CITY OF VANCOUVER

CITY CLERK'S DEPARTMENT
Access to Information & Privacy Division

File No.: 04-1000-20-2023-056

March 14, 2023

s.22(1)

Dear s.22(1)

Re: **Request for Access to Records under the Freedom of Information and Protection of Privacy Act (the "Act")**

I am responding to your request of January 27, 2023 under the ***Freedom of Information and Protection of Privacy Act (the Act)*** for:

> **Record of the Alternative Solution AL401959 regarding the tenant Louis Vuitton in the Fairmont Hotel at 900 W Georgia Street. Date range: January 1, 2013 to December 31, 2014.**

All responsive records are attached.

Under section 52 of the Act, and within 30 business days of receipt of this letter, you may ask the Information & Privacy Commissioner to review any matter related to the City's response to your FOI request by writing to: Office of the Information & Privacy Commissioner, info@oipc.bc.ca or by phoning 250-387-5629.

If you request a review, please provide the Commissioner's office with: 1) the request number (#04-1000-20-2023-056); 2) a copy of this letter; 3) a copy of your original request; and 4) detailed reasons why you are seeking the review.

Yours truly,

[Signed by Cobi Falconer]

Cobi Falconer, MAS, MLIS, CIPP/C
Director, Access to Information & Privacy
cobi.falconer@vancouver.ca
453 W. 12th Avenue Vancouver BC V5Y 1V4

If you have any questions, please email us at foi@vancouver.ca and we will respond to you as soon as possible. Or you can call the FOI Case Manager at 604-871-6584.

Encl. (Response Package)

:pm

(Please print on pink paper)

CITY OF VANCOUVER

CITY OF VANCOUVER
OFFICE OF THE CHIEF BUILDING OFFICIAL
Community Services, 453 West 12th Avenue, Vancouver, BC, V5Y 1V4

ALTERNATIVE SOLUTION PROPOSAL
(In Accordance with Section 2.3 OF Division C of the Vancouver Building By-law)

BU 460130 — Building Permit No.
900 West Georgia Street, Vancouver — Project Address
September 24, 2014 *(Rev Feb 26, 2015)* — Date

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Payment $ _____ Invoice Number: _____ AL Number: **AL401959**

APPLICANT INFORMATION

(Professional Seal)

Proposed By: Michael Linton, P.Eng., CP

Firm: CFT Engineering Inc.

Address: #800 - 1901 Rosser Avenue, Burnaby BC

Phone: (604) 684-2384 Fax: (604) 684-2402 Email: mlinton@cftengineering.com

CODE REFERENCE(S) & SUMMARY OF DEVIATION(S) FROM VANCOUVER BUILDING BY-LAW: The project is governed by the 2007 VBBL. Sentence 3.1.8.4.(1) states that the fire protection rating for closures shall be determined on the basis of results of tests conducted in conformance with the appropriate provisions in the referenced standards for testing of door assemblies, window or glass block assemblies, or fire damper assemblies. Therefore, closures are required to be tested and listed by a recognized authority. Rather than provide listed door assemblies or fire shutters in the locations identified, tempered glass panels and tempered glass and wood doors, protected by designated sprinkler nozzles are proposed. As this system is not listed, an alternative solution is proposed. The proposed alternative solution will be based on the tested fire rated glazing system which has been demonstrated to provide a 1 h fire-resistance rating and information from the Construction Technology Update No. 12, published by the National for Research Council, and prepared by A.K. Kim and G.D. Lougheed.

This alternative solution has been revised. All changes are in italics. Due to the building configuration the breeze way is considered an unheated area similar to an unheated parking garage and adjacent drive aisle. As such, a portion of the water filled piping supplying the fire rated glazing system will be located on the outside of the building. The sprinklers located on the breeze way side of the fire separation will be dry type pendant sprinklers, and will be served by the wet / water-filled piping. The 2007 edition of the VBBL references the 1999 edition of the NFPA 13 as the applicable edition. Sentence 3.2.5.13.(1) of the 2007 VBBL requires an automatic sprinkler system to be designed, constructed, installed, and tested in conformance with NFPA 13, 1999, "Installation of Sprinkler Systems," (NFPA 13/99). Reference 5-14.3.1.2 of NFPA 13/99 requires water filled pipe to be protected from freezing by reliable means, such as heat-tracing and insulating, capable of maintaining a minimum temperature between 4 °C (40 °F) and 48.9 °C (120 °F).

For this application it is proposed that the protection of the sprinkler branch lines located on the breeze way side of the required fire separation (unheated area) be protected against freezing in accordance with Reference 8.16.4 of NFPA 13, 2013, "Installation of Sprinkler Systems," (NFPA 13/13). As permitted by Bulletin 2014-002-BU, the 2014 Vancouver Building By-Law can be used on a "Generic" alternative solution basis. The 2014 VBBL references the 2013 edition of the NFPA 13 as the applicable edition of this standard. Therefore, it is proposed to reference the 2013 edition of NFPA 13 instead of the 1999 edition, for protection against freezing measures of sprinkler branch lines.

Reference 8.16.4.1.3. of NFPA 13/13 permits water-filled piping in areas exposed to temperature below 4°C (40°F) to be protected against freezing by installing protective coverings, insulation, listed heat tracing systems or other reliable means capable of maintaining the temperature at or above 4°C (40°F). In order to maintain the temperature of the water-filled piping located the outside at or above 4°C (40°F) the piping will be heat-traced and insulated. The heat-tracing and insulation will also be enclosed in a protective covering.

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PROPOSED ALTERNATIVE SOLUTION IS:
☑ ACCEPTABLE ☐ ACCEPTABLE (Subject to condition(s) noted below) ☐ REFUSED (For the reason(s) noted below)

For Boris Tursky — March 09 2015

CHIEF BUILDING OFFICIAL — DATE

cc: Sender/Certified Professional
Chief Building Official
Deputy Chief Building Official
City Electrical Inspector
Building Policy Engineer
Manager, Processing Centre (Buildings)
Manager, Building Inspection Branch
Manager, Plumbing & Gas Inspection Branch
Other Department _____
Engineer/Project Coordinator
District Building Inspector
District Electrical Inspector
Sprinkler Plan Reviewer

SUMMARY OF ALTERNATIVE SOLUTION CONTINUED:

BRIEF PROJECT DESCRIPTION: The Fairmont Hotel Vancouver is undergoing a tenant improvement of the hotel lobby and restaurant space. In order to maintain visual openness, glazed door assemblies and side lights are proposed for the two double entry doors located in the ground level breezeway off Burrard Street. These doors and side lights will be located in a required 1.5 h separation and require a minimum 1 h fire protection rating in accordance with Sentence 3.1.8.4.(2). The proposed glazed door assemblies will be protected by specially located sprinklers and are identified on the architectural plans in Appendix A.

OBJECTIVE(S) OF THE VANCOUVER BUILDING BY-LAW REQUIREMENT(S):

The purpose of testing and listing closures and assemblies is to ensure the minimum level of life safety and fire protection specified by the Building By-Law is met.

The intent of the 2007 Vancouver Building By-Law requirements are summarized by the objective and functional statements given in Divison A, Part 2 and 3. Those applicable to Sentence 3.1.8.4.(1) and Sentence 3.2.5.13.(1) are identified as follows:

OS1 Fire Safety — An objective of this Code is to limit the probability that as a result of the design or construction of the building, a person in or adjacent to the building will be exposed to an unacceptable risk of injury due to fire. The risks of injury due to fire addressed in this Code are those caused by

- [OS1.2] Fire or explosion impacting areas beyond its point of origin

OP1 Fire Protection — An objective of this Code is to limit the probability that as a result of design or construction, the building will be exposed to an unacceptable risk of damage due to fire. The risks of damage due to fire addressed in this Code are those caused by

- [OP1.2] Fire or explosion impacting areas beyond its point of origins
- [OP1.3] Collapse of physical elements due to fire or explosion

Functional Statements:

- [F03] To retard the effects of fire on areas beyond its point of origin.
- [F81] To minimize the risk of malfunction, interference, damage, tampering, lack of use or misuse.
- [F82] To minimize the risk of inadequate performance due to improper maintenance or lack of maintenance.

SUMMARY OF MITIGATING FEATURES:

In order to maintain a visual openness within the Fairmont Hotel Vancouver, sprinkler protected glazed side lights and doors will be utilized at required fire separations and fire protection ratings. As indicated above, the Building By-Law would require a 1 h fire protection rating for closures in a 1.5 h fire separation. The proposed protection system will consist of tempered and laminated glass protected by sprinklers.

The location of the windows and doors to be protected are identified on the architectural plans in Appendix A.

Although the original testing was intended for a fire separation providing a fire-resistance rating rather than a closure providing a fire protection rating, the results are directly applicable provided the door assembly remains in a closed position. The door assemblies proposed will be equipped with a self-closing device and positive latching mechanism and installed to the tolerances specified by NFPA 80.

Although there are currently no heat-tracing systems listed for the use on sprinkler branch lines with sprinkler heads, the Raychem XL-trace heat-tracing system is listed for use on sprinkler branch lines without sprinkler heads, and contains recommendations for installation on sprinkler branch lines with sprinkler heads. The Raychem XL-trace system in conjunction with insulation and protective covering will be used to maintain the temperature of the water-filled pipe at or above 4° C (40° F). The heat tracing system will be installed in accordance with the manufacturers listings, recommendations for sprinkler branch lines with sprinkler heads, the Vancouver Building By-Law and applicable Bulletins. As the Raychem XL-trace system is not listed for branch lines with sprinklers, a dry pendent sprinkler barrel will be utilized.

