

NFPA[®]

654

**Standard for
the Prevention of Fire and
Dust Explosions from the
Manufacturing, Processing,
and Handling of Combustible
Particulate Solids**

2020



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NFPA® 654

Standard for the

Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids

2020 Edition

This edition of NFPA 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids*, was prepared by the Technical Committee on Handling and Conveying of Dusts, Vapors, and Gases, released by the Correlating Committee on Combustible Dusts, and acted on by NFPA at its June Association Technical Meeting held June 17–20, 2019, in San Antonio, TX. It was issued by the Standards Council on August 5, 2019, with an effective date of August 25, 2019, and supersedes all previous editions.

This edition of NFPA 654 was approved as an American National Standard on August 25, 2019.

Origin and Development of NFPA 654

NFPA 654 was initiated by the Committee on Dust Explosion Hazards in 1943 and originally applied only to the prevention of dust explosions in the plastics industry. As such, it was tentatively adopted in 1944 and officially adopted in 1945. Amendments were adopted in 1946, 1959, 1963, and 1970. The 1970 edition was reconfirmed in 1975.

In 1976, responsibility for NFPA 654 was transferred to the Technical Committee on Fundamentals of Dust Explosion Prevention and Control. The committee prepared a complete revision for the 1982 edition, the scope of which was expanded to include chemical, dye, and pharmaceutical dusts, since the fire and explosion hazards of those dusts are generally the same as for plastic dusts.

In 1988, the committee voted to reconfirm the text as it appeared in the 1982 edition, with minor editorial corrections and changes in accordance with the NFPA *Manual of Style*.

In 1994, the standard was revised to improve its usability, adoptability, and enforceability; to update outdated terminology; and to add the NFPA language for equivalency and retroactivity. In addition, the Technical Committee on Fundamentals of Dust Explosion Prevention and Control added new technologies for explosion prevention to NFPA 69, *Standard on Explosion Prevention Systems*. The committee also clarified the requirements relating to controlling hazardous accumulations of process dust.

The 1997 edition was a complete revision that incorporated new processing and explosion protection technologies. The title of the document was revised to reflect that the standard encompassed all industries not otherwise included in previous editions of the standard, including the fibers industry. The complete revision incorporated new requirements for design basis of systems and design details for management of change.

A complete revision for the 2000 edition incorporated portions of NFPA 650, *Standard for Pneumatic Conveying Systems for Handling Combustible Particulate Solids*, which was withdrawn in 2000. NFPA 654 retained its title and provided a unified approach for protecting facilities that handled most combustible particulate solids. The combination of documents eliminated the redundancy that previously had existed between the two, similar standards. The 2000 edition of NFPA 654 included specific requirements related to fire protection in addition to the existing explosion protection requirements.

The 2006 edition incorporated a complete revision, which introduced a performance-based approach for protecting combustible particulate solids processing facilities. This approach enabled users of the standard to follow the traditional prescriptive method or, for unique situations, allowed the option of a performance-based design. Other changes included updating the standard to the current *Manual of Style for NFPA Technical Committee Documents* format.

The 2013 edition incorporated updates to definitions to coordinate with extracted text from the source documents in accordance with the *Manual of Style for NFPA Technical Committee Documents*. The most important change was the inclusion of four methods to determine whether a dust fire or explosion hazardous condition exists in a facility. The methods include those based on mass accumulation and risk evaluation as well as the layer depth criterion, which was described in the 2006 edition. Each of the methods was viewed as equivalent in establishing that a hazardous condition exists for either fires or explosions, so the change offered options for users of the standard when determining this fundamental condition.

The standard included changes to the housekeeping requirements in two aspects. One involved the determination of a dust hazardous condition and prompts a cleaning frequency based on the nature of the dust layer or dust mass. The second change established a hierarchy for cleaning methods: vacuuming first, followed by sweeping or water wash and then, if still necessary, blowing with compressed air, but only under controlled conditions. It is clearly recognized from the incidents reported over the past decade or more that housekeeping has not been adequate in all instances, so establishing a strategy for cleaning frequency based on accumulated dust will improve the practice. In some instances, improper housekeeping has contributed to incidents, so creating a preferred sequence for cleaning methods will increase safety as well.

