

Fixed Fire Suppression Systems – Non-Cooking

ISSUE:

Fixed fire suppression systems are found in a number of applications, inside and outside buildings, across Alberta. There are also a significant number of systems, using current and legacy technologies, to protect communication, data processing and electrical generation/distribution equipment.

Definition:

"Fixed extinguishing system" means a permanently installed system that either extinguishes or controls a fire at the location of the system. The systems may be Pre-Engineered or Engineered.

- These systems use a suppression agent, or combination of suppression agents permanently stored in an agent tank(s), affixed to the building structure or mobile equipment.
- The suppression agent is generally designed as a "Total Flood" system or a "Local Application" system.
- The agent may be distributed by a piping system, hand held agent hose lines where the occupancy being protected may be movable within a hazard or by manually operated monitors or nozzles, (foam systems).
- The detection system that is part of these systems may be mechanical, or electrical.

Systems within a building are typically installed in accordance with the Alberta Building Code (ABC) or the Alberta Fire Code (AFC) and maintained in accordance with the AFC.

These systems are also found in some outdoor industrial facilities and mobile construction and mining equipment as a loss prevention feature desired by the owner although not required by code. In the absence of any other guidance or regulation these systems are subject to the maintenance provisions of the AFC and the relevant standard(s).

Questions arise regularly from owners, designers and Safety Codes Officers in the Fire and Building Disciplines as to:

- When is a suppression system required?
- When is a designated *spray booth*, *spray room* or *spray area* required?
- What type of suppression system is required
- What standards (and version of standards) apply?
- What interconnections with other equipment and systems are required?
- What are the maintenance requirements of the suppression system(s)?

Important Note on Standards

The ABC and AFC reference a number of standards from the National Fire Protection Association (NFPA) and other Standards Development Organizations (SDOs) such as

Underwriter's Laboratories Canada (ULC). In each case a specific edition or version of each standard is referenced and that edition or version is the one that is in force under legislation in Alberta at the time of installation or maintenance. This can only be changed through an Order of the Lieutenant Governor In Council (Cabinet) which then amends the Code. As these standards change often, without formal input from the Technical Councils or Administrators, it is not reasonable to amend the Codes to adopt a new standard each time a new version is published by the SDO. In addition, to expect suppliers, owners, installers and maintenance staff, and Safety Codes Officers, to change inventory, methods, training and procedures every time a standard changes would be inappropriate and unmanageable given the large number of standards referenced.

However it is understood that the version of the standard referenced may have been revised a number of times during the life cycle of a Code. Equipment manufacturers in particular, and training programs for those conducting installation and maintenance in general, are often focused on the most recent standard.

When equipment available or methods prescribed in maintenance training are based upon a new standard, the owner, designer and installer may enter into discussions with the Safety Codes Officer in the respective discipline (sometimes both Building and Fire) to consider submitting an application for an "alternative solution" as per Division C of the ABC and/or AFC on the basis that the requirements of the new edition of a standard provide a greater or equal degree of safety than the currently referenced edition.

Building Code Requirements¹:

The following ABC 2006 references speak to either the need for, or the advantages gained by, protection of spaces, activities and/or equipment by a fire suppression system. The reader is directed to the Code itself for the full wording and context of requirements as well as the Objectives and Functional Statements which provide further clarification as to the purpose of each article.

Article 3.3.5.22. Special Fire Suppression Systems, of the ABC states:

1) A part of a *building* in which there is spray application of flammable or *combustible* paints, coatings or finishings shall conform to the requirements of NFPA 33, "Spray Application Using Flammable or Combustible Materials."

Spray painting operations are designated as an F1 – High Hazard Industrial Occupancy in A-3.1.2.1.(1).

Article 1.4.1.2. in Division A states:

***High-hazard industrial occupancy* (Group F, Division 1) means an *industrial occupancy* containing sufficient quantities of highly *combustible* and flammable or explosive materials which, because of their inherent characteristics, constitute a special fire hazard.**

High-hazard industrial occupancies (F1) of more than 800 m² or more than one storey are required to be sprinklered as per Article 3.2.2.66. Sprinklering of the building may negate the need for a fixed suppression system if the sprinkler system is designed to properly cover the hazard level for the spray booth, area or room.

