



CANADIAN FORCES FIRE MARSHAL

DIRECTIVE

FMD 4003

Authority Having Jurisdiction: CFFM

Subject:

**Fire Protection and Life Safety
Engineering Design**

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Fire Prevention

OPI:

CFFM 4

Reference:

See References

PURPOSE

To provide criteria for building design for construction projects, renovation projects and minor works.



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RECORD OF AMENDMENTS

Amendment No.	Additions/Revisions	New Version No.	Date
1	Title change from FMOG to FMD	1	1 Sep 09
2	Amendments and updates	2	14 Mar 11
3	General updates and revisions	3	15 Dec 14

Change Indication

Where a technical change or addition has been made relative to the 2nd version, a vertical line [|] has been added in the margin next to the affected provision. No change indication has been provided in cases where provisions have been renumbered or deleted.



General

1. This document provides criteria for the design and production of drawings and specifications for the Department of National Defence and Canadian Armed Forces (DND/CAF) infrastructure.

Definitions

2. Authority Having Jurisdiction (AHJ): The authority having jurisdiction for infrastructure in the Department of National Defence (DND) and the Canadian Armed Forces (CAF) is the Canadian Forces Fire Marshal.
3. Responsible authority: For DND/CAF construction projects, the responsible authority is the office responsible for project review as detailed in the Department of National Defence's Realty Asset Management Manual (RAMM), Chapter 10, publication C-08-005-120/AG-000. For locally managed projects, the responsible authority shall be the Fire Chief, the Chief Fire Inspector or the Senior Fire Fighter as applicable. For projects exceeding local spending authority, the responsible authority shall be the CFFM.
4. Consultant: means a private professional engineer or architect and / or the individual responsible for the design of the project.
5. Temporary infrastructure: Any building or structure for the occupancy of persons or material that will remain in place for less than 6 months.
6. Fire pump: A fire pump for fire protection service providing required design flow and pressure for water supply infrastructure or fixed systems supplying DND/CAF infrastructure.
7. Fire booster pump: A fire pump for fire protection service providing required design pressure for fixed water-based fire protection systems. This pump is often in the building it supplies.

Application

8. This document applies to all new construction and renovation projects for DND/CAF infrastructure in Canada.



9. This document is not intended to be applied to existing infrastructure.
10. Foreign deployed operations infrastructure shall comply with FMD 2000 Fire Protection Services Standard on Deployed Operations.
11. Temporary infrastructure deployed in exercises within Canada, such as tents and deployed mobile feeding platforms (MFP), shall conform to FMD 2000. All other infrastructure in Canada shall comply with the criteria in this document.
12. Tension fabric shelters (ex. Sprung) and trailers shall comply with FMD 4009 Trailers and Tension Fabric Shelters.
13. For leased facilities, this document should form part of the design criteria for design / fit up of the space for DND/CAF use. Consult the responsible authority for guidance on spaces intended to be leased for occupancy by DND/CAF personnel.
14. This document applies to renovation projects where the project scope includes extension of building area by 50% or more, major recapitalisation of building electrical, mechanical and architectural features or projects involving a change of major occupancy as defined in the National Building Code of Canada. For clarification see the responsible authority.

Intent

15. This document is intended for building designers. Statements of work for design of DND/CAF infrastructure by architectural and engineering firms shall include this document to ensure building designers are aware of design requirements for DND/CAF occupied buildings and leased spaces.
16. The Consultant is expected to incorporate the requirements of this document in the drawings and specifications to ensure the contractor has a sufficient understanding of the expectations for installation and acceptance of passive and active fire protection and life safety systems, including shop drawing requirements, installation quality, acceptance testing requirements, and close-out documentation submittals.



17. While all the requirements of this document are applicable in all cases as previously detailed, judgement should be used in the application of the requirements relative to the scope of the project. See the responsible authority for clarification.

Applicable Codes and Standards

18. The minimum standard for design and construction of buildings for the DND/CAF shall be:
 - 18.1 Department of National Defence's Realty Asset Management Manual (RAMM), Chapter 10, publication C-08-005-120/AG-000;
 - 18.2 The National Building Code of Canada (NBCC) and all documents referenced therein;
 - 18.3 The National Fire Code of Canada (NFCC) and all documents referenced therein;
 - 18.4 Provincial building and fire codes;
 - 18.5 Local regulations; and
 - 18.6 National Fire Protection Association (NFPA) 409: *Standard on Aircraft Hangars*.
19. In addition to the codes and standards referenced above, the following DND Construction Engineering Technical Orders (CETO) contain relevant fire and life safety design requirements. These requirements shall be included in the design of all DND/CAF facilities.
 - 19.1 C-98-001-003-MS-003 Handbook - Siting;
 - 19.2 C-98-007-000-AF-Z01 Universal design and barrier free access directives and standards for DND / CAF facilities;
 - 19.3 C-98-15F-001/DD-001 Design Criteria Fuel Facilities;
 - 19.4 G1-029 RCMP Guide – Secure Rooms;
 - 19.5 C-98-010-001 DD-003 Design and construction requirements for battery charging and storage rooms; and