Safety management elements also were strengthened in the standard, including hazard analysis, management of change, training, emergency procedures, incident investigations, and contractor/subcontractor safety. Incident investigations indicated that one or more of these elements were reported as contributing factors to various incidents, so including them in the standard stressed their importance in the overall safety culture at a facility.

The 2017 edition included changes designed to begin the alignment of the standard with the newly issued NFPA 652, *Standard on the Fundamentals of Combustible Dust*. Definitions used in NFPA 654 were aligned with those in NFPA 652, and the objectives in Chapter 4 were updated. Although the requirement to perform a hazard analysis had been part of the standard since the 2006 edition, requirements to perform a dust hazard analysis (DHA) retroactively were added for those facilities constructed prior to the 2006 edition. The work to align NFPA 654 with NFPA 652 will continue in the next revision cycle.

The 2020 edition is a complete reorganization of the document. Many of the existing requirements were moved to align the document with NFPA 652, *Standard on the Fundamentals of Combustible Dust*, and any material previously extracted into NFPA 652 from NFPA 654 is now hosted in NFPA 652. Where requirements in the code are retroactive, statements were made to clearly indicate this to the user. New requirements for ultrafine particles (including nanopowders and nanoparticles) and additive manufacturing have been added to recognize unique hazards and developing technology, and requirements covering static, conductivity, and portable vacuum cleaners have been extracted from NFPA 652. The deadline for performing a dust hazard analysis (DHA) on existing processes and facility compartments is now specified to align with NFPA 652.

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NFPA 654

Standard for the

Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids

2020 Edition

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Information on referenced and extracted publications can be found in Chapter 2 and Annex G.

Chapter 1 Administration

1.1* Scope.

1.1.1* This standard provides requirements for all phases of the manufacturing, processing, blending, conveying, repackaging, and handling of combustible dusts and particulate solids or hybrid mixtures, regardless of concentration or particle size, where the materials present a fire, a flash fire, or an explosion hazard.

N 1.1.2 This standard includes specific requirements for additive manufacturing.

1.1.3 The owner/operator shall be responsible for implementing the requirements in this standard.

1.2 Purpose. The purpose of this standard is to prescribe technical requirements necessary to manage safety to life and property from fire, flash fire, and explosion hazards involving combustible particulate solids, including hybrid mixtures, and to minimize the resulting damage from a fire or an explosion.

1.3 Goal. The goal of this standard is to provide safety measures to prevent and mitigate fires and dust explosions in facilities that handle combustible particulate solids.

1.4 Application.

1.4.1 This standard shall be used to supplement the requirements established by NFPA 652.

1.4.2 This standard shall not apply to the following:

- (1) Storage or use of consumer quantities of such materials on the premises of residential or office occupancies
- (2) Storage or use of commercially packaged materials at retail facilities
- (3) Such materials displayed in original packaging in mercantile occupancies and intended for personal or household use or as building materials
- (4) Warehousing of sealed containers of such materials when not associated with an operation that handles or generates combustible dust
- (5) Such materials stored or used in farm buildings or similar occupancies for on-premises agricultural purposes

Δ 1.4.3 This standard shall not be required to apply to materials covered by the following documents, unless specifically referenced by the applicable document:

- (1) NFPA 30B
- (2) NFPA 33
- (3) NFPA 61
- (4) NFPA 85
- (5) NFPA 120
- (6) NFPA 400
- (7) NFPA 484
- (8) NFPA 495
- (9) NFPA 655
- (10) NFPA 664
- (11) NFPA 1125

1.5 Conflicts.

1.5.1 Where a requirement specified in this industry-specific standard differs from a requirement specified in NFPA 652, the requirement in this standard shall be permitted to be used.

1.5.2 Where a requirement specified in this standard specifically prohibits a requirement specified in NFPA 652, the prohibition in this standard shall apply.

1.6* Retroactivity. The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

1.6.1 Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.