Spray application, and commercial cooking, which is covered in STANDATA FCI-14-02, are the only two activities which generate an ABC requirement for the installation of a fixed fire suppression system other than a fire sprinkler system. The ABC actually does not direct installation of a particular type of suppression system, rather it directs compliance with the design standard, NFPA 33 “Standard for Spray Application Using Flammable or Combustible Materials” - 2003 Edition, which then outlines acceptable suppression systems, methods and standards.

It should be noted that automotive paint booths installed between April 1999 and September 2007, in accordance with the following Building Code STANDATA 97-IB-006, were allowed to be installed without a fire suppression system.

www.municipalaffairs.alberta.ca/documents/ss/STANDATA/building/bcb/97IB006update.pdf

Booths installed before or since those dates will typically require a fire suppression system.

Because the process of spray painting or coating typically relies upon atomization of a liquid, or suspension of a powder, in air, and as that suspended material, along with residue deposited on other surfaces, almost always meets the definition of *combustible materials* under NFPA 33; Building and Fire SCOs need to be cautious when told that “we only spray with water based paint so we don’t need a fire suppression system”.

NFPA 33 affirms in the standard that:

- 1) all spray painting or coating or electrostatic coating using any *combustible material*, whether solvent or water borne, requires a fire suppression system as per NFPA 33,
- 2) in most instances, even if one step of the process involves a water borne coating which wasn’t a *combustible material* the remaining preparation and finish coats will almost always involve *flammable or combustible materials*, and
- 3) the resultant overspray and residue is almost always combustible, and as such spray operations will almost always require a fire suppression system. Situations where the owner or designer does not think that a fire suppression system is required should be dealt with through the submission of a request for an Alternative Solution to the Building and Fire Safety Codes Officers having jurisdiction. It should be noted that an alternative solution cannot waive requirements but can only propose something providing an equal or greater level of safety than the prescriptive requirements of the Code(s).

Our review of Material Safety Data Sheets (MSDS) for a wide range of coating products including those noted as acrylic, latex or water based, with the exception of interior wall paints, usually indicate a flashpoint of less than 93.3°C for all or some of the components and the residue of such products is almost always a *combustible material* as defined in the standard.

There are also situations where a particular risk or hazard, which is incompatible with a typical water based (sprinkler) system, exists. Specific areas containing those risks could be protected with either:

- a fixed suppression system in combination with fire sprinklers (care must be taken to ensure that the temperature rating of the sprinkler heads is well above that of the activation devices for the fixed system), or
- just a fixed suppression system designed for the specific hazard. This most often occurs where sensitive electronic equipment and/or high voltage electrical equipment are in place or where dangerous goods which are incompatible with water are stored in

accordance with the AFC. There may be a sprinkler system in the remainder of the building but sprinklers MAY not be needed in the space protected by the fixed system.

Both of these options may not follow the prescribed Acceptable Solutions in Division B of the Codes. As such the owner/designer is required to submit a request for an Alternative Solution to the SCO(s) having jurisdiction.

Fire Code Requirements²:

Other instances of a regulatory requirement for a fixed fire suppression system come from the AFC and typically deal with specific hazards from activities and products.

The building, structure or place may, or may not, already have a sprinkler system and it should be noted that having a sprinkler system “might” not be enough to eliminate the need for a fixed suppression system depending upon the amount of product and the nature of the hazard.

The following AFC 2006 references speak to either the need for, or the advantages gained by, protection of spaces, activities and/or equipment by a fire suppression system. The reader is directed to the Code itself for the full wording and context of requirements as well as the Objectives and Functional Statements which provide further clarification as to the purpose of each article.

2.1.2.2. - Hazardous Activities
2.1.3.5. -Special Fire Suppression Systems
A-2.1.3.5.(3)(c) - Halon
3.2.7.5.(3) - Storage Arrangements – Protection Required
3.2.7.9. - Fire Suppression Systems – Dangerous Goods Storage
4.2.7.6. - Fire Suppression Systems Flammable and Combustible Liquid Storage
A-4.2.7.6.(1) - Options for fixed fire suppression systems
4.2.9.1.(2) - Maximum Quantities - Flammable & Combustible Liquids – Storage Rooms
4.9.4.3.(1)(e) – Process Plants
4.10.3.2. – Distillery Storage Tanks
5.5.4.3.(2)(b) – Laboratory Ventilated Enclosures

Permit Requirements

The installation of any fixed suppression system in any building, structure or place may only be conducted under a Building Permit. This applies to:

- systems required under the ABC,
- systems required under the AFC, or
- systems not required but that the owner voluntarily installs to protect their property.