ANALYSIS AND EVALUATION TO VALIDATE ACCEPTANCE: Construction Technology Update No. 12, published by the National Research Council, and prepared by A.K. Kim and G.D. Lougheed, presents the results of testing of a fire rated glazing system utilizing a pendent sprinkler located above the upper window mullion. Construction Technology Update No.12, is reproduced in Appendix B. The system tested permits the use of specifically located pendent sprinklers to provide a 1 h fire-resistance rating for a glazed assembly and discusses a pony wall beneath the glazing.

The purpose of the pony wall is to prevent materials from being placed immediately adjacent to the tempered glass. For the application proposed, this is not a concern. The glazed door and fixed window assemblies to be protected are located in the main circulation routes and combustibles or other materials would not be stored adjacent to the glazed door and fixed window assemblies. Therefore, the provision of a pony wall is not necessary or relevant to the proposed application.

NFPA 13, 2013 provides guidance for maintaining the temperature of water filled pipe at or above 4 °C (40 °F) by reliable means, such as heat-tracing and insulating. Reference 8.16.4.1.4.1 requires the heat-tracing system to be listed for use on branch lines, Reference 8.16.4.1.4.2 requires positive confirmation that the heat-tracing circuit is energized, and Reference 8.16.4.5 requires confirmation the system will not freeze. NFPA goes on to state that when selecting an alternative approach to maintaining temperatures at or above 4 °C (40 °F) caution must be used to verify that the temperatures do not exceed the maximum ambient temperature allowed for the sprinkler temperature rating and that insulation does not create an obstruction to the sprinkler water distribution pattern.

Although there are currently no heat-tracing systems listed for use on sprinkler branch lines with sprinkler heads, the Raychem XL- trace heat-tracing system is listed for use on sprinkler branch lines without sprinkler heads, and contains recommendations for installation on sprinkler branch lines with sprinkler heads. As part of the design process, the design guide and installation manual requires the designer to determine the design conditions and pipe heat loss.

In order to reduce the risk of the temperature of the water-filled pipe dropping below 4 °C (40 °F) heat tracing, thermal insulation, and protective covering will be installed in accordance with the Raychem XL-trace heat-tracing system product design guide and installation manual, recommendations for sprinkler branch lines with sprinkler heads, and requirements of the 2007 VBBL, and the applicable Bulletins 2000-016-EL/PL,2004-001-EL/BU, 2004-010-EL, and 2000-044-EL.

In order to minimize the risk of freezing temperatures being conducted through the sprinkler head piping to the water in the connecting water filled pipe, the dedicated sprinklers positioned on the breeze way side of the fire separation will be quick-response dry type pendent sprinklers which are listed for use in applications where building configuration exposes the sprinklers and/or connecting piping to freezing conditions. The overall barrel length of the quick-response dry pendent sprinkler will exceed the length required by the sprinkler head data sheet based on the January Design Temperature of 1% and minimum water temperature of 4 °C (40 °F). The portion of the quick-response dry pendent sprinkler barrel required to be located in the heated area protected by a listed heat-tracing system will be keep to a minimum.

Conversely, in order to reduce the risk of the heat from the heat tracing being conducted from the water-filled piping such that the maximum ambient temperature allowed for the sprinkler head is exceeded, a portion of the dry pendant sprinkler barrel will be exposed allowing the heat to be dissipated. The length of this exposure must be determined based on site conditions but will meet the criteria as noted above. Further, the heat-tracing is provided with a thermostat, such that it will not be in operation at ambient temperatures, such that the maximum allowable ambient temperature for the pendant heads will not be exceeded.

As required by NFPA 13/13, the Raychem installation guide, and the applicable Bulletins 2000-016-EL/PL, 2004-001-EL/BU, 2004-010-EL, and 2000-044-EL, the heat tracing system will be monitored by the building's fire alarm system. Failure of the heat-tracing system (loss of power, low temperature, ground-fault, etc...) will result in a supervisory signal (trouble signal) at the building's fire alarm annunciator panel and a signal will be sent to the central monitoring station. In turn, the central monitoring station will contact the building owner or manager and advise of the supervisory signal. This will result in the building owner / manager taking the necessary steps to repair the system.

For protection of the doors and the fixed glazing system, the sprinklers located on the vestibule side (interior) of the fire separation will be quick-response pendant sprinklers and will be served by the wet / water-filled piping, as referenced in Construction Technology Update No. 12. The sprinklers located on the breeze way side (exterior) of the fire separation will be quick-response dry type pendant sprinklers, and will also be served by the wet / water-filled piping. The piping located on the breeze way side (exterior) of the fire separation will be heat-traced and insulated and enclosed in a protective covering. The following criteria will be used in the design of the Fire Rated Glazing System for the doors and side lights:

ARCHITECTURAL

1.	Glazing in Doors	Minimum 6 mm (¼ in.) thick tempered glass (2 x 9 mm tempered or tempered and laminated glass.
2.	Door Size	Maximum 2.4 m width for a single sprinkler (1.8 m total width proposed).
3.	Framing	Where framing is provided at the top of the door and side light assembly, the sill depth, between the face of the glazing and the face of the frame or wall cladding, may not exceed 100 mm. The maximum frame depth is associated with the configuration and location of the pendant sprinkler relative to the glazing.
4.	Door Hardware	The doors to be protected must be equipped with a listed self-closing device and latching mechanism. No horizontal hardware, such as panic hardware, that would restrict the flow of water is permitted across the face of the door.

ANALYSIS AND EVALUATION TO VALIDATE ACCEPTANCE (Continued):

ARCHITECTURAL (CONT'D)

5.	Baffles	Decorative or concealment baffles are permitted subject to review of acceptance by CFT Engineering Inc.
6.	Pony Wall	A 1 m (3 ft. 3 in.) pony wall is not required. In all of the locations proposed, the glazed doors and fixed windows to be protected are in main circulation routes which would not be appropriate for the storage of materials.

MECHANICAL

7.	Flow	Sprinklers in the Fire Rated Glazing System will be designed to discharge at least 4.5 USgpm/lineal ft. with a minimum discharge of 27 USgpm per sprinkler. This is greater than the flow and pressure specified by Construction Technology Update No. 12 for the fire protection of windows using sprinklers.
8.	Water Demand	The fire rated glazing system will be hydraulically designed to accommodate the following: • the floor area system demand • all glazing protection sprinklers within the design area, and • the hose stream allowance.
8.	Water Supply	The water demand should be available for 1½ h, equal to the fire-resistance rating of the fire separation and exceeding the required fire protection ratings.
9.	Separate System	The Fire Rated Glazing System will be separate from the floor area sprinkler system from the point of connection to the riser and will be a separate sprinkler zone.
10.	Sprinkler Nozzles	Quick-response pendant sprinklers, 5.6 K factor, for sprinklers located on the "warm" (interior) side of the fire separation. Quick-response dry pendant sprinklers, 5.6 K factor, for sprinklers located on the "cold" (exterior) side of the fire separation (Tyco Series DS-1 or equivalent). The length of the barrel of the dry pendent sprinkler to be protected by the heat-tracing and thermal insulation will be determined based on the climatic data contained in Division B, Part 1, Subsection 1.1.3, and Table 1.1.3.1.A based on the January Design Temperature of *1%*, minimum water temperature of 4 °C (40 °F), and Table C, "Exposed sprinkler Barrels in Wet Pipe Systems Minimum Recommend Lengths," of the Tyco Series DS-1 sprinkler head data sheet. The over all barrel length of the quick-response dry pendent sprinkler will exceed the length required by the sprinkler head data sheet based on the January Design Temperature of 1% in order to maintain a minimum water temperature of 4 °C (40 °F).
11.	Sprinkler Piping	Noncombustible (metallic) sprinkler piping.
12.	Sprinkler Location	Sprinklers are located on both sides of the door and fixed glazing system assemblies to be protected. Proximity of floor area sprinklers to be reviewed by sprinkler design engineer, and CFT Engineering Inc. on site.
13.	Sprinkler Position	Sprinklers protecting the doors and the fixed glazing to be pendant sprinklers and installed in accordance with the Construction Technology Update No. 12, and the sprinkler listing as follows: • The pendent sprinklers for doors are to be located at the center of the door sets to be protected, approximately (± 25 mm) 300 mm horizontally away from the glazing surface, and (± 25 mm) 300 mm above the top of the door. • Sprinklers for the fixed glazing will be located at the center of the fixed glazing panel to be protected, approximately (± 25 mm) 300 mm horizontally away from the glazing surface, and (± 25 mm) 300 mm above the top of the glazing.
14.	Sprinklers in Unheated Areas	For this project, because the tempered glass is located in an exterior wall, the sprinklers protecting the glazing on the breezeway side of the separation are required to be quick-response dry type pendent sprinklers (see Item 10 for additional information).
15.	Posted Sign	A sign shall be permanently mounted beside the main water supply stating, "Special sprinkler heads on this system are an integral part of a fire separation. This water supply may only be shut off after all the proper authorities have received notice in writing."

The sprinklers in the Fire Rated Glazing System will be installed in accordance with the 2013 edition of NFPA 13 "Standard for the Installation of Sprinklers".