19.6 C-09-153-001/TS-000 Ammunition and Explosives Safety Manual
Volume 1: Storage and Transportation.

- 20. Regardless of the edition of the documents referenced in the NBCC or NFCC, the Consultant shall reference the latest edition at time of tender for all codes and standards referenced in this and other referenced publications.
- 21. In the case of conflict or discrepancy, the most recent and/or stringent requirement shall apply.
- 22. Alternative solutions: Alternative solution proposals submitted to the responsible authority shall be prepared in accordance with NBCC Division C, Section 2.3.
- 23. All alternative solutions shall be submitted to CFFM for review and approval.

Design and Code Analysis

- 24. A design and code analysis for each design shall be submitted to the responsible authority for review.
- 25. The design and code analysis shall be included in every concept review and design development report submission and shall be updated and modified as the design progresses.
- 26. The design and code analysis shall detail each relevant code requirement and then clearly describe how the design meets or exceeds the requirements of relevant codes and standards. Where applicable, discuss the following fire and life-safety provisions:
 - 26.1 Building Code analysis (standard Building Code compliance chart);
 - 26.2 Classification of occupancy;
 - 26.3 Expected occupant load; where the Statement of Requirement (SOR) design is based on the personnel requirements for the infrastructure, the Consultant shall employ the occupant load calculation that is the greater of the SOR or the NBCC calculation.



- 26.4 Requirements for fire-rated walls, fire-rated doors, fire dampers, smoke barriers, fire stop systems, fire blocks;
- 26.5 Interior finish ratings;
- 26.6 Standpipe systems and fire extinguishers;
- 26.7 Analysis of automatic water-based fire suppression systems and protected areas; methods, densities, and any parameters applicable to sprinkler storage applications (height, configuration and commodity classification as defined in NFPA 13);
- 26.8 Description of special fire suppression systems other than water-based, and the rationale for their use;
- 26.9 Water supply for fire protection and evaluation of available supply with potential demand;
- 26.10 Smoke control systems;
- 26.11 Fire alarm system (the type of alarm system and a description of fire alarm zones);
- 26.12 Connection to and description of the fire alarm monitoring system;
- 26.13 Emergency and exit lighting;
- 26.14 Emergency power;
- 26.15 Coordination with physical security, access control and force protection requirements;
- 26.16 Fire department access;
- 26.17 Spatial separation, including detailed calculations of new buildings and any surrounding infrastructure;
- 26.18 Description of hazardous materials storage including Petroleum, Oil and Lubricants (POL), dangerous goods and ammunition;



- 26.19 Description of any hazardous activities occurring in the building, including restricted egress, processes involving HAZMAT or dangerous goods, or any activity causing increased risk to life and property;
 - 26.20 Description of any applicable requirements of the National Fire Code of Canada, including Part 2 Building and Occupant Fire Safety, Part 3 Indoor and Outdoor Storage, Part 4 Flammable and Combustible Liquids and Part 5 Hazardous Processes and Operations, and
 - 26.21 Specific compliance with the additional requirements of this FMD.
27. **NOTE:** Projects with limited fire protection considerations might not require a detailed fire protection design analysis. Consult the responsible authority for clarification.

Partial Occupancy

- 28. Where construction occurs adjacent to areas occupied by DND/CAF personnel, partial occupancy measures shall be implemented in accordance with the NFCC and FMD 4005 *Partial Occupancy*.
- 29. The responsible authority shall determine the application of partial occupancy measures; this may include a temporary 1 hour fire separation, temporary fire alarm or fire watch service, and modification to the building's existing fire safety plan.

Shop Drawing Submissions

- 30. Fire protection and life-safety shop drawings shall be submitted to the responsible authority as a complete package, by trade, after review and comment by the design consultant.
- 31. After shop drawing review by the responsible authority, comments from both consultant and responsible authority shall be acted upon prior to material order and installation.



32. Design specifications shall detail all shop drawings to be reviewed by the responsible authority prior to installation, including all types of systems addressed in this document. Consult the responsible authority for a specific list of shop drawings to be submitted for review.

Fire Separations

33. Fire separations shall be provided where required by the NBCC and the NFCC.
34. Fire resistance ratings of fire separations shall conform to CAN/ULC-S101: *Fire Endurance Tests of Building Construction and Materials*.
35. The fire resistance ratings of fire separations shall be based on a ULC or cUL listed design. Where a ULC listed design does not exist, reference to Appendix D of the NBCC is permitted.
36. The responsible authority will evaluate UL or other recognized designs only where no ULC or cUL design exists.
37. Assemblies conforming to NBCC tables A-9.10.3.1.A and A-9.10.3.1.B are only permitted to be used for buildings conforming to Part 9 of the NBCC.
38. All listed assembly design numbers (or reference to Appendix D of the NBCC) shall be shown on working drawings for the assembly shown.

