



DUST HAZARD ANALYSIS GUIDE

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More importantly, a DHA is now required for compliance with NFPA 652 and industry-specific standards. When NFPA 652 was initially published, a compliance deadline was set for September 2018 and later extended to September 2020 for most industries. All such deadlines have now passed, so it's important to begin the DHA process now if not yet completed.

Regulatory authorities and insurers reference the NFPA 652 standard and other industry standards when inspecting any processes or facilities with combustible dusts. Therefore, following these safety standards correctly starts with the DHA process led by a qualified person with expert knowledge of combustible dust hazards, the NFPA Standards, and the workings of your facility's specific processes. If your organization does not have an in-house combustible dust expert, it is advisable to contact a qualified outside consultant.

Failing to complete a DHA may leave your company unprotected from the consequences of fire or explosion and vulnerable to negative impacts such as citations, permit approval delays, risk of employee injury or fatality, loss of production, asset damage, and damage to public perception.



This guide will help you understand what a DHA is, why it's important, and how Dustcon Solutions can help you comply with DHA requirements.

Combustible dust hazards have real-life consequences

The DHA requirement within industries handling combustible dusts was first established by the NFPA 652 Standard in 2015 to identify and address combustible dust hazards.

These hazards have contributed to serious industrial accidents, such as the 2008 Imperial Sugar dust explosion and fire in Savannah, GA, that caused 14 deaths and 38 injuries. Another incident at Hoeganaes Corporation in Gallatin, TN, consisted of a series of flash fires involving metal dust and hydrogen over a period of 6 months in 2011 that resulted in 5 deaths and 3 injuries. Incidents like these and others have fueled investigations by the U.S. Chemical Safety Board (CSB), which in turn makes safety recommendations to improve safety at both the company being investigated as well as in the broader industry sector where the incident occurred. In 2008 after the Imperial Sugar incident, OSHA reissued its Combustible Dust National Emphasis Program (NEP) that it had announced only the year before to both increase enforcement activities and to focus on specific industry groups that experience frequent combustible dust incidents or combustible dust incidents with catastrophic consequences.

Each year, there continue to be numerous combustible dust incidents that occur in the United States and around the world, resulting in process downtime, damage to facilities and process lines, and sadly worker injuries and deaths. Narrowing incidents down to the United States, in 2020, according to DustEx Research Ltd.,

there were 118 incidents and in 2021, there were 143 incidents that resulted in a total of 61 injuries and 3 fatalities. In an effort to prevent these accidents and the tragic consequences, enforcement agencies such as OSHA have adopted standards from the National Fire Protection Association (NFPA), a nonprofit organization. The NFPA has created both industry specific combustible dust standards and more general standards to guide which safety measures companies that deal with combustible dust should take to recognize hazards and address them to prevent incidents.

In the years since the NEP was introduced, NFPA standards have continued to evolve, with technical committees consisting of industry stakeholders and experts convening to revise current standards and to create new ones. Currently, a DHA is needed to comply with the requirements of NFPA 652 and industry-specific standards such as NFPA 61, NFPA 664, NFPA 484, and NFPA 654. The NFPA requirements may be enforced through local building codes, through adoption by OSHA (or other governmental safety agencies), or by adoption by insurance companies, making it an important part of a facility's safety management and operations.

Who needs a DHA?

The DHA requirement applies to all new processes and facilities and retroactively to existing processes and facilities that handle, generate, or store combustible particulate solids. Beyond compliance, one or more DHA is needed to adequately understand and prevent the consequences related to combustible dust, which may include employee injury or fatality, asset damage, and business continuity interruption.



The requirement to have a completed DHA is already in place and that requirement also includes reviewing and updating the DHA every 5 years. If major changes are made to a facility or process, it is also best practice to complete a DHA at that time.