ANALYSIS AND EVALUATION TO VALIDATE ACCEPTANCE (Continued):

ELECTRICAL

16.	Alarm Panel (Sprinkler)	Separate flow switches or alarm check valves, and control valves, shall be electrically supervised and indicated separately at the fire/sprinkler alarm annunciator panel.
17.	Alarm Panel (Heat Tracing)	Heat tracing will be required to be monitored by the fire alarm panel.

HEAT TRACING

18.	Insulation:	The XL-trace heat-tracing will be installed in accordance with the manufacturers listing, the recommendations for sprinkler branch lines with sprinkler heads, and requirements of the 2007 VBBL and the applicable Bulletins 2000-016-EL/PL, 2004-001-EL/BU, 2004-010-EL, and 2000-044-EL. Copies of the City of Vancouver bulletins and exerts from the XL-trace system design guide and installation manual have been attached for reference.

For additional information on the Raychem XL-Trace System for Fire Sprinkler Freeze Protection please reference the Design Guide and Installation Manual. A completed copy of the Design Guide and Installation Manual can be found at:

http://www.pentairthermal.com/images/EN-RaychemXLTraceFireSprinkler-DG-H58489_tcm432-26422.pdf

CONFIRMATION

19.	Glazing Shop Drawings	Details of the proposed window and door assemblies located in the Fire Rated Glazing System should be provided to CFT Engineering and the architect for review.
20.	Sprinkler Shop Drawings	Sprinkler shop drawings are required to be submitted to CFT Engineering for review relative to the design of the Fire Rated Glazing System and to the Mechanical Consultant for review relative to NFPA 13.
20.	Field Reviews	CFT Engineering will conduct field reviews to confirm satisfactory provision of the above noted items to meet the requirement of the alternative solution for the fire rated glazing system.

Conclusion: The alternative solution presented in this report will achieve at least the minimum level of performance required by Part 3, Division B of the VBBL in the areas defined by the objective and functional statements attributed to the applicable acceptable solution for the glazing located in the 1 ½ h fire separation between the hotel lobby and restaurant space and the ground level breezeway.

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STAFF COMMENTS AND RECOMMENDATIONS:

☐ Attached ☐ Noted in Prism

Comments By: _____ Position: _____ Date: _____

REVIEW PANEL COMMENTS:

Comments By: _____ Position: _____ Date: _____

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Sprinkler Standpipes

XL-Trace is designed to maintain fire suppression system standpipes at 40°F (4°C) in areas subject to freezing.

FOR ABOVEGROUND STANDPIPES

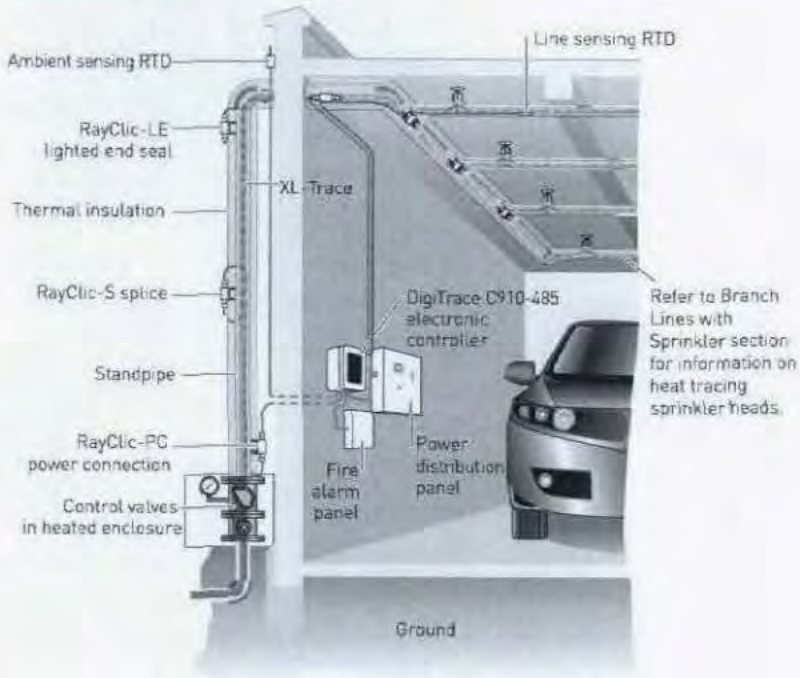

Fig. 6 Standard sprinkler standpipe heating system layout

Application Requirements

The system complies with Pentair Thermal Management requirements for freeze protection of sprinkler system piping when:

- The heating cable is permanently secured to insulated metal pipes with GT-66 glass tape or to plastic pipes using AT-180 aluminum tape.
- Schedule 5, 10, 20, or 40 steel sprinkler standpipe up to and including 20 inches in diameter is used.
- UL Listed fiberglass or closed cell flame-retardant insulation with weatherproof cladding is used.
- DigiTrace C910-485 or ACS-30 controllers with integrated ground-fault protection and alarm contacts are used and are connected to a fire control panel.
- The heating cable is installed per manufacturer's instructions with approved Pentair Thermal Management connection kits. See Table 11 on page 25 and the XL-Trace System Installation and Operation Manual (H58033).

Approvals

UL Listed and c-CSA-us Certified for nonhazardous locations.

UL LISTED	ULC LISTED	C SP -W US
5XL1-CR, -CT 8XL1-CR, -CT	5XL1-CR, -CT 8XL1-CR, -CT	5XL1-CR, -CT 8XL1-CR, -CT 12XL2-CR, -CT
5XL2-CR, -CT 8XL2-CR, -CT	5XL2-CR, -CT 8XL2-CR, -CT	5XL2-CR, -CT 8XL2-CR, -CT

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Branch Lines with Sprinklers

XL-Trace is designed to maintain branch lines containing sprinklers at 40°F (4°C) in areas subject to freezing.

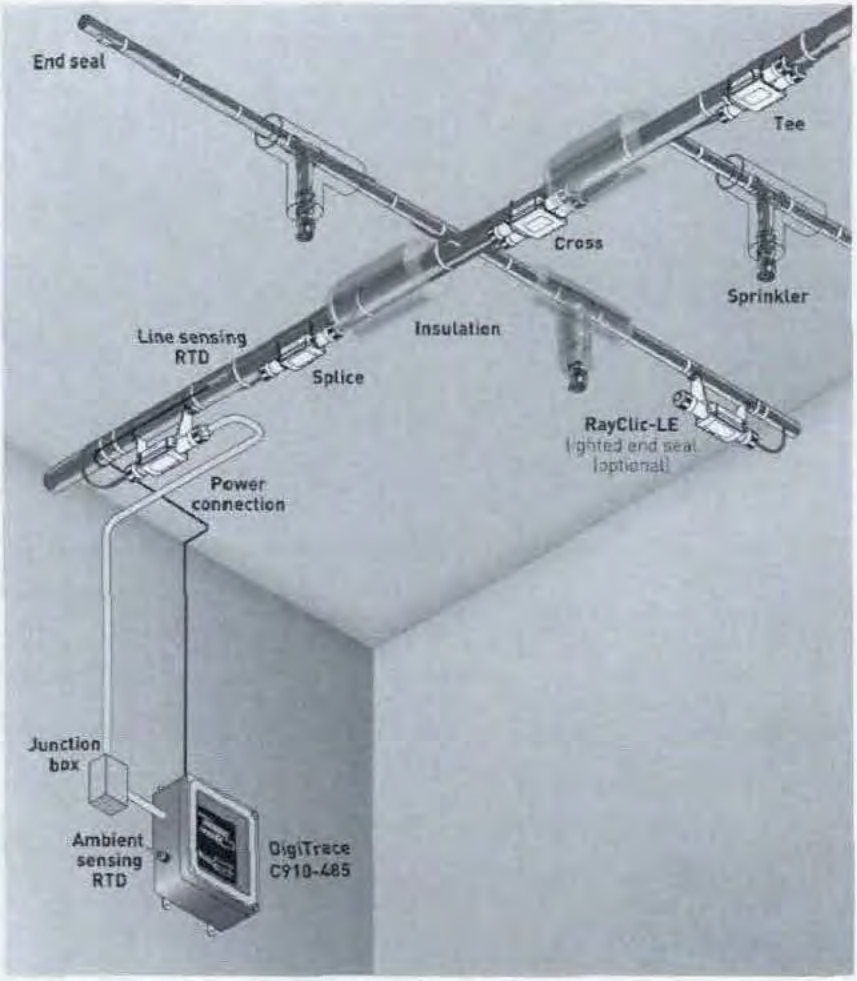

Fig. 7 Typical fire suppression system for branch lines with sprinklers

Application Requirements

The system complies with Pentair Thermal Management requirements for fire suppression branch lines with sprinklers when:

- The heating cable is permanently secured to metal pipes with GT-66 glass tape, or to plastic pipes using AT-180 aluminum tape.
- DigiTrace C910-485 or ACS-30 controllers with integrated ground-fault protection with alarm contacts are used and are connected to a fire control panel.
- The sprinkler design accounts for the sprinkler shadow created by the outer diameter of the thermal pipe insulation.
- Closed-cell, waterproof thermal insulation with fire-retardant, waterproof covering is used.
- The heating cable is installed per manufacturer's instructions with approved Pentair Thermal Management connection kits. See Table 13 on page 27 and the XL-Trace System Installation and Operation Manual (H58033).
- Additional heating cable is installed to compensate for sprinkler heads, sprigs, valves and pipe supports as detailed in the Table 6 on page 20 of this document and the XL-Trace System Installation and Operation Manual (H58033).