ACCEPTANCE INSPECTION

39. An examination of the fire separation assembly by the responsible authority shall determine if the assembly is installed as per its ULC or cUL listing or as specified in Appendix D of the NBCC.
40. The examination shall take place prior to close up to confirm assembly components and installation configuration.
41. Any and all deviations from design shall be considered grounds for rejection and replacement.



Closures in Fire Separations

- 42. Closures in fire separations shall be provided in accordance with the NBCC.
- 43. Closures in fire separations, including fire dampers, shall be installed in accordance with NFPA 80: *Standard for Fire Doors and Other Opening Protectives*.
- 44. Fire-rated double door installations shall be provided with door closers on both the active and the inactive leaf.
- 45. Where a roll down fire door (shutter) is provided with a fire alarm release device, the device shall incorporate battery back-up to prevent the release device from activating on AC power failure. Where practical, release devices shall receive their power from an auxiliary fire alarm power output.

ACCEPTANCE INSPECTION

- 46. Closures in fire separations shall be inspected and tested as per NFPA 80.
- 47. Each fire damper shall be tagged following testing, and the tag shall identify the date of testing.
- 48. Each roll down fire door shall be functionally tested from each release point by cutting an 'S' hook on the fusible link line and also by activating the fire alarm release device where applicable.

Access Control

- 49. Installation of access control devices for all doors in a means of egress shall comply with the NBCC and FMD 4010 Security and Safe Egress.
- 50. Installation of magnetic locking devices shall comply with FMD 4000 Electro Magnetic Door Locks.
- 51. Where security / access control requirements and safe egress requirements conflict, the requirements of the NBCC shall have priority.



Exit Discharge

52. Every exit to the exterior shall discharge to a level hard-surface landing of minimum 300mm larger dimensions than the door opening.
53. A hard-surface path shall lead from each exterior exit landing to a public thoroughfare.
54. Exterior pathways provided for building emergency egress and leading to a public thoroughfare shall be a minimum of 1100mm wide and shall be a minimum of 3 metres from any unprotected openings in the building exterior.
55. Where an exit discharges to a fenced-in or enclosed space, the path leading to a public thoroughfare shall be provided with a gate or other unobstructed means to permit occupants to proceed to the public thoroughfare.

Spray-Applied Fireproofing

56. Spray-applied fireproofing is permitted to provide fire resistance ratings of supporting structural members where required by the NBCC.
57. Fire resistance ratings of spray-applied fireproofing materials shall conform to CAN/ULC-S101: *Fire Endurance Tests of Building Construction and Materials*.
58. Spray-applied fireproofing shall be specified by either a ULC or cUL listed design. The responsible authority will evaluate UL or other recognized designs only where no ULC or cUL design exists.
59. All listed assemblies or approved alternatives shall appear in specifications under spray applied fireproofing, and on design drawings in structural and/or architectural drawings.

ACCEPTANCE INSPECTION AND CLOSE-OUT DOCUMENTATION

60. Spray-applied fireproofing shall be tested for thickness and density of the material applied in accordance with American Society for Testing and Materials (ASTM) E605: *Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material Applied to Structural Members*.



61. Spray-applied fireproofing shall be tested for cohesion/adhesion of the material applied in accordance with ASTM E736: *Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members*.
62. Intumescent fireproofing shall be tested in accordance with AWCI's Technical Manual 12-B: *Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-Resistive Materials*
63. Test reports shall be submitted for review and approval by responsible authority prior to acceptance and concealment.

Firestopping

64. In addition to the locations required by the NBCC, firestopping shall be installed at:
 - 64.1 Head-of-wall joints;
 - 64.2 The point of intersection between dissimilar fire separation assemblies – e.g. between concrete block and gypsum;
 - 64.3 Penetrations through any membrane forming part of a fire separation, including electrical back boxes in gypsum fire separations;
 - 64.4 Fire dampers – only where permitted by damper manufacturer's installation instructions;
 - 64.5 Structural penetrations; and
 - 64.6 Floor – curtain-wall intersections (perimeter firestop systems). UL listed systems are acceptable for this application where no ULC listed system exists.
65. Fire resistance ratings of firestop systems shall be based on test results in accordance with CAN/ULC-S115: *Fire Tests of Firestop Systems*.
66. Firestopping shall consist of a ULC or cUL listed firestop system. The responsible authority will evaluate UL or other recognized designs only where no ULC or cUL design exists.