Suppression System Types – Spray Applications

Spray Booths, Areas or Rooms, associated exhaust plenums, ductwork, filters, recirculation units and mixing rooms, designed under NFPA 33, have the following choices to fill the need for the required fire suppressions systems as per Chapter 9 of that standard. These systems must meet all the applicable requirements of one of:

- NFPA 13 - “Installation of Sprinkler Systems” - 2002
- NFPA 16 - “Installation of Foam-Water Sprinkler and Foam-Water Spray Systems” - 2003
- NFPA 12 - “Carbon Dioxide Extinguishing Systems,” - 2005

- NFPA 17 - “Dry Chemical Extinguishing Systems” - 2002
- NFPA 2001 - Clean Agent Fire Extinguishing Systems” -2004

Building Safety Codes Officers will typically encounter these installations at the plan review stage for a building (mechanical) permit and will either have complete engineering drawings for the system or it will have been pre-engineered for the hazard and coverage area by the manufacturer. It is strongly suggested that Building SCOs involve the Fire SCO at this time to come to a common understanding of the hazards presented and the suitability of the system for the products being used. This also allows the Fire SCO to properly incorporate system knowledge and documentation into the operational inspection file for future use.

Operational inspection of installed systems by the Fire SCO may require them to determine the type of system, evaluate its operational readiness and cleanliness and examine equipment inspection reports completed by qualified persons.

It is important to note that NFPA 33 does anticipate sprinkler heads (on NFPA 13 systems) and system nozzles (on fixed suppression systems) to be protected by easily removable coverings.

9.4.7 Sprinklers protecting spray areas and mixing rooms shall be protected against overspray residue so that they will operate quickly in event of fire.
9.4.7.1 Sprinklers shall be permitted to be covered by cellophane bags having a thickness of 0.08 mm (0.003 in.) or less or by thin paper bags. These coverings shall be replaced frequently so that heavy deposits of residue do not accumulate.
9.4.7.2 Sprinklers that have been painted or coated by overspray or residues shall be replaced with new sprinklers.

The purpose of these covers is to ensure that the activation mechanism (sprinklers) and the application orifices are clean and ready to function as designed.

For sprinkler heads this is typically accomplished using lightweight plastic bags (sandwich bags) or lightweight paper (coffee filters) held on by small amounts of “Scotch” tape or rubber bands as required, to keep residue from building up on the sprinkler heads. These bags are replaced one or more times per day at most installations where sprinklers protect spray rooms/booths/areas.

Fixed fire suppression system nozzles usually have flexible rubber caps or other covers attached and applied over the tip which are designed to blow off upon system activation thus keeping the nozzle opening clean to allow for agent discharge. The exterior surface of these caps needs to be cleaned regularly as well.

Suppression System Types – Storage or Process Areas

For all other situations, as noted in Article 2.1.3.5. of the AFC, there are a number of types of fixed suppression systems which could be acceptable. In addition, as technology evolves, it may be of value for the owner, operator or designer to examine newer systems which meet standards, or versions of standards, not yet referenced in code. The possible use of such systems could be submitted as a proposed Alternative Solution to the SCO(s) having jurisdiction.

The choice of a fixed fire protection system requires a thorough understanding and assessment of the hazard(s) to be protected, other products or hazards, activities, processes, risks and potential sources of ignition as well as a review of the building construction, size, height, occupancy classification, occupant load, fire detection systems, HVAC systems and surrounding

occupancies. Other considerations will be whether the system will be deployed in a contained area, such as a spray booth, electrical vault, server room or a more open setting such as a spray area or data processing pool in an office setting.

Some of these systems may have been designed as part of the construction of a new building as part of proper functional assessment. In this case they would be included in the building permit(s) and, though perhaps not required by the ABC, would be inspected by a Building SCO using the guidance of the AFC, possibly the ventilation portions of the ABC, and the appropriate installation standard as per AFC Article 2.1.3.5. Such systems are also often installed in building renovations which might not obviously create an understanding of the need for a building permit. Procedures for handling these installations will need to be in place so that these “after occupancy” additions are noted, permitted and properly inspected.

Once again, information and consultation between the Building and Fire SCOs will create a common understanding leading to a safe and compliant installation for the owner and occupants.

In some process and industrial settings, the types of systems outlined in Article 2.1.3.5. will be installed as part of structures or in areas which do not meet the definition of a building under the ABC. They still fall under the jurisdiction of the AFC and the Fire SCO needs to determine what permitting, review and installation inspection processes the Authority Having Jurisdiction wishes to have in place. Typical locations for this type of fixed fire suppression installation might include loading and transfer facilities for flammable and combustible liquids and special hazard areas within a process plant.