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Approvals

c-CSA-us Certified for use in U.S. and Canada in nonhazardous locations.

5XL1-CR, -CT 8XL1-CR, -CT 5XL2-CR, -CT 8XL2-CR, -CT

Freezer Application

XL-Trace is designed to keep condensate in dry sprinklers from freezing and may be installed in freezers located in areas subject to freezing.

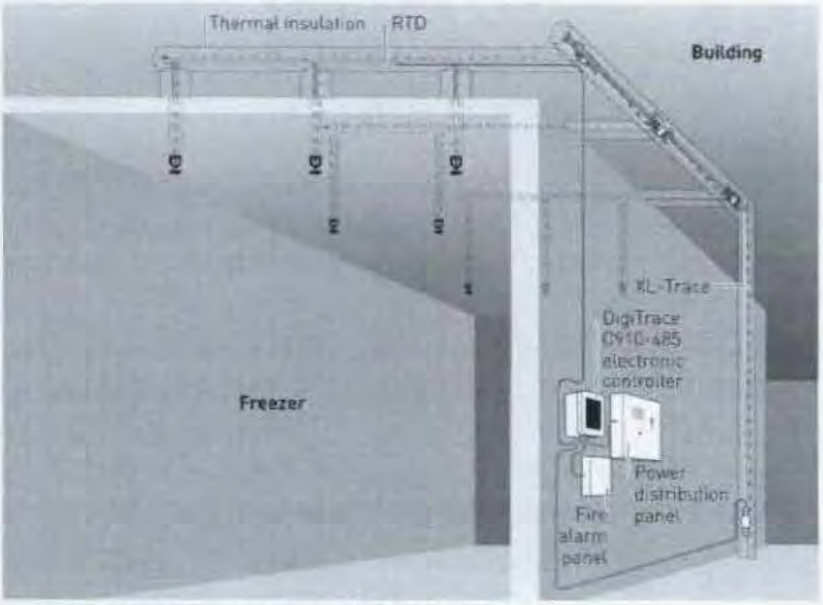

Fig. 8 Typical fire suppression system for freezer applications

Application Requirements

The system complies with Pentair Thermal Management requirements for fire suppression systems for freezer applications when:

- The system is for freezer and freezer within a freezer applications.
- The heating cable is permanently secured to metal pipes with GT-66 glass tape, or to plastic pipes using AT-180 aluminum tape.
- DigiTrace C910-485 or ACS-30 controllers with integrated ground-fault protection and alarm contacts are used and are connected to a fire control panel.
- Closed-cell, waterproof thermal insulation with fire-retardant, waterproof covering is used for pipes and sprigs in areas subject to freezing.
- The sprinkler design accounts for sprinkler shadow created by the outer diameter of the thermal pipe insulation.
- The heating cable is installed per manufacturer's instructions with approved Pentair Thermal Management connection kits. See Table 13 on page 27 and the XL-Trace System Installation and Operation Manual (H58033).
- Additional heating cable is installed to compensate for sprinkler heads, sprigs, valves and pipe supports as detailed in the Table 6 on page 20 of this document and the XL-Trace System Installation and Operation Manual (H58033).

Approvals

c-CSA-us Certified for use in U.S. and Canada in nonhazardous locations.

5XL1-CR, -CT 8XL1-CR, -CT 5XL2-CR, -CT 8XL2-CR, -CT

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FIRE SUPPRESSION SYSTEM FREEZE PROTECTION DESIGN

This section details the design steps necessary to design your application. The examples provided in each step are intended to incrementally illustrate the project parameter output for two sample designs from start to finish. As you go through each step, use the "XL-Trace System Fire Sprinkler System Freeze Protection Design Worksheet," page 32, to document your project parameters, so that by the end of this section you will have the information you need for your Bill of Materials.

XL-Erate, the commercial pipe freeze protection and flow maintenance design software, is available at http://www.pentairthermal.com to assist with your design.

Design Step by Step

Your system design requires the following essential steps.

1. Determine design conditions and pipe heat loss
2. Select the heating cable
3. Determine the heating cable length
4. Determine the electrical parameters
5. Select the connection kits and accessories
6. Select the control system
7. Complete the Bill of Materials

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BULLETIN 2000-016-EL/PL **Revised December 11, 2007**

PROTECTION OF STANDPIPES & SPRINKLER PIPING AGAINST FREEZING

When portions of standpipes and wet sprinkler supply mains are subject to freezing, the pipe shall be protected against freezing by reliable heat-generating systems capable of maintaining a minimum temperature of 4.4°C (40°F). (Refer to NFPA 13 or 14).

The reliable maintenance at the required temperature level is permitted to be achieved by systems specifically listed for this purpose (The NFPA 13, 1999 Edition, "Automatic Sprinkler Systems Handbook", acknowledges that heat-tracing systems may be utilized as such systems).

DESIGN AND INSTALLATION REQUIREMENTS (See Attachment "A")

Electric heat-tracing cable systems are deemed to be acceptable provided the following conditions are met:

1) The entire heat-tracing cable system (all cables certified to CSA Standards C22.2, No. 130.1 or 130.2 and all heat-tracing controls) are designed and sealed by a Professional Mechanical Engineer.
2) The heat output capacity shall be based on the ambient air temperature of -13°C (8°F) when used on metal pipes protected by a minimum 1" thick fibreglass insulation. Two inch thick insulation is recommended for pipes over 3" in diameter.
3) The manufacturer's installation instructions shall be closely followed and adhered to and posted in the sprinkler valve room.
4) Heating cables shall not be installed until a written release is received from the District Plumbing Inspector indicating that the standpipe and sprinkler pipes are completely installed and have passed all necessary tests.
5) A remote supervisory/trouble signal indicating any condition described in item (8) below shall be provided on the annunciator of the building fire alarm system. The trouble/supervisory signal shall be installed in addition to trouble signals mandated by Sentence 3.2.4.9.(2) of Division B of the Vancouver Building By-law for an automatic sprinkler system.
6) Where an on-site generator system is used to supply emergency power to a fire pump motor(s), it shall be of sufficient capacity to provide power for all heat-tracing cables installed on the site. The heating circuits shall be connected to an Emergency Power Source with all electrical connections and temperature settings permanently identified using lamicoide-type labels.
7) Where plastic pipes are used for **wet sprinkler systems** in conformance with the Vancouver Building By-law and heat-tracing cable is utilized to provide freeze protection, the installation shall meet the following requirements:
   a) Be installed so as to maintain a pipe surface temperature of not less than 4.4°C (40°F),
   b) Operate at ambient temperature of not more than 35°C (95°F), and
   c) Limit temperature at every contact point with the plastic pipe to not more than 60°C (140°F).
8) All heating circuits shall be thermostatically controlled and continuously monitored (electrically supervised) for:
   a) loss of incoming supply voltage,
   b) loss of control power,
   c) ground fault,
   d) continuity, and

City Hall 453 West 12th Avenue Vancouver BC V5Y 1V4 vancouver.ca
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e) open circuits.

NOTES:

1) All control and supervisory devices indicated in items (8) (a) to (e) above shall be installed in a control box that is provided as part of an electric heat tracing cable system.
2) An ambient air sensing thermostat protected from direct sunlight and moisture and complete with a lockable enclosure shall be provided as part of an electric heat-tracing cable system. (Not required for self-regulated systems).
3) Electrical supervision of items (8)(c) to (e) above shall include wiring and other control devices (relays, switches, etc) that are necessary to fulfill required control functions.
4) Installation of the entire heat-tracing system (heat-tracing cable and associated controls) shall be done only by a registered Electrical Contractor with the benefit of an electrical permit.
5) Wiring methods of the power supply circuits to the control box shall comply with relevant provisions of Section 12 of the CEC, Part 1.
6) Installation of heat tracing cable shall meet applicable requirements of Section 62 of the CEC, Part 1.
7) Acceptance of each heat-tracing cable system is conditional upon:
   i) receipt of the letter from a Professional Engineer responsible for the system design, stating that the system is installed as per original design and that all control functions conform to item (8) of this Bulletin, and (see Attachment "A").
   ii) Successful completion of coordinated inspection by the electrical and plumbing inspectors.

INSPECTION ACTIVITY

1. In order to obtain sprinkler and electrical permits for the installation of such systems, the following steps must be taken:
   (a) Plans designed by a Professional Engineer must be submitted for sprinkler plan checking and issuance of a sprinkler permit.
   (b) Application for an electrical permit must be submitted by an electrical contractor. The Electrical Permit may be issued only upon the issuance of the sprinkler permit.
2. All respective work done by licensed electrical and sprinkler contractors under the scope of their permits is subject to inspections by inspectors of the Plumbing and Electrical Branches.
3. The purpose of the electrical inspection is to check that only cables certified to CSA Standards C22.2, No. 130.1 or No. 130.2 are used, that installation conforms to the CEC requirements and that all controls mandated by item (8) above, are installed in the control box and that the intended operation of these controls is certified by the Professional Engineer responsible for the entire heat-tracing cable system design.
4. The purpose of the plumbing inspection is to check that all piping subject to freezing is protected by electric heat-tracing cable systems as per accepted designed plans.