67. Engineering Judgments (EJ) shall be submitted for every situation where a listed firestop system does not exist. EJ's shall be prepared by the manufacturer or by a licensed engineer, in cooperation with a firestop manufacturer.
68. Mortar patching to seal a service penetration may only be used to seal service penetrations where the thickness of the mortar is not greater than the thickness of the courses, and set at the same time as the remainder of the wall.
69. Specifications shall specify use of a ULC listed firestop system for all fire-stopping.
70. Sleeves shall only be used in concrete block and cast-in-place concrete assemblies and then only if the sleeve is built in to the assembly at the time of construction of the assembly. Sleeves shall not be installed where penetrations are made following construction of an assembly.
71. All firestop materials shall be from one manufacturer.
72. One installer shall install all fire-stopping on the project. Each trade shall not firestop their own work.
73. The firestop installer or company shall have been registered in good standing with the Firestop Contractors International Association (FCIA) or CFFM approved equivalent for at least 2 years prior to contract award.

ACCEPTANCE INSPECTION AND CLOSE-OUT DOCUMENTATION

74. Firestopping shall be inspected and evaluated as per ASTM E2174 Standard Practice for On-site Inspection of Installed Firestops and ASTM E2393 Standard Practice for On-site Inspection for Installed Fire Resistive Joint Systems and Perimeter Fire Barriers. Reports shall be submitted to the responsible authority for review as per the above standard.
75. An examination of the firestopping system shall determine if the assembly is installed as per its ULC listing.
76. Specifications shall allow for destructive testing and subsequent repair of installed firestopping.



77. The examination shall take place prior to close up to confirm assembly components and installation configuration.
78. Any and all deviations from the ULC listed system or an approved EJ shall be considered grounds for rejection and replacement.

Water Supply for Fire Protection and Fire Hydrants

79. In addition to the NBCC and DND/CAF Civil Engineering Guideline requirements, fire hydrants shall be located along all required fire routes.
80. Maximum spacing between hydrants along accessible routes shall be 120 metres in residential areas, and 90 metres in all other locations.
81. Good engineering and fire protection practice provides a looped supply for fire protection supplies to help ensure water supply during maintenance and water main service interruption and/or breaks. Where practical, fire protection supplies for both buildings and hydrants shall be supplied from a looped configuration.
82. For unsprinklered buildings, the needed fire flow shall conform to the ISO Guide for Determination of Needed Fire Flow. For sprinklered buildings, the needed fire flow shall be the demand of the sprinkler system including inside / outside hose allowance. Calculations for existing sprinkler systems shall include reliability analysis as defined in the ISO Guide.
83. For evaluation of water distribution network and available fire flows at DND/CAF locations, consult CFFM for assistance.

ACCEPTANCE INSPECTION AND CLOSE-OUT DOCUMENTATION

84. Fire hydrants shall be flow tested following installation. The flow shall be measured and documented and the hydrant marked as per the requirements of NFPA 291 Recommended Practice for Fire Flow Testing and Marking of Hydrants.



Automatic Sprinkler Systems

85. Automatic sprinkler protection shall be provided in all new buildings and structures meeting any of the following conditions:
 - 85.1 Required by the NBCC to be sprinklered;
 - 85.2 Over 150m² in building area; or
 - 85.3 Where sleeping accommodation exceeding 10 persons per building is provided.
86. All new automatic sprinkler systems shall be designed, installed, and tested in accordance with NFPA 13: *Standard for the Installation of Sprinkler Systems* or NFPA 13R: *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height* as appropriate.
87. In addition to the requirements of the NBCC and NFPA 13 or 13R, the following additional features shall be incorporated in all new automatic sprinkler systems:
 - 87.1 All new automatic sprinkler systems shall be hydraulically designed using water supply test data obtained by testing to NFPA 291 Recommended Practice for Fire Flow Testing and Marking of Hydrants. Tests shall be conducted by, or under the direct supervision of, the sprinkler system designer;
 - 87.2 Design shall be based on water supply data not less than 1 year old as required by NFPA 13. The Consultant shall perform a flow test of the water supply system in the vicinity of construction for the purposes of design;
 - 87.3 Project specifications shall require a flow test by the installing contractor for the purposes of detailed design and production of hydraulic calculations;
 - 87.4 Sprinkler system design shall incorporate a minimum safety factor of 35 kPa (5psi) at the system's design flow rate;
 - 87.5 Earthquake bracing in accordance with NFPA 13 shall be provided where required by the NBCC;