Due to the many factors which need to be considered in selecting, designing and installing a fixed fire suppression system, these decisions should be made by the owner in consultation with both a qualified, competent and experienced installer, and a professional engineer with direct and relevant experience in fixed fire suppression system design and verification.

All fixed fire suppression systems in Alberta, whether required by Code or not, must be installed in accordance with the codes and standards in effect at the time of installation and must be maintained in accordance with the maintenance requirements of the standards adopted in the current version of the AFC. In the case of mobile equipment such as that used in Mining and Construction it is unlikely that the Fire SCO will be inspecting the equipment itself; however, records of the maintenance of all systems, in accordance with the relevant standard, must be retained by the owner in accordance with the AFC and may be reviewed by the Fire SCO to ascertain compliance with the AFC and the Safety Codes Act.

Upon completion of an installation, the Fire SCO should ask for documentation of system verification by the installer or the designer. Use of the “Fire Suppression System Test” attached as Appendix B to STANDATA 06-BCI-001-R1 with appropriate modifications is recommended for this purpose.

www.municipalaffairs.alberta.ca/documents/ss/STANDATA/building/bci/06BCI001.pdf

System Interconnection

When the fixed fire suppression system is installed in a building or structure which has a fire alarm system, then the activation of the fire suppression system must trigger an alarm on the fire alarm system. Older fixed suppression systems installed before the adoption of the 1997 ABC and AFC may not have this interconnection. If so when either the fire suppression system or the fire alarm system is upgraded the interconnection is required to be installed and verified.

In addition the fixed fire suppression needs to be interconnected with the (booth/area/room) exhaust system. Depending upon the engineered design, the suppression system activation will shut down the exhaust and supply systems to retain the extinguishing agent in the booth in order for the suppression system to work properly. Different sequencing and interconnect may be designed for specific systems and hazards. The Fire SCO must ensure that they understand that sequencing and that the interconnections and sequencing have been tested as part of system verification, semi-annual or annual maintenance of the fixed fire suppression system and annual inspection of the fire alarm system if applicable.

System Servicing

The AFC 2006 in Article 6.6.1.1. "Testing, Inspection and Maintenance" states:

6.6.1.1.(1) A special fire suppression system that meets the description given in any one of the standards referenced in Article 2.1.3.5. shall be tested, inspected and maintained in conformance with the appropriate requirements of that standard.

The standards noted all stipulate that system maintenance be conducted semi-annually or annually (dependent upon system type) by a trained individual. The AFC 2006 in Division C Article 2.2.4.1. "Qualifications" states

2.2.4.1.(1) Only qualified persons shall install, test or perform maintenance on
(a) a special fire suppression system (see Appendix A),

A-2.2.4.1.(1)(a) Persons are considered qualified in the maintenance of special fire suppression systems when

(a) they have acquired a certificate of training from a public post-secondary educational institution,

(b) they comply with the ULC "Certificate Service for the Installation and Servicing of Fire Suppression Systems,"⁽¹⁾ or

(c) they have acquired a certificate of training from a manufacturer.

⁽¹⁾ Recognizing persons certified under the ULC program restricts the individual to performing maintenance only on those systems for which they have a current manufacturer's certificate.

As such every fixed fire suppression system in Alberta is to be maintained by a trained and qualified person at least once and often twice a year. This will include the replacement of any fusible links in the system with new links specific for that system and type of installation.

Tags

At each maintenance interval the qualified person conducting the maintenance is required to print their name as well as sign and date an inspection tag for that system, which includes the name of the company the qualified person is working for. That tag is to be attached to the control box or cylinder in a manner which will not impede the operation of the system. Previous tags must be removed at the time of service.

Records – See also AFC Div C Article 2.2.1.2.

Records of the design, installation and verification of fixed fire suppression systems shall be retained on site for the life of the system

Records of owner's inspections and all maintenance by a qualified person on the fixed fire suppression system shall be retained on site for a period of two years. Evidence of previous hydro-testing of cylinders must be retained until after the completion of the next hydro-test.

This Interpretation applies throughout Alberta.

¹ All references are to the Alberta Building Code, Division B, unless otherwise stated.

² All references are to the Alberta Fire Code, Division B, unless otherwise stated.