W.M. Johnston, P.Eng.
CHIEF BUILDING OFFICIAL

A. Z. Tsisserev, P.Eng.
CHIEF ELECTRICAL INSPECTOR
AND CITY ELECTRICIAN

D. A. Pope
CHIEF PLUMBING INSPECTOR

Attachment "A"

Attachment "A"
To Bulletin 2000-016-EL/PL

Verification Report
(Compliance of Electric Heat-Tracing Cable System with Bulletin 2000-016-EL/PL)

The Chief Electrical Inspector and
City Electrician
453 w 12th avenue
Vancouver, B.C.
V5Y 1V4

Date: _____
(YY MM DD)

Dear Sir:

Re:

Address _____

Electrical Permit: _____

Sprinkler Permit: _____

This is to confirm that the entire electric heat-tracing system is designed, constructed and installed In accordance with all applicable provisions of Bulletin 2000-016 EL/PL and to verify that it is operational as intended by the system design.

Company Name: (if applicable)_____

Name: _____P.Eng

Signature: _____

Address: _____

Telephone: _____

Fax: _____ (Affix PROFESSIONAL SEAL here)

e-mail: _____

CITY OF VANCOUVER

COMMUNITY SERVICES GROUP
Office of the Chief Building Official

BULLETIN 2004-001-EL/BU **APRIL 19, 2007**
(Revised)

ELECTRICAL SUPERVISION OF FIRE ALARM SYSTEM DEVICES AND SIGNAL TO A CENTRAL STATION AND FIRE DEPARTMENT

This bulletin clarifies the Vancouver Building By-law (VBBL) requirements in respect to electrical supervision of a fire alarm system, supervisory devices, trouble signals on the FA annunciator and signals to a central station or to a fire department as follows:

I). Electrical Supervision (trouble signals and supervisory devices/conditions):

(1) Article 3.2.4.9. of Division B of the VBBL mandates **electrical supervision** for a fire alarm system.

(2) Section 3.3 of ULC S524-01 lists fire alarm system components (wiring to the devices) that must be provided with **electrical supervision.**

(3) In addition to the list of fire alarm system devices required to be supervised in conformance with Section 3.3 of ULC S524, Clause 7-7.1 of the NFPA 96 states that where a commercial cooking operation is equipped with an automatic fire-extinguishing system in accordance with the NFPA 96 criteria, **electrical supervision of this fire-extinguishing system must be provided on the FA annunciator.**

(4) Paragraph 3.3.1.5 of ULC S524 explains that every abnormal condition such as an open circuit fault or a ground fault on each circuit of a FAS must be indicated by a **trouble signal**, and that the **trouble signal** shall not interfere with the operation of other circuits (i.e. shall not interfere with a **fire alarm initiating, audible or visual signals**).

(5) Clause 3.3.3 of ULC S524 provides requirements for operation of **trouble signals** (identification, audible and visual components, silencing, etc.).

(6) ULC S524 does not define a "**supervisory signal**" as a separate entity, but provides a definition of a "**trouble signal**" as "a visual and audible indication of equipment failure, circuit failure, fault condition or operational malfunction". However, ULC S524 defines a "**supervisory device**" as "a field device to signal a condition that could prevent proper operation of a fire protection system", and defines "**tamper device**" as "a device used to detect the removal or opening of a protective cover". Thus, any abnormal condition such as a short or open circuit, or operation of a supervisory/tamper device must be indicated on a fire alarm annunciator (see 3.3.3.1 of ULC S5240 by a trouble signal.

Thus, any abnormal condition which could be manifested by a short or open circuit, or by operation of a supervisory/tamper device must be indicated on a fire alarm annunciator (see 3.3.3.1 of ULC S524) by a **distinctive trouble signal.**

(7) The City of Vancouver has recognized the fact that a "**supervisory signal**" is not defined and not used in the ULC S524 (it appears that the ULC S524 intends to identify trouble conditions and supervisory conditions by a "**trouble signal**"). Thus, Sentence 3.2.4.9.(2) of Division B of the VBBL has been amended accordingly to reflect this fact and to provide consistency with the ULC S524.

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(8) Sentence 3.2.4.9.(2) of Division B of the VBBL covers electrical supervision requirements for all applicable components of an automatic sprinkler system and this Sentence specifically mandates a **dedicated trouble signal** on the FA annunciator for **each following supervisory function or condition listed in paragraphs (a) to (g):**

a) movement of a valve handle that controls the supply of water to sprinklers;

b) loss of excess water pressure required to prevent false alarms in a wet pipe system;

c) loss of air pressure in a dry pipe system;

d) loss of air pressure in a pressure tank;

e) a significant change in water level in any water storage container used for fire fighting purposes;

f) loss of power to any automatically starting fire pump; and

g) a temperature approaching the freezing point in any dry pipe valve enclosure or water storage container used for fire fighting purposes.

In addition to the listed supervisory functions (a) to (g) it has been recognized by the City of Vancouver that a heat-tracing cable system may be used to protect a sprinkler system against freezing, provided that the heat-tracing cable system meets requirements of the revised Bulletin 2000-016-EL/PL. If such a heat-tracing cable system is permitted, then a **separate common trouble signal** must be indicated on the annunciator for each heat tracing cable system designed to provide a reliable operation of fire protection systems (standpipe and sprinkler) in the building. This **single common trouble signal** is sufficient, as the heat tracing control panel would have to be provided with separate electrical supervisory functions for each condition as outlined in Clause 8 of Bulletin 2000-016-EL/PL.

(9) A **single common trouble signal** from a fire pump may also be sufficient for the purpose of paragraph 3.2.4.9.(2)(f) of Division B of the VBBL, provided that **each supervisory condition** mandated by Article 7-4.7 of the NFPA 20 is **separately indicated on the fire pump controller**, approved for "fire pump service". Supervisory conditions mandated by the NFPA 20 are as follows:

a) "pump or motor running";

b) "loss of phase";

c) "phase reversal";

d) "controller connected to alternate source"

*Notes: a) Where a unique supervisory condition required to be identified by a **separate trouble signal** on the fire alarm annunciator in accordance with Sentence 3.2.4.9.(2) of the VBBL is reflected by a number of similar **supervisory devices** (i.e. by a number of similar tamper switches in various valve handles, etc.), this **supervisory condition** may be represented on the FA annunciator by a **single trouble signal**, **only** if the Registered Professional Electrical Engineer responsible for the design of the fire alarm system can demonstrate to the Electrical Inspections Branch that such a grouping of these **supervisory devices** via a **single trouble signal**, will enable facilitation of efficient troubleshooting.*

*b) Use of a **common trouble signal** on the FA annunciator from a fire pump as indicated in item (9) above, should be discussed by the FAS designer with the Electrical Inspections Branch on the project by project basis.*

II) Signals to a Central Station and to a Fire Department:

(1) Sentence 3.2.4.9.(3) of Division B of the VBBL has been amended to clarify that activation of a trouble signal that identifies any supervisory function or condition of the sprinkler system (see items (7) to (9) above) must transmit a signal to an independent central station only. (and not to the Fire Department as mandated by the BCBC).The Central Station would be able to immediately notify a building owner/manager of an abnormal condition on the FAS. (There is no reason to send a trouble signal to a Fire Department and to dispatch fire fighters upon acknowledgment of an abnormal condition on a sprinkler system).

Note: Although the VBBL does not mandate a transmission of a trouble signal identifying an open circuit or ground fault condition on FAS components or wiring, this approach is encouraged as it is consistent with good fire protection engineering practice.

(2) Where a signal to the Fire Department **is required** in conformance with Article 3.2.4.7 of Division B of the VBBL (assembly occupancy with occupant load exceeding 300, actuation of a first stage in a two stage FAS, actuation of a waterflow device), the FAS must be designed so, that actuation of any waterflow device (a sprinkler flow switch) will be separately transmitted to the Fire Department via a Central Station - to allow fire fighters to know that the fire alarm has been, in fact, initiated by a building sprinkler system which has commenced it's fire suppression action.

D. H. Jackson, P.Eng.
DIRECTOR OF INSPECTIONS AND
DEPUTY CHIEF BUILDING OFFICIAL

A.Z. Tsisserev, P.Eng.
CHIEF ELECTRICAL INSPECTOR
AND CITY ELECTRICIAN

CITY OF VANCOUVER

COMMUNITY SERVICES
Office of the Chief Building Official

BULLETIN 2004-010-EL

APRIL 19, 2007
Revised August 16, 2013

LOCKING DEVICES FOR ELECTRICAL DISCONNECTING MEANS

This Bulletin clarifies locking requirements for disconnecting means serving fire and life safety equipment (in order to prevent unauthorized operation).

BACKGROUND

Sections 32 and 46 of the Canadian Electrical Code (CEC), Part I govern the installation requirements for special types of equipment, which in addition to being electrical equipment, are also fire and life safety equipment regulated by the provisions of the Vancouver Building By-law (VBBL).

In addition to electrical safety requirements, rules of these particular Sections of the CEC deal with conditions that regulate performance and reliability of this electrically connected fire and life safety equipment.

For example:

a. Rule 32-108(2) mandates that the disconnecting means for the separate circuit supplying a fire alarm system must be coloured "***red***" and be "***lockable in the ON position***".

b. Section 32 also references ULC standard S 524 which requires the disconnecting means for an emergency generator to "***be fitted with a locking device to prevent unauthorized operation***" (see Clause 3.2.4.3 of the ULC S 524).

c. Disconnecting means for a fire pump described in Rules 32-200 to 32-212 of the CEC must also be "***lockable in closed position***" (see Article 6-3.2.2.3(2) of the NFPA 20).

d. Rule 46-208(2) requires that "***the branch circuit overcurrent devices shall be accessible only to authorized persons***".

