualified person evaluated the facility and determined locations that are Class II, Group G, Division 1 or Division 2, and where the facility should be considered unclassified due to cleaning practices or absence of combustible dust?						

Δ FIGURE F.5 Agricultural and Food Dust Hazard Analysis (DHA) Checklist.

AGRICULTURAL AND FOOD DUST HAZARD ANALYSIS (DHA) CHECKLIST

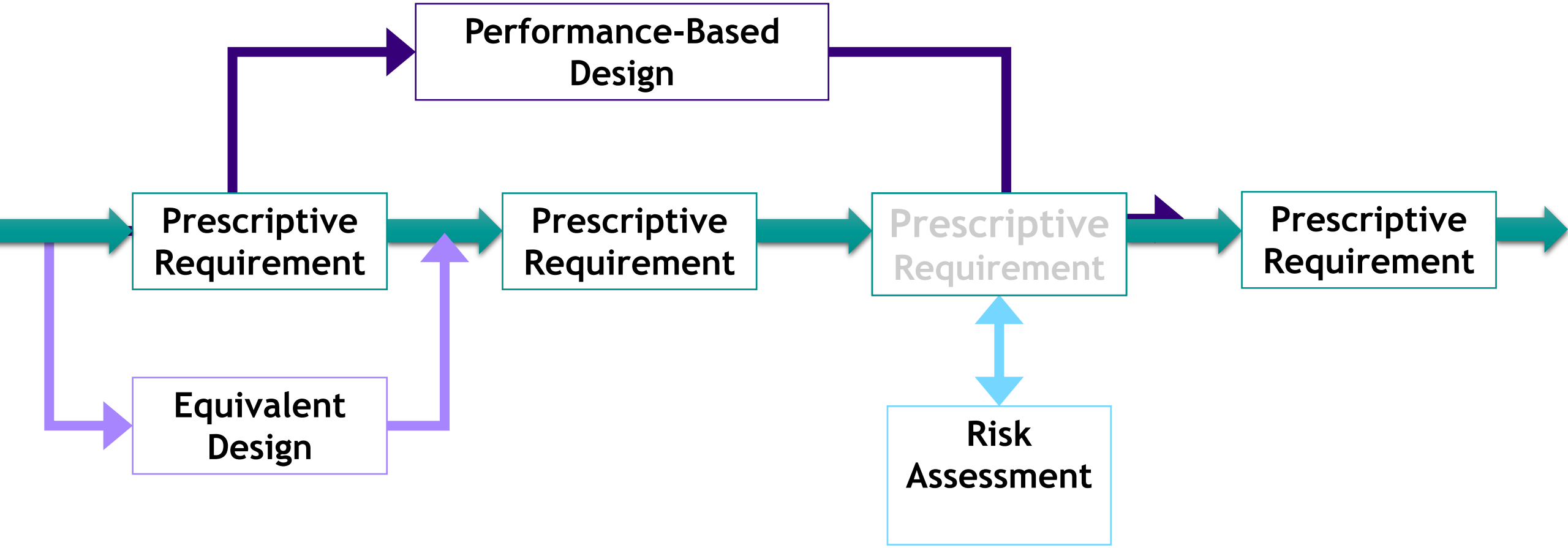
21.0 HUMAN FACTOR, continued		Yes	No	N/A	Comments	Action	Date Due
21.38	If sparks could travel to an adjacent room through cracks or openings, have combustible materials all been moved or protected?						
21.39	Will any fire protection or detection systems be disabled as a result of this hot work?						
	If yes, is an active fire watch available?						
21.40	Is a trained fire watch present during the hot work and for 60 minutes after the hot work is completed?						
21.41	Are regular inspections of the work area made to ensure that no smoldering fires develop, including a final inspection performed prior to closing the area for the day or weekend?						
21.42	Have people responsible for the hot work operations received documented training to (1) inspect the proposed work area to determine that the conditions of the permit system have been met, (2) designate additional precautions as deemed necessary, and (3) sign the permit to authorize the work to begin?						
21.43	Is combustible dust training provided annually to staff involved in facility design and operation, including plant engineering and maintenance?						
21.44	Are contractors informed of all known/potential hazards related to their work as well as site safety rules to reduce combustible dust fire and explosion hazards, including, but not limited to, emergency action plans, hot work permits, avoiding potential ignition sources, grounding requirements, cleaning out of combustible material before commencing work, and prohibition of smoking in hazardous areas?						

Δ FIGURE F.5 *Continued*

I Completed My DHA, Now What?

