



Woodland Fire Department

DUST HAZARD ANALYSIS (DHA) Guideline CRR-009

PURPOSE

The purpose of this guideline is to provide owners, operators, designers, and contractors with clear requirements and expectations for conducting a Dust Hazard Analysis (DHA) in facilities and operations where combustible particulate solids are present.

This guideline applies to both new and existing facilities and is intended to protect life safety, property, and mission continuity by proactively identifying hazards, ensuring proper management practices, and complying with applicable codes and standards.

SCOPE

A DHA is a systematic review to identify and evaluate potential fire, flash fire, or explosion hazards associated with combustible dust. The intent of this document is to:

- Ensure compliance with 2022 California Fire Code Section 2203, which mandates conformance with NFPA 652 for new and existing facilities handling combustible dust.
- Incorporate the hazard identification, evaluation, and mitigation processes outlined in 2019 NFPA 652: Standard on the Fundamentals of Combustible Dust, including documentation, periodic review, and implementation of safeguards.
- Provide guidance on the roles and responsibilities of facility owners/operators in determining whether materials are combustible or explosible, characterizing their properties, and implementing controls to minimize the risk of deflagration or explosion.
- Promote a consistent approach for reviewing and updating DHAs every five years or when process changes occur, as required by NFPA 652.

This guideline does not supersede or replace the requirements of the California Fire Code, NFPA standards, or other applicable regulations. Instead, it provides a framework for compliance, documentation, and enforcement specific to operations in the City of Woodland.

Per NFPA 652, Section 7.1, a DHA is required for both new and existing facilities:

- A DHA shall be completed for all new processes and facility compartments.
- For existing processes and facility compartments, a DHA shall have been completed by September 7, 2020.
- The absence of previous incidents shall not be used as the basis for not performing a DHA.

- The DHA shall be reviewed and updated at least once every five (5) years or whenever significant changes occur in the process or facility.

DEFINITIONS

The definitions contained in this Guideline shall apply to the terms used herein. Where terms are not defined in this Guideline, they shall be defined using their ordinarily accepted meanings within the context in which they are used, or as defined by the 2022 California Fire Code (CFC) and 2019 NFPA 652.

AHJ – Authority Having Jurisdiction. For this document, the AHJ is the Woodland Fire Department, Community Risk Reduction Division (WFD-CRR), unless otherwise specified.

Combustible Dust - A finely divided combustible particulate solid, including combustible fibers/flyings, that presents a flash-fire hazard or explosion hazard when suspended in air or the process-specific oxidizing medium over a range of concentrations (2019 NFPA-652, 3.3.6).

Combustible Particulate Solid - Any solid material composed of distinct particles or pieces, regardless of size, shape, or chemical composition, that, when processed, stored, or handled in the facility, has the potential to produce a combustible dust (2019 NFPA-652, 3.3.9).

Deflagration - Propagation of a combustion zone at a velocity that is less than the speed of sound in the unreacted medium (2019 NFPA-652, 3.3.12).

Dust Hazards 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 (2019 NFPA-652, 3.3.19).

Explosion - The bursting or rupture of an enclosure or container due to the development of internal pressure from a deflagration (2019 NFPA-652, 3.3.22).

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 ignitable liquid, without the production of damaging pressure (2019 NFPA-652, 3.3.24).

Fugitive Dusts - Dust that escapes from equipment and containers (2019 NFPA-652, 3.3.26).

Minimum Explosible Concentration (MEC) - The minimum concentration of a combustible dust suspended in air, measured in mass per unit volume, that will support a deflagration (2019 NFPA-652, 3.3.34).

Qualified Person - A person who, by possession of a recognized degree, certificate, professional standing, or skill, and who, by knowledge, training, and experience, has demonstrated the ability to deal with problems related to the subject matter, the work, or the project (2019 NFPA-652, 3.3.41).

DHA DETERMINATION

A DHA is a detailed review of a facility and its processes to determine where there is a risk of a combustible dust fire, flash fire, or explosion. Each part of the process is examined to see if a deflagration hazard exists.

- If a hazard is already being controlled, the DHA documents how it is managed.
- If a hazard is not being controlled, the DHA should identify ways to manage it and note any important data that still needs to be collected before control measures can be put in place.

For a deflagration to occur, all of the following must be present:

1. Dust particles small enough to allow a flame to spread through them.
2. A way for the dust to become suspended or dispersed in air (or another oxidizing atmosphere).
3. Enough dust in the air to reach the minimum explosible concentration.
4. A source of ignition capable of igniting the dust cloud.