Appendix G of the CEC provides references to the VBBL requirements with respect to other particular electrical equipment that must reliably operate in the event of life and fire emergency. Such electrically connected equipment includes emergency generators, fire alarm systems, exit signs, emergency lighting, fire pumps, fire fighters' elevators, smoke control and smoke venting fans, motorized smoke and fire dampers, kitchen fire suppression systems, heat tracing, sprinkler and standpipe systems.

Some of these fans and dampers are located in public areas such as parking garages (i.e. smoke venting fans), and disconnecting means for this life safety equipment may be subjected to unauthorized access and operation by the public.

The intent of the CEC, VBBL and other related Standards with respect to the uninterrupted operation of this fire and life safety equipment could be compromised if the disconnecting means for this equipment is subjected to tampering.

DOC/2012/119683

CITY OF VANCOUVER

COMMUNITY SERVICES GROUP
Office of the Chief Building Official

BULLETIN 2000-044-EL

APRIL 19, 2007
(Revised June 20, 2007)

GROUND FAULT PROTECTION OF HEAT-TRACING CABLES FOR PIPE AND SOIL HEATING, ICE OR SNOW MELTING ON ROOFS OR CONCRETE OR ASPHALT SURFACES, AND SIMILAR APPLICATIONS OTHER THAN SPACE HEATING

This Bulletin provides clarification of ground fault protection requirements for electrical heating cable sets and heating panel sets that are installed for the purpose of electric surface heating in conformance with Rule 62-300 of the Canadian Electrical Code, Part I. (CEC)

Background

Rule 62-300 mandates ground fault protection of heat-tracing cables. This CEC requirement has been introduced into the Code due to fires that were attributed to damaged heat-tracing cables.

Although the City of Vancouver had mandated that ground fault protection of heat-tracing cables must be installed **on standpipe and sprinkler piping** since 1993 (Bulletin 2000-016-EL/PL), Subrule 62-300(4) now states that **all** electric heating cable sets and heating panel sets used in surface heating systems must be equipped with ground fault protection, unless these heating cable sets are installed in conformance with Rule 62-300(5).

Interpretation

1. Ground fault protection of a heat-tracing system installed on standpipe and sprinkler piping must conform to the applicable requirements of Bulletin 2000-016-EL/PL.
2. Each heat-tracing cable installed for purposes other than described in Bulletin 2000-016-EL/PL must be supplied from a dedicated branch circuit.
3. The circuit breaker protecting a dedicated heat-tracing branch circuit described in item 2 above must be provided with ground fault protection conforming to Subrule 62-300(4). Ground fault protection shall be set at not more than 30 mA and shall comply with manufacturer's instructions.

Original signed by
A.Z. Tsisserev, P.Eng.
Electrical Safety Manager;
Chief Electrical Inspector and City Electrician.

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DEC 19 2014
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COPY TO: CHS 111731 $243.00

CFT Engineering Inc.

#800 - 1901 Rosser Avenue
Burnaby, BC
V5C 6R6
Ph: (604) 684-2384
Fax: (604) 684-2402
e-mail: cft@cftengineering.com

TRANSMITTAL

TO: Boris Turishev — Boris.turishev@vancouver.ca
Building Policy Engineer
Licensing and Inspection,
Office of the Chief Building Official
515 W.10th Avenue,
Vancouver, BC V5Z 4A8

cc:
James Lau, Kasian Architecture — (Via Email) James.Lau@Kasian.com
Michael Garforth, Kasian Architecture — (Via Email) michael.garforth@Kasian.com
Mr. Kia Chen, Integral Group — (Via Email) kchen@integral-group.ca
Mr. Dan Wong, DENV Engineering — (Via Email) denveng7@email.com
Mr. Chris Widmeyer, Ivanhoe Cambridge — (Via Email) Chris.Widmeyer@ivanhoecambridge.com
Mr. Basir Mahroufi, SimplexGrinnell — (Via Email) Bmahroufi@simplexgrinnell.com

FROM: David Lee

DATE: December 15, 2014

RE: Fairmont Vancouver
900 West Georgia Street, Vancouver, BC

PROJECT #: C6758

TRANSMITTING: Revised Alternative Solution (AL. No. :AL401959)

Please find attached the revised Alternative Solution for the Fairmont Hotel Lobby Renovation project located at 900 West Georgia Street in Vancouver, BC, and cheque ($243.00) for the revised alternative solution fee. This alternative solution has previously been accepted but has been revised to allow for the protection of water-filled pipe located outside the building, that may be exposed to temperatures below 4°C (40°F), to be protected by heat-tracing and insulation. There have been no other changes to this alternative solution.

All revisions to the alternative solution are in italics.

If you have any questions, or require any additional information, please do not hesitate to contact our office.

Thank you.

David Lee, AScT, B.Tech

DL/tr

C6758_T03

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(Please print on pink paper)

CITY OF VANCOUVER

CITY OF VANCOUVER
OFFICE OF THE CHIEF BUILDING OFFICIAL

Community Services, 453 West 12th Avenue, Vancouver, BC, V5Y 1V4

ALTERNATIVE SOLUTION PROPOSAL

(In Accordance with Section 2.3 OF Division C of the Vancouver Building By-law)

BU 460130 — Building Permit No.

900 West Georgia Street, Vancouver — Project Address

September 24, 2014 — Date

For office use only

Cheque # 004640

Payment $ 704.00 Invoice Number: 7168610 AL Number: AL 401959

APPLICANT INFORMATION

(Professional Seal)

Proposed By: Michael Linton, P.Eng., CP

Firm: CFT Engineering Inc.

Address: #800 - 1901 Rosser Avenue, Burnaby BC

Phone: (604) 682-2384 Fax: (604) 682-2402 Email: mlinton@cftengineering.com

CODE REFERENCE(S) & SUMMARY OF DEVIATION(S) FROM VANCOUVER BUILDING BY-LAW: Sentence 3.1.8.4.(1) states that the fire protection rating for closures shall be determined on the basis of results of tests conducted in conformance with the appropriate provisions in the referenced standards for testing of door assemblies, window or glass block assemblies, or fire damper assemblies. Therefore, closures are required to be tested and listed by a recognized authority. Rather than provide listed door assemblies or fire shutters in the locations identified, tempered glass panels and tempered glass and wood doors, protected by designated sprinkler nozzles are proposed. As this system is not listed, an alternative solution is proposed. The proposed alternative solution will be based on the tested fire rated glazing system which has been demonstrated to provide a 1 h fire-resistance rating and information from the Construction Technology Update No. 12, published by the Institute for Research in Construction, and prepared by A.K. Kim and G.D. Lougheed.

BRIEF PROJECT DESCRIPTION: The Fairmont Hotel Vancouver is undergoing a tenant improvement of the hotel lobby and restaurant space. In order to maintain visual openess, glazed door assemblies and side lights are proposed for the two double entry doors and side lights located in the ground level breezeway off Burrard Street. These doors and side lights will be located in a required 1.5 h separation and require a minimum 1 h fire protection rating in accordance with Sentence 3.1.8.4.(2). The proposed glazed doors assemblies will be protected by specially located sprinklers and are identified on the architectural plans in Appendix A.

For office use only

PROPOSED ALTERNATIVE SOLUTION IS:

☑ ACCEPTABLE ☐ ACCEPTABLE (Subject to condition(s) noted below) ☐ REFUSED (For the reason(s) noted below)

For Boris Turishev

CHIEF BUILDING OFFICIAL

Oct 17, 2014

DATE

cc: Sender/Certified Professional
Chief Building Official
Deputy Chief Building Official
City Electrical Inspector
Building Policy Engineer

Manager, Processing Centre (Buildings) E.Hildebrandt
Manager, Building Inspection Branch
Manager, Plumbing & Gas Inspection Branch
Other Department _____ J.Hook

Engineer/Project Coordinator
District Building Inspector
District Electrical Inspector
Sprinkler Plan Reviewer

SUMMARY OF ALTERNATIVE SOLUTION CONTINUED:

OBJECTIVE(S) OF THE VANCOUVER BUILDING BY-LAW REQUIREMENT(S):

The purpose of testing and listing closures and assemblies is to ensure the minimum level of life safety and fire protection specified by the Building By-Law is met.

The intent of the 2007 Vancouver Building By-Law requirements are summarized by the objective and functional statements given in Divison A, Part 2 and 3. Those applicable to Sentence 3.1.8.4.(1) are identified as follows:

OS1 Fire Safety	An objective of this Code is to limit the probability that as a result of the design or construction of the building, a person in or adjacent to the building will be exposed to an unacceptable risj of injury due to fire. The risks of injury due to fire addresses in this Code are those caused by	
	[OS1.2]	Fire or explosion impacting areas beyond its point of origin
	[F03]	To retard the effects of fire on areas beyond its point of origin
OP1 Fire Protection	An objective of this Code is to limit the probability that as a result of design or construction, the building will be exposed to an unacceptable risk of damage due to fire. The risks of damage due to fire addressed in this Code are those caused by	
	[OP1.2]	Fire or explosion impacting areas beyond its point of origins
	[OP1.3]	Collapse of physical elements due to fire or explosion
	[F03]	To retard the effects of fire on areas beyond its point of origin

SUMMARY OF MITIGATING FEATURES:

Alternative solution - In order to maintain a visual openness within the Fairmont Hotel Vancouver, sprinkler protected glazed side lights and doors will be utilized to maintain required fire separations and fire protection ratings. As indicated above, the Building By-Law would require a 1 h fire protection rating for closures in a 1.5 h fire separation. The proposed protection system will consist of tempered and laminated glass protected by sprinkler.