- Typically a DHA will identify areas that don't comply with prescriptive requirements of standards, or areas with previously unidentified hazards.
  - Develop plan to analyze recommendations and if appropriate add additional layers of protection or mitigation.
  - In some cases it may be beneficial to analyze alternative protection methods
    - Equivalency (Chapter 1)
    - Risk Assessment (Chapter 9)
    - Performance-based design (Chapter 6)
  - Document final decisions

Alternate Protection Strategies

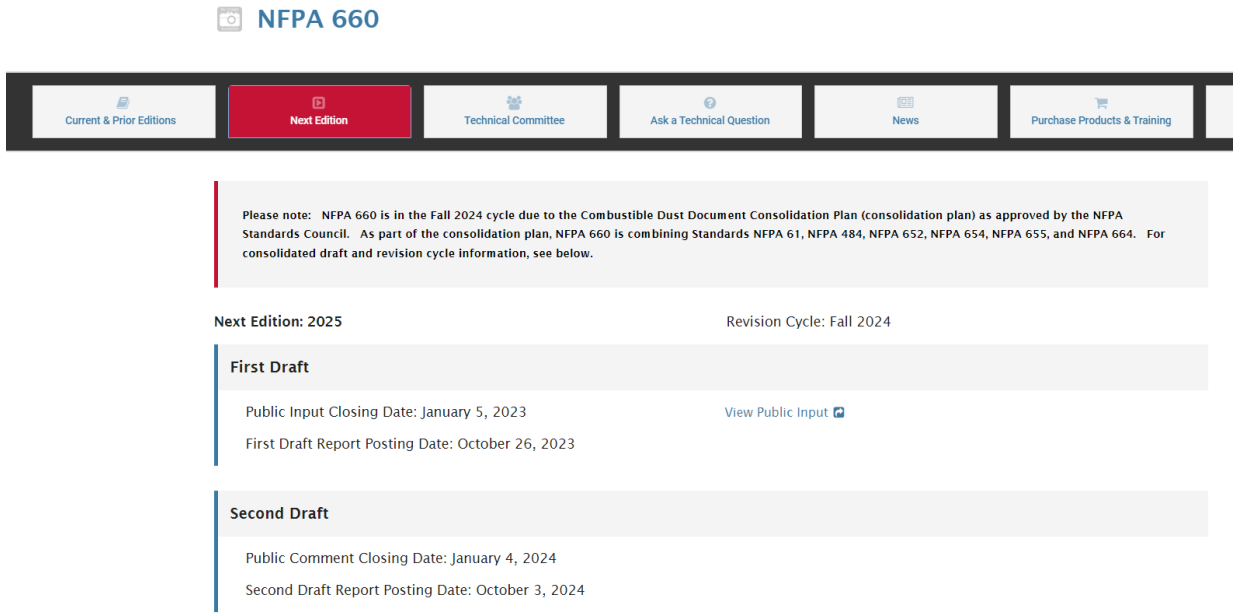


What can you do?

Next steps in NFPA 660 and DHAs

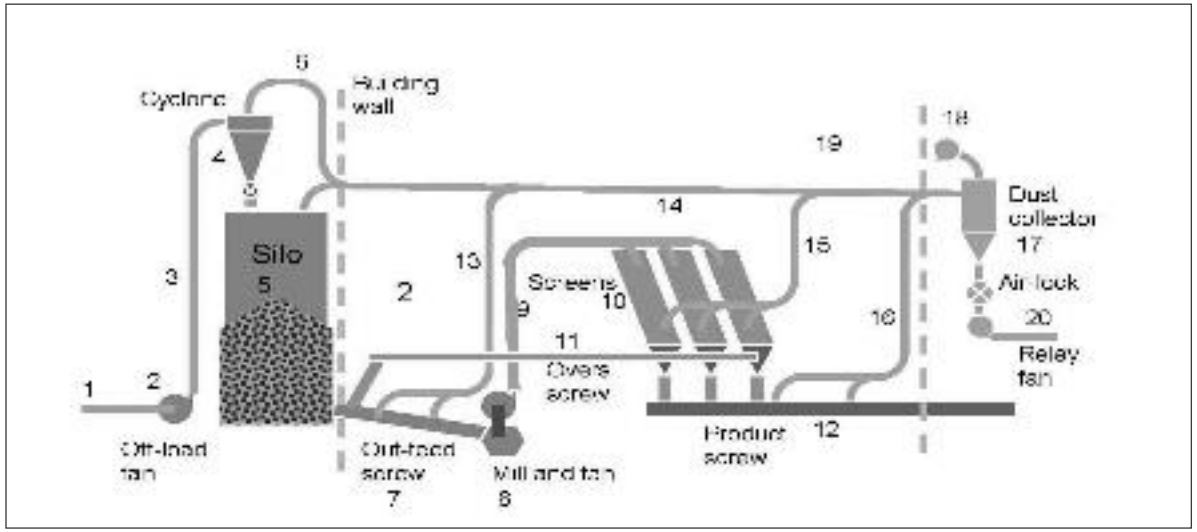
Provide Comments to NFPA 660

- Review current draft
- Deadline: January 6, 2024
- Can provide comments with proposed language on:
  - Public Inputs
  - Committee Inputs
    - Example DHA checklists for different types of facilities
  - First Revisions



DHAs

- Complete DHAs on applicable processes
- Evaluate and act upon recommendations
- Document final decisions



Tim Myers, Ph.D., P.E., CFEI

Principal Engineer and Office Director
Natick, MA
tmyers@exponent.com

Questions?

Notes:

- *Speaking from my own perspectives and not representing the NFPA or NFPA Technical committees.*
- *NFPA 660 is a proposed standard and is still in revision process and has not been approved.*