Here is a basic, but not exhaustive list of what industries may require a DHA:

- + Agriculture
- + Chemical manufacturing
- + Textile
- + Forest and wood products
- + Metal processing
- + Paper products
- + Biomass processing
- + Pharmaceutical
- + Recycling operations
- + Tire and rubber manufacturing
- + Food processing
- + Wastewater treatment
- + Coal handling
- + Recycling

Here's a list of typical combustible dust types requiring a DHA:

- + Metal dusts
- + Wood dusts
- + Coal and other carbon dusts
- + Plastic dusts and additives
- + Biosolids
- + Other organic dusts, such as sugar, flour, paper, soap, and dried blood
- + Certain textile materials

DHA Preparation and Process

Some companies may have a staff member that's qualified to perform a DHA, but most companies do not have the expertise in-house and need to rely upon an outside consultant to do the work on their behalf.

Either way, NFPA 652 states that the leader of the DHA effort shall be a "qualified person." For the purposes of this guide, we'll assume that an outside consultant has been chosen, but it's important to select a trusted expert for this task. The definition of what qualifies a person with "possession of a recognized degree, certificate, professional standing, or skill" with the appropriate "knowledge, training, and experience." This guidance for facility managers to select someone to perform a DHA should be considered along with whether the person has:



A firm knowledge of the related NFPA standards

and any other relevant international or third-party standards such as ATEX directives or FM Global Data Sheets



Expertise in combustible dust related hazards and safeguards



Past DHA experience or participation in a prominent way



Relevant experience with the process or industry segment to be analyzed

To ensure a DHA is properly completed, check a candidate's resume or CV, review a sample DHA Report from previously completed work, and check references to ensure you select an appropriate candidate for the DHA process.

To prepare for a DHA, gather documentation about the process and materials, including: a list of materials handled and each one's safety data sheet (SDS) and explosibility test results. For untested materials, each one must be characterized through either sampling and lab testing or by consulting industry published data, assuming the data is representative of material at your facility.

Other documents needed can include process flow diagrams (PFDs), piping and instrumentation diagrams (P&IDs), facility layout drawings, equipment drawings and equipment installation and operation manuals, details on explosion and fire protection systems, a near-miss and incident history for the facility or process, management systems, and programs in place for combustible dust safety.

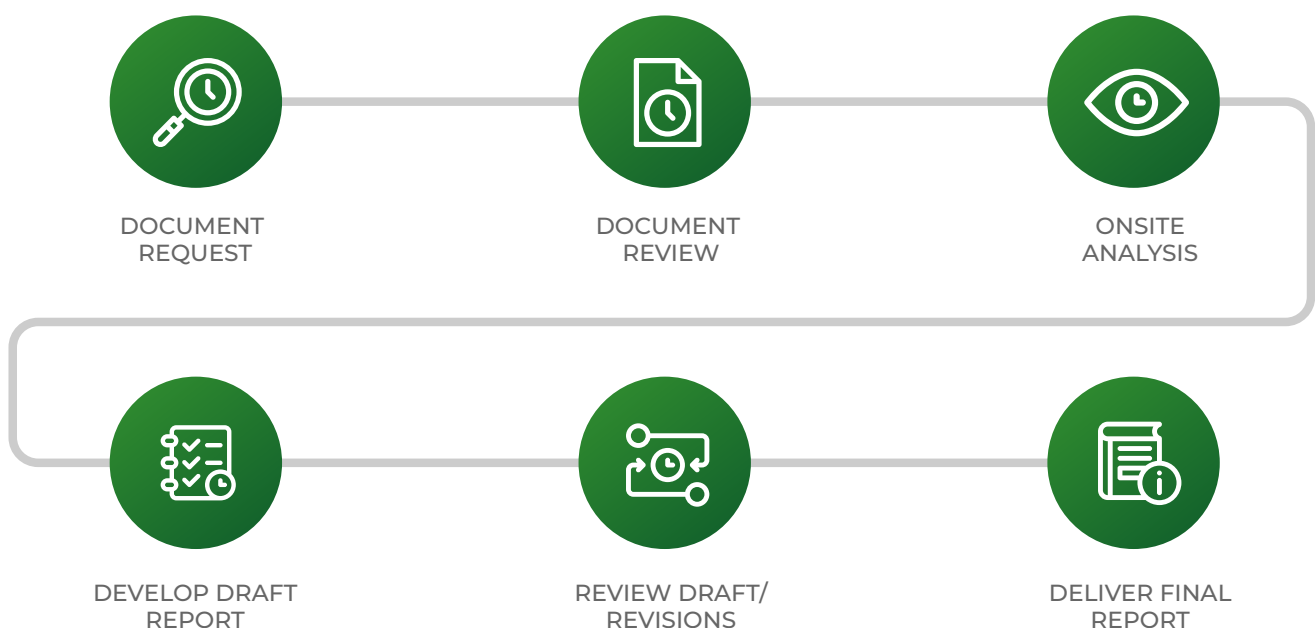
After all the relevant documents have been gathered and reviewed, an onsite walkthrough is necessary to evaluate conditions on the plant floor as well as discussions and contributions from staff at the facility to understand any relevant issues. A DHA should be an effort which is undertaken by a multidisciplinary team of engineers, safety professionals, operations management, and maintenance staff along with the process safety expert, who is often a third-party consultant, qualified to lead the DHA.