The location of the doors to be protected are identified on the architectural plans in Appendix A.

Although the original testing was intended for a fire separation providing a fire-resistance rating rather than a closure providing a fire protection rating, the results are directly applicable provided the door assembly remains in a closed position. The door assemblies proposed will be equipped with a self-closing device and positive latching mechanism and installed to the tolerances specified by NFPA 80.

ANALYSIS AND EVALUATION TO VALIDATE ACCEPTANCE: Construction Technology Update No. 12, published by the Institute for Research in Construction, and prepared by A.K. Kim and G.D. Lougheed, presents the results of testing of a fire rated glazing system utilizing a pendent sprinkler located above the upper window mullion. The construction technology update No.12, prepared by NRC, is reproduced in Appendix B. The system tested permits the use of a specifically located pendent sprinkler to provide a 1 h fire-resistance rating for a glazed assembly and discusses a pony wall beneath the glazing.

The purpose of the pony wall is to prevent materials from being placed immediately adjacent to the tempered glass. For the application proposed, this is not a concern. The glazed door and fixed window assemblies to be protected are located in main circulation route and combustibles or other materials would not be stored adjacent to the glazed door and fixed window assemblies. Therefore, the provision of a pony wall is not necessary or relevant to the proposed application. In all of the locations proposed, the glazed doors and fixed windows to be protected are in main circulation routes which would not be appropriate for the storage of materials.

For protection of the doors and the fixed glazing system quick-response pendant sprinklers, as referenced in Construction Technology Update No. 12, will be employed. The following criteria will be used in the design of the Fire Rated Glazing System for the doors and side lights:

ANALYSIS AND EVALUATION TO VALIDATE ACCEPTANCE (Continued):

Architectural

1.	Glazing in Doors	Minimum 6 mm (¼ in.) thick tempered glass (2 x 9 mm tempered or tempered and laminated glass.
2.	Door Size	Maximum 2.4 m width for a single sprinkler (1,800 m total width proposed)
3.	Framing	Where framing is provided at the top of the door and side light assembly, the sill depth, between the face of the glazing and the face of the frame or wall cladding, may not exceed 100 mm. The maximum frame depth is associated with the configuration and location of the pendant sprinkler relative to the glazing.
4.	Door Hardware	The doors to be protected must be equipt with a listed self-closing device and latching mechanism. No horizontal hardware, such as panic hardware that would restrict the flow of water permitted across the face of the door.
5.	Baffles	Decorative or concealment baffles are permitted subject to review of acceptance by CFT Engineering Inc.
6.	Pony Wall	a 1 m (3 ft. 3 in.) pony wall is not required. In all of the locations proposed, the glazed doors and fixed windows to be protected are in main circulation routes which would not be appropriate for the storage of materials.

Mechanical

7.	Flow	Sprinklers in the FRGS will be designed to discharge at least 4.5 USgpm/lineal ft. with a minimum discharge of 27 USgpm per sprinkler. This is greater than the flow and pressure specified by Construction Technology Update No. 12 for the fire protection of windows using sprinklers.
8.	Water Demand	The fire rated glazing system will be hydraulically designed to accommodate the following: • the floor area system demand • all glazing protection sprinklers within the design area, and • the hose stream allowance.
8.	Water Supply	The water demand should be available for 1½ h, equal to the fire-resistance rating of the fire separation and exceeding the required fire protection ratings.
9.	Separate System	The Fire Rated Glazing System will be separate from the floor area sprinkler system from the point of connection to the riser and will be a separate sprinkler zone.
10.	Sprinkler Nozzles	Quick-response pendant sprinklers, 5.6 K factor.
11.	Sprinkler Piping	Noncombustible (metallic) sprinkler piping.
12.	Sprinkler Location	The sprinkler is located on both sides the door and fixed glazing system assemblies to be protected. Proximity of floor area sprinklers to be reviewed by sprinkler design engineer, and CFT Engineering Inc. and on site.
13.	Sprinkler Position	Sprinklers protecting the doors and the fixed glazing to be pendant sprinklers and installed in accordance with the Construction Technology Update No. 12, and the sprinkler listing as follows. The pendent sprinklers for doors are to be located at the center of the door sets to be protected, approximately (± 25 mm) 300 mm horizontally away from the glazing surface, and (± 25 mm) 300 mm above the top of the door.

ANALYSIS AND EVALUATION TO VALIDATE ACCEPTANCE (Continued):

13.	Sprinkler Position (Cont'd)	Sprinklers for the fixed glazing will be located at the center of the fixed glazing panel to be protected, approximately (± 25 mm) 300 mm horizontally away from the glazing surface, and (± 25 mm) 300 mm above the top of the opening.
14.	Sprinklers in Unheated Areas	For this project, because the tempered glass is located in an exterior wall, the sprinklers protecting the glazing on the breezeway side of the separation are permitted to be quick-response dry type pendent sprinklers.
15.	Posted Sign	A sign shall be permanently mounted beside the main water supply stating, "Special sprinkler heads on this system are an integral part of a fire separation. This water supply may only be shut off after all the proper authorities have received notice in writing."

ELECTRICAL

16.	Alarm Panel	Separate flow switches or alarm check valves, and control valves, shall be electrically supervised and indicated separately at the fire/sprinkler alarm annunciator panel.

The sprinklers in the Fire Rated Glazing System will be installed in accordance with NFPA 13 "Standard for the Installation of Sprinklers".

For office use only

STAFF COMMENTS AND RECOMMENDATIONS:

☐ Attached ☐ Noted in Prism

Comments By: _____ Position: _____ Date: _____

REVIEW PANEL COMMENTS:

Comments By: _____ Position: _____ Date: _____

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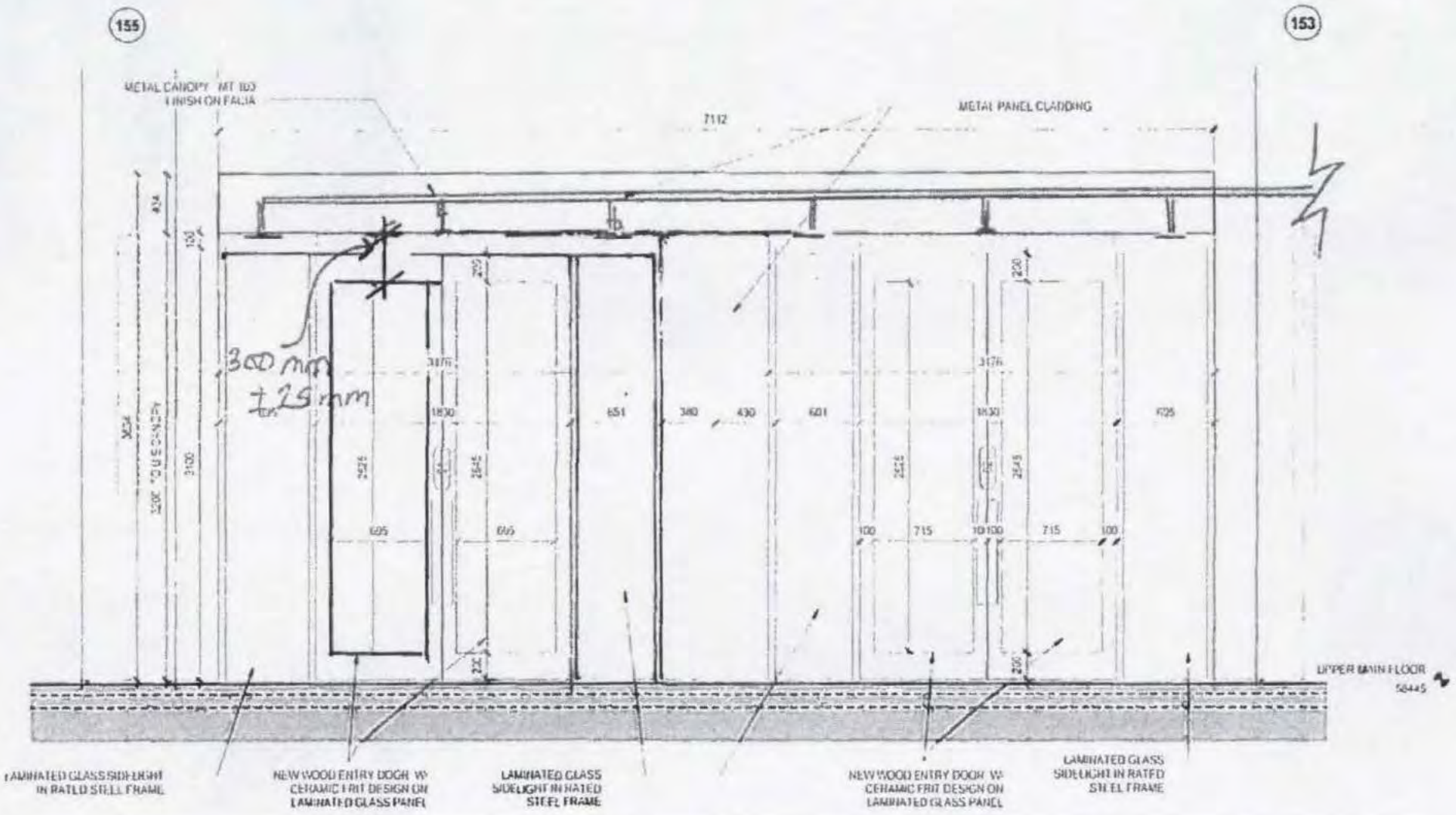
⊥ = PENDENT SPRINKLER