- 87.6 All sprinkler system main drains shall be piped to discharge to the exterior and not into interior building drains. Where drain piping is below grade, a small auxiliary drain shall be installed to a floor drain;
- 87.7 Rooms containing the sprinkler system main valve assembly shall be provided with direct access to the exterior for Fire Department and maintenance access;
- 87.8 Fire department connections shall be installed within 45m of a fire hydrant and within 15m of both the fire department building entrance and fire alarm annunciator;
- 87.9 Outside post indicator valves (PIV) shall not be used unless specifically required either by code or the local responding Fire Department;
- 87.10 Where backflow preventers are required, these devices shall be ULC listed for fire protection service. All backflow preventers shall be selected, installed, verified, and tested in accordance with CAN/CSA-B64.10: *Manual for the Selection and installation of Backflow Prevention Devices*.
- 87.11 Means shall be provided to test backflow preventers at maximum system design flow. This flow shall discharge to the exterior in a location and manner so as to not cause damage to landscape or flooding, and not to a building interior drain. A copy of the verification and annual test certificate shall be permanently posted at the backflow prevention device;
- 87.12 Because of the additional maintenance required, glycol loops shall not be used. Dry pendent or dry sidewall sprinklers shall be used for small areas, and dry-pipe sprinkler systems shall be used for larger areas.
- 87.13 Where possible, rack storage shall be protected by ceiling level sprinklers only in order to allow maximum flexibility should a reconfiguration of the racking be necessary in the future.
- 87.14 Fire department connections shall be fitted with fittings compatible with the equipment of the responding fire department. The responding fire department shall be consulted to confirm. For DND/CAF fire



departments, Storz connections are common. Consult responsible authority for clarification.

ACCEPTANCE INSPECTION AND CLOSE-OUT DOCUMENTATION

- 88. Flushing of the underground main and submittal of Contractor's Material and Test Certificate for Underground Piping shall be coordinated with Civil trades. Piping shall be flushed from riser to exterior of the building;
- 89. Automatic sprinkler systems shall be inspected and accepted by the responsible authority in accordance with the requirements of the standard used in system design.
- 90. Installing contractor shall submit Contractor's Material and Test Certificates for both Aboveground and Underground piping and any other related documentation to the responsible authority prior to acceptance.

Standpipe and Hose Systems

- 91. Standpipe and hose systems shall be provided where required by the NBCC.
- 92. Standpipe and hose systems shall be specified as a Class I system in accordance with NFPA 14.
- 93. All new standpipe and hose systems shall be designed and installed in accordance with NFPA 14: *Standard for the Installation of Standpipe and Hose Systems*.
- 94. Earthquake bracing in accordance with NFPA 13 shall be provided where required by the NBCC.
- 95. Manual wet standpipes as defined in NFPA 14 may be specified where permitted by NBCC. Manual standpipes must include signage at the fire department connection showing required input pressure from the fire department pumper apparatus.

ACCEPTANCE INSPECTION AND CLOSE-OUT DOCUMENTATION

- 96. Standpipe and hose systems shall be inspected and accepted by the responsible authority in accordance with the requirements of NFPA 14.



97. Installing contractor shall submit a Contractor's Material and Test Certificate for Aboveground Piping to the responsible authority prior to acceptance.

Fire Pumps

98. All new fire pumps and fire booster pumps shall be designed and installed in accordance with NFPA 20: *Standard for the Installation of Stationary Pumps for Fire Protection*.
99. Where a fire pump is required to meet the required flow and pressure, a minimum of two independent pumps and drivers shall be provided. Pumps shall be capable of supplying full demand with the largest pump out of service. A maximum of one half of the pump drivers may be powered by electricity.
100. Where there is an existing water supply and a fire booster pump is required to meet the demand pressure of a fire suppression system, the pump shall be either a diesel engine or electric motor driven.
101. Where an electric driven fire booster pump is provided, back-up emergency power for the electric motor shall be provided by a diesel power generator designed and installed to NBCC, NFPA 20 and CAN/CSA-282: *Emergency Electrical Power Supply for Buildings*.

ACCEPTANCE INSPECTION AND CLOSE-OUT DOCUMENTATION

102. Acceptance test of fire pumps and fire booster pumps shall be performed by the installing contractor as per NFPA 20 and witnessed by the responsible authority. The manufacturer representative shall be present for testing conducted by responsible authority.
103. Installing contractor shall submit acceptance and testing documentation required by NFPA 20 to the responsible authority.

Fixed Fire Suppression Systems

104. All fixed fire suppression systems shall be designed and installed in accordance with the requirements of the relevant NFPA standards. These include but are not limited to:



- 104.1 Low, medium and high expansion foam extinguishing systems;
 - 104.2 Carbon dioxide extinguishing systems;
 - 104.3 Water spray fixed extinguishing systems;
 - 104.4 Foam water sprinkler and foam water spray systems;
 - 104.5 Dry chemical extinguishing systems;
 - 104.6 Wet chemical extinguishing systems;
 - 104.7 Commercial kitchen extinguishing systems;
 - 104.8 Water mist fire protection systems; and
 - 104.9 Clean agent extinguishing systems.
105. Where NFPA standards refer to alarm, detection and actuation for suppression systems, these systems shall be installed to the requirements of CAN/ULC-S524, Installation of Fire alarm Systems, and not NFPA 72.
106. Control panels for fire suppression systems shall be of the same manufacturer and networked with the building fire alarm system.
107. Control panels for fixed fire suppression systems shall be capable of stand-alone operation.
108. Where fixed fire suppression systems are specified, all design calculations and assumptions shall be submitted to the CFFM for review in accordance with the relevant NFPA standard. CFFM is available for assistance with acceptance testing.
109. Designs for kitchen suppression systems under NFPA 96 Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations and standard wet and dry sprinkler systems need not be submitted to CFFM for review. CFFM is available to assist with review and interpretation as required.

