

Tuesday e-Tech Alert

October 4, 2005



Clean Room Duct Protection

The current 2002 edition of NFPA 13 contains sections extracted from the 2000 edition of NFPA 318 – *Standard for the Protection of Cleanrooms* dealing with sprinkler protection of ducts within clean rooms:

“13.23.1.3 Sprinklers installed in duct systems shall be hydraulically designed to provide 0.5 gpm (1.9 L/min) over an area derived by multiplying the distance between the sprinklers in a horizontal duct by the width of the duct. Minimum discharge shall be 20 gpm (76 L/min) per sprinkler from the five hydraulically most remote sprinklers.

“13.23.2.3 Sprinklers installed in ductwork shall be spaced a maximum of 20 ft (6.1 m) apart horizontally and 12 ft (3.7 m) apart vertically.”

“13.23.2.4 A separate indicating control valve shall be provided for sprinklers installed in ductwork.

“13.23.2.5 The sprinklers shall be accessible for periodic inspection and maintenance.

Corresponding annex sections clarify that small orifice sprinklers, 3/8 in. (9.5 mm) or larger can be used, but nowhere it is made clear under what conditions sprinklers are required within the ducts. Section 2.1.2.6 of the 2000 edition of NFPA 318 was never extracted into NFPA 13. It called for sprinklers within combustible ducts with cross-sectional diameter equal to or greater than 10 in. (254 mm) unless ducts were approved for use without sprinklers.

The NFPA 318 document has been renamed in its latest (2002) edition and is now titled *Protection of Semiconductor Fabrication Facilities*. Since it was in the same update cycle as NFPA 13, new sections could not be referenced within the sprinkler standard. The section addressing the requirement for sprinklers within ducts has been modified:

“4.1.2.6 Exhaust Ducts. Interior automatic sprinklers shall be provided in exhaust ducts conveying vapors, fumes, or mists generated by hazardous chemicals as follows:

(1) Automatic sprinklers shall be provided in metallic and noncombustible, nonmetallic ducts when all of the following conditions are present:

(a) Largest interior cross-sectional area is equal to or greater than 480 cm³ (75 in²).

(b) Ducts are located within the building.

(c) Ducts are conveying flammable vapors or fumes.

(2) Automatic sprinklers shall be provided in combustible nonmetallic exhaust ducts when the largest interior cross-sectional area is equal to or greater than 480 cm³ (75 in²).

“4.1.2.6.1 Internal sprinklers shall not be required where ducts are approved for use without internal automatic sprinklers.”

An annex section clarifies that a duct with an area of 480 cm³ (75 in²) is equivalent to a 10-inch (254 mm) diameter duct.

This language parallels that found within most mechanical codes. The *International Mechanical Code*, for example, which is a companion document to the *International Building Code*, contains the following wording relative to the need for suppression systems within hazardous ducts:

“510.7 Suppression required. Ducts shall be protected with an approved automatic fire suppression system installed in accordance with the International Building Code.

Exceptions:

1. An approved automatic fire suppression system shall not be required in ducts conveying materials, fumes, mists, and vapors that are nonflammable and noncombustible under all conditions and at any concentrations.
2. An approved automatic fire suppression system shall not be required in ducts where the largest cross-sectional diameter of the duct is less than 10 inches (254 mm).”

While the mechanical code provides no specific allowance for ducts approved for use without sprinklers, this could be addressed through the general provisions of the code relating to alternative materials, methods, equipment and appliances.

There are other significant requirements within NFPA 318 dealing with sprinklers inside exhaust ducts of semiconductor facilities, including the following:

“4.1.2.6.4 Drainage shall be provided to remove all sprinkler water discharged in ductwork.

“4.1.2.6.5 Where corrosive atmospheres exist, duct sprinklers and pipe fittings shall be manufactured of corrosion-resistant materials or coated with approved materials.

“4.1.2.6.7 Where the branch exhaust ductwork is constructed of combustible materials, automatic sprinkler protection shall be provided within the workstation transition piece or the exhaust branch exhaust duct.

“4.1.2.6.8 Where the branch exhaust ductwork is subject to combustible residue buildup, regardless of the material of construction, automatic sprinkler protection shall be provided.”

Upcoming NFSA Technical Tuesday Online Seminar

Topic: Sloped Ceilings

Instructor: Victoria B. Valentine, P.E., NFSA Manager of Product Standards

Date: October 11, 2005

Current installations involve a variety of sloped ceiling conditions and different types of sprinklers used under the sloped ceilings. This program will review sloped ceiling arrangements and the guidance provided by NFPA 13. Special attention will also be given to combustible concealed spaces of wood truss construction with members closely spaced and a slope having a pitch of 4 in 12 or greater.

For registration visit www.nfsa.org .