DHA hazard classifications

When complete, the DHA should place each location in the facility into one of three categories:

- **Not a hazard** – Conditions do not support a deflagration.
- **Might be a hazard** – Some conditions could support a deflagration, but more evaluation is needed.
- **Deflagration hazard** – Conditions are present that could lead to a dust explosion or flash fire.

DHA REPORT ITEMS

The Dust Hazard Analysis (DHA) shall evaluate all potential fire, flash fire, and explosion hazards associated with combustible dust and provide recommendations to manage these hazards in accordance with 2019 NFPA 652, Section 7.2.1.

At a minimum, the DHA shall include the following:

1. Hazard Identification and Evaluation

- Identify and evaluate all process areas and facility locations where fire, flash fire, or explosion hazards may exist.
- Where hazards are present, analyze and document specific fire and deflagration scenarios, including:
 - Safe operating ranges for the process or equipment.
 - Existing safeguards that manage the hazards.
 - Recommended additional safeguards, with an implementation plan.

2. Electrical Classified Locations

- Provide a copy of the facility plan showing the extent and boundaries of all electrical classified locations and divisions, in accordance with the current California Electrical Code, Article 500.

3. Process System Evaluation

- Evaluate each part of the process system where combustible dust is present or where combustible particulate solids could result in dust generation. This evaluation shall address:
 - Potential intended and unintended dust transport between process areas.
 - Potential fugitive dust emissions into buildings or compartments.
 - Potential for deflagration propagation between process system components.

4. Building or Compartment Evaluation

- Evaluate each building or building compartment where combustible dust is present (NFPA 652, 7.3.4.1).
- Compare actual or intended dust accumulation against the threshold housekeeping dust accumulation that would pose a risk of:
 - Flash-fire exposure to personnel.
 - Structural or compartment failure due to explosive overpressure (NFPA 652, 7.3.4.1.2).

5. Material Properties Analysis

- Identify and evaluate the following material properties for all combustible particulate solids present (NFPA 652, 5.2):
 - Particle size
 - Particle size distribution
 - Particle shape
 - Particle aging
 - Particle attrition
 - Particle suspension
 - Particle agglomeration
 - Triboelectric attraction
 - Hydrogen bonding
 - Entrainment fraction
 - Combustible concentration
 - Competent ignition sources
 - Dustiness/Dispersibility

Note: A sample DHA format is available in Annex B of NFPA 652 for reference.

QUALIFIED PERSON

Per NFPA 652, Section 7.2.2, a Dust Hazard Analysis (DHA) shall be performed or led by a qualified person.

A *qualified person* is an individual who:

- Has knowledge and experience in conducting DHAs.
- Understands the hazards of combustible dusts.
- Is familiar with applicable codes, standards, and industry best practices.

While a DHA may be conducted by a single qualified person for simple processes, most DHAs are performed by a team. Depending on the size and complexity of the facility, this team may range from two people to many more.

A DHA team may include individuals with expertise in:

- Facility-specific processes.
- Operations and maintenance.
- Process equipment design and function.
- Safety systems and controls.
- History of the facility's operation and incidents.
- Properties and behavior of the combustible material(s).
- Emergency procedures and response.

Participants may include:

- Facility operators.
- Engineers.
- Owners or managers.
- Equipment manufacturers.
- Industry consultants.

DOCUMENTATION

All findings, evaluations, and recommendations from the Dust Hazard Analysis (DHA) shall be documented in accordance with NFPA 652, Section 7.2.3. Documentation must be clear, organized, and sufficient to demonstrate compliance with applicable codes and standards.

The DHA documentation shall include:

- A summary of identified fire, flash fire, and explosion hazards.
- Details of existing safeguards and recommendations for additional safeguards.
- Supporting data for hazard evaluations, including material properties and process conditions.
- Facility plans and diagrams showing electrical classified areas and process equipment locations.
- A record of the individuals and qualifications of those who conducted the DHA.
- A schedule for implementing recommended hazard controls.

Cleaning and Housekeeping Programs

Where hazard management relies on routine cleaning, the DHA shall include:

- A detailed description of the cleaning program.
- The frequency and methods used for cleaning.
- The equipment, tools, and cleaning agents used.
- The specific surfaces and areas covered.
- Procedures for documenting cleaning activities and inspections.

The cleaning program must demonstrate that combustible dust accumulations are consistently maintained *below the threshold levels* that could contribute to a fire, flash fire, or explosion hazard.