ACCEPTANCE INSPECTION AND CLOSE-OUT DOCUMENTATION

110. Acceptance of fixed fire suppression shall be performed by the installing contractor in accordance with the relevant NFPA standard and witnessed by the responsible authority. Consult the responsible authority for specific testing requirements.



- 111. For clean agent fire suppression systems, the door blower fan unit and smoke pencil test method shall be conducted by a third party to demonstrate the integrity of the enclosure.
- 112. For kitchen fire suppression systems, a balloon test with nitrogen test gas shall be performed to verify the integrity of the piping network as required by NFPA 96.

Portable Fire Extinguishers

- 113. Portable fire extinguishers shall be provided in accordance with the NBCC and NFCC.
- 114. All fire extinguishers shall be multi-purpose dry chemical type. Other types of extinguishers shall be used only where required for special hazards where dry chemical is incompatible with the materials stored. I.e., combustible metals may require a Class D fire extinguisher, clean rooms may require clean agent extinguishers, grease appliances may require a Class K extinguisher, aircraft hangars may require portable foam extinguishers.

ACCEPTANCE INSPECTION

- 115. An examination of the fire extinguishers provided shall determine if the extinguishers are appropriately installed for:
 - 115.1 Type;
 - 115.2 Sizing; and
 - 115.3 Distribution (travel distance between extinguishers).

Fire Alarm, Detection and Monitoring Systems

- 116. A fire alarm system shall be installed wherever a sprinkler system or other fire suppression system is installed or when required by NBCC.
- 117. All fire alarm systems, including fire suppression releasing systems/panels, shall be designed, installed, tested, and verified in accordance with:



- 117.1 NBCC;
- 117.2 CAN/CSA-C22.1: *Canadian Electrical Code (CEC)*;
- 117.3 CAN/ULC-S524 *Installation of Fire Alarm Systems*;
- 117.4 CAN/ULC-S536 *Inspection and Testing of Fire Alarm Systems*; and
- 117.5 CAN/ULC-S537 *Verification of Fire Alarm Systems*.

118. In addition to the requirements of the NBC, CEC, and CAN/ULC-S524, *Installation of Fire Alarm Systems*, the following features shall be incorporated in all fire alarm systems and fire suppression releasing systems:

- 118.1 All systems having more than two zones shall be addressable;
- 118.2 All wiring shall be Class A;
- 118.3 Signalling shall be via combination electronic audible/visible devices with supplementary visible devices distributed as necessary.
- 118.4 Strobes shall be minimum 30cd intensity;
- 118.5 Strobes shall not be silenceable;
- 118.6 Where Barrier Free requirements apply as per C-98-007-000/AF-Z01 Universal Design and Barrier-Free Access Guidelines and Standards for DND/CAF Facilities, the fire alarm signal shall be visible from within every room. Compliance can be achieved by careful placement of signals so that light from a strobe can be seen through windows and through doorways of rooms not occupied with the door closed (e.g. janitor and communications closets);
- 118.7 Addressable loops shall serve no more than one floor;
- 118.8 Zones shall be annunciated individually by dedicated LED indicators.
- 118.9 No circuit is to be loaded to more than 80% of its maximum capacity;
- 118.10 Where an emergency power generator is installed, it shall supply the fire alarm system in addition to fire alarm back-up batteries;
- 118.11 AC power supply to a transponder shall be from a dedicated circuit complete with a breaker lock;
- 118.12 Fan shut down shall only be provided, where required by the NBCC;