A DHA may take anywhere from a couple weeks to several months to complete, depending on the scope and complexity of the process/facility. Below is standard DHA Process flowchart for working with a consultant, keeping in mind that timeframes may vary.

It is important to understand that a DHA alone will not necessarily include other services such as a comprehensive hazardous area classification ("Electrical Classification"), detailed fire and explosion protection design, or development of management systems which are lacking. Additionally, certain hazards may fall outside the scope of a DHA.

For example, a DHA does not cover inhalation hazards associated with dust in the air and the determination of personal protective equipment such as the need for respirators would not be covered. Additionally, hazards posed by materials which are not particulate solids may not be evaluated as part of a DHA. These could include fire, flash fire, and explosion hazards from flammable liquids, gases, and vapors. Unless said gases and vapors interact with combustible dust to form hybrid mixtures, they would likely be outside the scope of a DHA.

Dust Hazard Analysis Steps



Completed DHA and Recommendations

Once one or more DHAs have been completed, it will identify specific areas and equipment within your facility in which fire and explosion hazards exist, identify the safeguards currently in place to prevent or mitigate the hazard, and specify additional safeguards needed to ensure proper compliance and safety.

The DHA should include a basis of safety or document that provides a concise hazard listing for each process and the critical process safety information necessary to prevent combustible dust incidents. This information can be used as documentation to ensure that future changes to the process do not negatively impact combustible dust safety.

The recommendations made by the DHA to close safety gaps may serve as a roadmap for future improvements to equipment and management systems. In many cases, recommendations may be prioritized and ranked based on relative risk and required resources to complete the recommended actions.

Once completed, a DHA itself will not protect your facility or plant, so completing the recommended updates and changes will be what enhances safety and brings your process into compliance. Focusing on the critical hazards found (priority items) first and then methodically addressing the lower priority issues that a DHA reveals will often help a company to pass the compliance inspections from OSHA or other regulatory authorities. Balancing safety with the cost and time required for compliance can be a challenge.



Remember that a DHA is only one part of a safety management plan, but it is a required one if your dust is combustible!

Safety consulting from Dustcon Solutions

Dustcon Solutions has a strong process safety and compliance background with more than 50 years of combined consulting experience and specialized expertise in conducting DHAs. Combustible dust compliance and safety is integral to our business, which has more than 20 years of active involvement in the dust explosion protection industry as well as membership on the NFPA Technical Committees responsible for the latest standards pertinent to combustible dust explosion prevention.

Our consultants can provide the following services to help you with compliance and plant safety:



Hazard Analysis

- + Dust Hazard Analysis (DHA)
- + Hazardous Area Classification (HAC)
- + Process Hazard Analysis
- + Compliance Audits

Dust Testing Services

- + Explosibility & Combustibility Screening
- + Explosion Severity Testing (KSt, Pmax)
- + Ignition Sensitivity (MIE, MEC, MIT, etc)
- + Special Hazards Testing (self-heating)

Combustible Dust Training & Program Development

- + Customized Training Programs
- + Management Systems Development
- + Process Safety Management Support

Other Services

- + Incident Investigation
- + Special Expert Services
- + Explosion Protection Design
- + Project Management Support



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