- 118.13 Where required by NBCC, duct smoke detectors shall be installed on the supply side of an air handling unit, and shall shut down only the unit to which it is connected. Shut down shall be achieved directly from the fire alarm to the motor controller or unit, and not through a building management system;
 - 118.14 Fire alarm system wiring shall be permanently labelled at each end of every conductor;
 - 118.15 Fire alarm system wiring should be continuous from panel to device. Where splices are required, they shall be within accessible junction boxes and only on labelled terminal blocks;
 - 118.16 Outdoor patios and rooftop areas, contained by a fence or railing, used for assembly occupancies and having an egress path other than immediately at grade, i.e. via ramps or stairs, shall be provided with both visible and audible fire alarm signalling;
 - 118.17 All buildings shall have an annunciator installed at the designated fire department building entrance as identified by the local responding Fire Department; and
 - 118.18 Fire alarm panels shall be provided with the bypasses for HVAC shutdown, door hold open devices, kitchen system power shutdown and overhead door hold open devices.
- 119. Fire alarm monitoring systems installed on and monitoring DND properties shall be installed as per ULC S561, Installation and Services for Fire Signal Receiving Centres and Systems as a proprietary fire signal receiving centre.
 - 120. All wiring for alarm monitoring shall be installed in conduit as required by CAN/ULC-S561.
 - 121. Fire alarm graphics/diagrams provided at fire department entrance shall be active where required by responsible authority. Passive graphics are acceptable in most cases.

ACCEPTANCE INSPECTION AND CLOSE-OUT DOCUMENTATION

- 122. Fire alarm active and/or passive graphics shall be reviewed as part of shop drawing submission to responsible authority.



123. All fire alarm systems shall be verified in accordance with CAN/ULC-S537: *Verification of Fire Alarm Systems*.
124. The responsible authority shall perform a spot inspection and acceptance tests prior to substantial completion and occupancy of the building. Any faults / deficiencies found during the inspection shall be rectified prior to granting occupancy.
125. A report conforming to CAN/ULC-S537 shall be submitted to the responsible authority prior to acceptance.

Emergency Lighting

126. Emergency lighting shall be provided as required in the NBCC. In addition to the NBCC requirements, the following provisions shall be provided:
 - 126.1 Outdoor patios, decks, and rooftop areas, contained by a fence or railing, used for assembly occupancies and having an egress path other than immediately at grade, shall be provided with emergency lighting at an average level of 10 lx with no area less than 1 lx. Emergency lighting shall be provided for both the entire patio area and egress route to grade;
 - 126.2 Where emergency lighting is provided in residential "quarters" type buildings, emergency lighting shall be designed with 30, 60, or 120-minute power supply, and a reserve 30, 60, or 120-minute power supply upon activation of the fire alarm. Upon power failure, the emergency lighting shall activate for the amount of time required by the NBCC. After this period, the emergency light unit shall deactivate the lighting, reserving an equal amount of lighting capacity to be activated in the event of a fire alarm during an extended power failure; and
 - 126.3 In hazardous locations, as defined by CAN/CSA-C22.1 *Canadian Electrical Code*, emergency lighting requiring more than six lighting heads in any area shall be provided via the building lighting fixtures, powered by either an emergency power generator, or an approved emergency lighting UPS/inverter system, located in a non-hazardous area.



127. Where an emergency power generator is provided, the generator shall supply power for emergency lighting.
128. If self-contained emergency lighting units are used, they shall conform to CAN/CSA-C22.2 No. 141: *Unit Equipment for Emergency Lighting*.

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129. The installing contractor shall measure lighting levels of installed emergency lighting with a lux meter to confirm compliance with the minimum lighting requirements as found in the NBCC. This testing shall be performed after dark, during a full-building power failure.
130. The installing contractor shall submit a shop drawing summary floor plan of the installed emergency lighting locations and lighting level measurements found in those areas. Report shall be submitted to the responsible authority for review prior to acceptance.

Exit Signs

131. Exit signs shall be provided as required by the NBCC.
132. Where an emergency power generator is provided, the generator shall supply power for all internally illuminated exit signs.

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133. An examination of the exit signs by the responsible authority shall determine any areas which do not sufficiently direct the occupant to an exit or any non-functional signs.

Emergency Power

134. Emergency power supply installation shall comply with the requirements of CAN/CSA-C282: *Emergency Electrical Power Supply for Buildings*.
135. All buildings designated as post-disaster buildings in accordance with the NBCC shall be provided with an emergency power generator. Where an emergency power generator is provided, it shall supply the following fire and life safety equipment:



- 135.1 Fire alarm and detection system;
- 135.2 Fire suppression releasing panels;
- 135.3 Emergency lighting;
- 135.4 Internally illuminated exit signs;
- 135.5 Area of refuge smoke control systems; and
- 135.6 Firefighter elevator.

- 136. Wiring supplying emergency power to smoke control systems and fire fighter elevators and the wiring between the generator and the transfer switch shall be provided with a fire resistance rating where required by the NBCC.

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- 137. Emergency power shall be tested as part of the overall building acceptance process. All fire safety engineering systems supplied with emergency power shall be verified by the responsible authority for functionality prior to acceptance.

Fire Protection of Dwelling Units

- 138. All DND/CAF dwelling units and residential housing shall conform to NBCC.
- 139. In addition to the requirements of the NBCC, the following shall be provided in all dwelling units owned by DND/CAF.
- 140. Carbon monoxide and smoke alarms:
 - 140.1 Carbon monoxide detectors and smoke alarms shall be designed and installed as per NBCC;
 - 140.2 In addition to the requirements of the NBCC and the NFCC, smoke alarms and carbon monoxide detectors shall:
 - 140.2.1 Have battery back-up, in addition to their electrical connection;



140.2.2 Incorporate a manually operated device within the circuitry so that the signal emitted by the smoke alarm can be silenced for a period of not more than 10 minutes; and

140.2.3 Be photoelectric when installed on the same level as a kitchen;

140.3 Smoke alarms are required to be run on a lighting circuit as per CSA C22.2 Canadian Electrical Code. Lighting circuit shall be on the ground floor or other common area;

140.4 Combination smoke alarm / carbon monoxide alarms are acceptable in any location that requires either a smoke alarm or carbon monoxide alarm.

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141. Carbon monoxide detection and smoke alarms shall be inspected and tested by the responsible authority for functionality.

Fire Protection of Information Technology and Equipment

142. Fire protection of information technology buildings, rooms and spaces shall comply with the requirements of FMD 4011 Fire Protection of Information Technology and Equipment.

143. Automatic sprinkler protection is required in all spaces serving IT equipment.

144. Automatic sprinkler protection may be required under raised floor spaces. See NFPA 13 for further detail.

Hazardous Processes

145. All hazardous processes shall be designed in accordance with the NBCC and the NFCC.

146. Where no Canadian standard or Code regulates the protection of a specific hazardous process, the system shall be designed and installed as per the



requirements of the relevant NFPA standard or other standard acceptable to the CFPM. See the responsible authority for clarification.

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147. All hazardous processes shall be tested and accepted by the responsible authority in accordance with the relevant NFPA design standard.



REFERENCES

Realty Asset Management Manual, Chapter 10: Fire Protection and Emergency Services
(C-08-005-120/AG-000)

National Fire Code of Canada, latest edition

National Building Code of Canada, latest edition

Construction Engineering Technical Orders (CETO)

C-98-001-003-MS-003: Handbook - Siting

C-98-007-000-AF-Z01: Universal Design and Barrier Free Access Directives and Standards
for DND/CAF Facilities

C-98-010-001 DD-003: Design and Construction Requirements for Battery Charging and
Storage Rooms

C-09-153-001/TS-000: Ammunition and Explosives Safety Manual Volume 1: Storage and
Transportation

C-98-15F-001/DD-001: Design Criteria Fuel Facilities

Fire Marshal Directives

FMD 2000: *Fire Protection Services Standard on Deployed Operations*

FMD 4000: *Electromagnetic Door Locks*

FMD 4005: *Partial Occupancy*

FMD 4009: *Trailers and Tension Fabric Buildings*

FMD 4010: *Security and Safe Egress*

FMD 4011: *Fire Protection of Information Technology and Equipment*

National Fire Protection Association

NFPA 11: *Standard for Portable Fire Extinguishers*

NFPA 13: *Standard for the Installation of Sprinkler Systems*

NFPA 13R: *Standard for the Installation of Sprinkler Systems in Residential Occupancies
up to and Including Four Stories in Height*

NFPA 14: *Standard for the Installation of Standpipe and Hose Systems*

NFPA 20: *Standard for the Installation of Stationary Pumps for Fire Protection*

NFPA 80: *Standard for Fire Doors and Other Opening Protectives*

NFPA 291 *Recommended Practice for Fire Flow Testing and Marking of Hydrants*

NFPA 409: *Standard on Aircraft Hangars*

Underwriters' Laboratories of Canada

CAN/ULC-S101: *Fire Endurance Tests of Building Construction and Materials*

CAN/ULC-S115: *Fire Tests of Firestop Systems*

CAN/ULC-S524: *Installation of Fire Alarm Systems*



CAN/ULC-S536: Inspection and Testing of Fire Alarm Systems

CAN/ULC-S537: Verification of Fire Alarm Systems

Canadian Standards Association

CAN/CSA-B64.10: Manual for the Selection of Backflow Prevention Devices

CAN/CSA-C22.1: Canadian Electrical Code

CAN/CSA-C22.2 No. 141: Unit Equipment for Emergency Lighting

CAN/CSA-C282: Emergency Electrical Power Supply for Buildings

CAN/CSA-C860: Performance of Internally Lighted Exit Signs

American Society for Testing and Materials

ASTM E605: Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material Applied to Structural Members

ASTM E736: Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

ASTM E2174: Standard Practice for On-site Inspection of Installed Firestops

ASTM E2393: Standard Practice for On-site Inspection for Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

RCMP Guidelines

G1-029 RCMP Guide – Secure Rooms;

Association of the Wall and Ceiling Industry

AWCI's Technical Manual 12-B: Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-Resistive Materials

The International Organization for Standardization (ISO)

Guide for Determination of Needed Fire Flow