Kasian

FAIRMONT HOTEL VANCOUVER LOBBY REDESIGN

D01 D02 ELEVATIONS

150096
05/21/14
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MG
ASK-024

Fire Rated Glazing System
Conceptual Elevation

REV 1
OCTOBER 17, 2014

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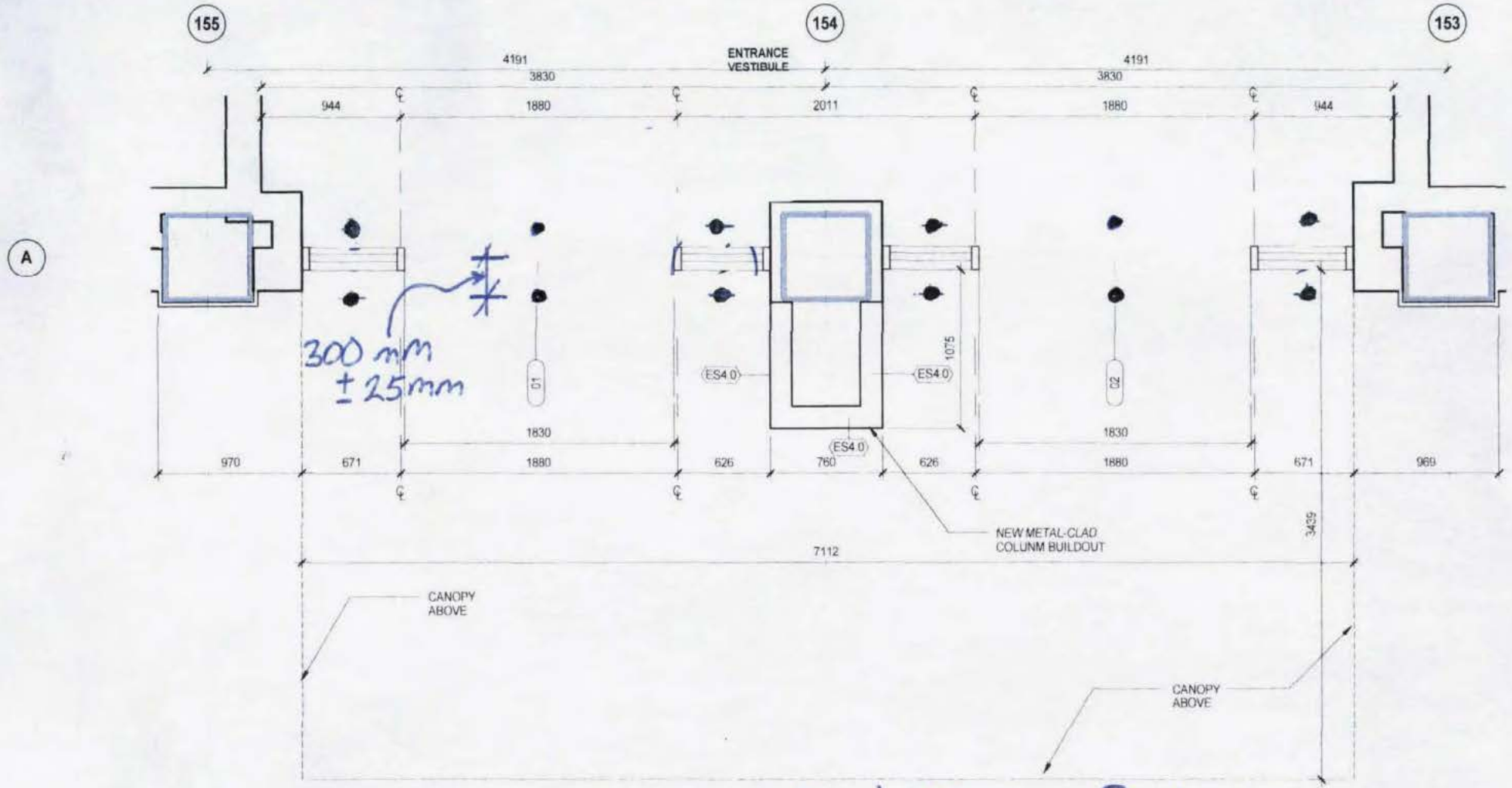

Fire Rated Glazing System
Sprinkler Locations - Conceptual Plan

kasian

PROJECT: FAIRMONT HOTEL VANCOUVER LOBBY REDESIGN

DRAWING TITLE: D01 D02 PLAN

PROJECT NO	150096
ISSUED DATE	04/30/14
SCALE	1 25
DRAWN	Author
REVIEWED	Approver

ASK-023

NRC · CNRC

Construction Technology Update No. 12

Fire Protection of Windows Using Sprinklers

by A.K. Kim and G.D. Lougheed

Building owners and designers have been limited in the extent to which they can use glazing in fire-rated separations. This Update presents the results of IRC research on the use of dedicated sprinkler systems to protect glazing in fires and provides guidelines that will ensure effective protection in different situations.

There is an increasing demand for the use of glazing assemblies in fire separations and in the building envelope for aesthetic, security and economic reasons. Ordinary glass cannot be used because thermal stresses will cause it to shatter after only a few minutes of exposure to fire. Therefore, for fire-rated assemblies, North American model building codes limit vertical glazing to wired glass in steel frames with a maximum glazing dimension of 1400 mm. This represents a severe restriction for designers.

To overcome these limitations without compromising fire safety, fire researchers at NRC's Institute for Research in Construction (IRC) developed a protection method involving the use of a dedicated automatic sprinkler system that applies a film of water to the glazing assembly.[1] The IRC investigations demonstrated that tempered or heat-strengthened glass (which, by itself, provides only minimal passive fire protection), protected by such a sprinkler system, will remain intact for more than 1 hour. Based on these studies, the sprinkler-protection system has been accepted by some code authorities for use in fire separations in buildings for specific applications.

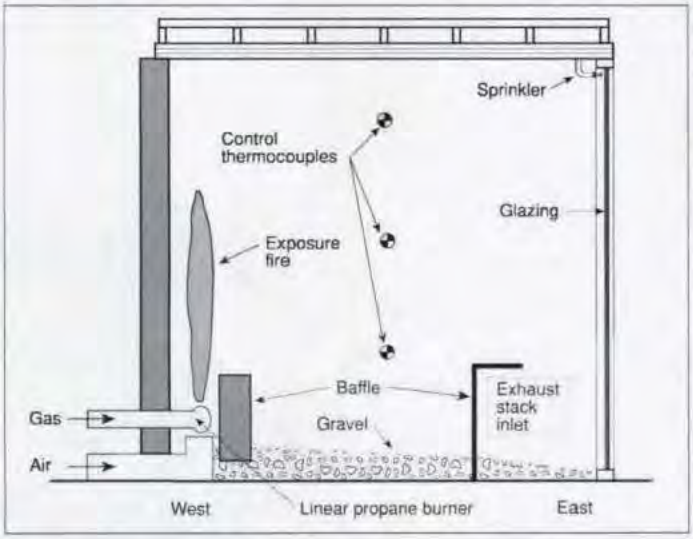

Figure 1. Section through test room

Thermal Shock

Tests with a small-scale radiant panel demonstrated that cold water applied to hot glazing can cause premature failure of the glass.[2] Without water protection, tempered and heat-strengthened glazing can sustain a glazing temperature on the exposed side of more than 350°C. However, when water was sprayed onto the hot glazing, the glazing failed at much lower temperatures. The critical temperatures established for heat-strengthened and tempered glazing are 150–165°C and 200°C, respectively.[2] The critical temperature for plain glass (80–90°C) is too low to allow for effective protection using a sprinkler system. These investigations established that in order for a sprinkler to provide effective protection, it must be activated before the glazing temperature exceeds its critical level.

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NRC Test Facility

The full-scale fire tests on sprinkler-protected window assemblies were conducted in a room with a floor area of 3600 mm by 3300 mm and a ceiling height of 3300 mm.[2] A sketch of the test facility is shown in Figure 1.

Fire exposure was provided by a linear propane burner installed near the floor adjacent to the west wall of the test room. Combustion air was supplied through a perforated steel duct located beneath the burner. Combustion products and steam were withdrawn from the room using natural ventilation through two exhaust stacks with a 600-mm by 450-mm cross-section.

Fire Exposure

The fire exposure was established by conducting a preliminary test without sprinkler operation to determine the propane flow rate required to maintain the average temperature in the enclosed compartment as close as possible to the standard time-temperature curve, used for determining the fire resistance of building assemblies.[3]

The propane flow rate determined in the calibration test was then used for the tests with sprinkler protection. The only sprinklers operating during the tests were those used to protect the window assembly. Although such a system would, in most cases, be used in a building with overall sprinkler protection, it is assumed that the window-protection system would be a dedicated one, separate from the main sprinkler system.

Design Considerations

Specific design considerations for a dedicated sprinkler-protection system for a full-height (floor to ceiling) window assembly are addressed below. These include:

- window width,
- mullion depth, and
- multi-sprinkler systems.

For all tests, a fast-response sprinkler was used.[1,2,4] In the tests, a sprinkler was installed in a horizontal orientation and positioned at the top centre of a window assembly. The centreline of the sprinkler's deflector was located 50 mm below the top window frame, and the deflector positioned

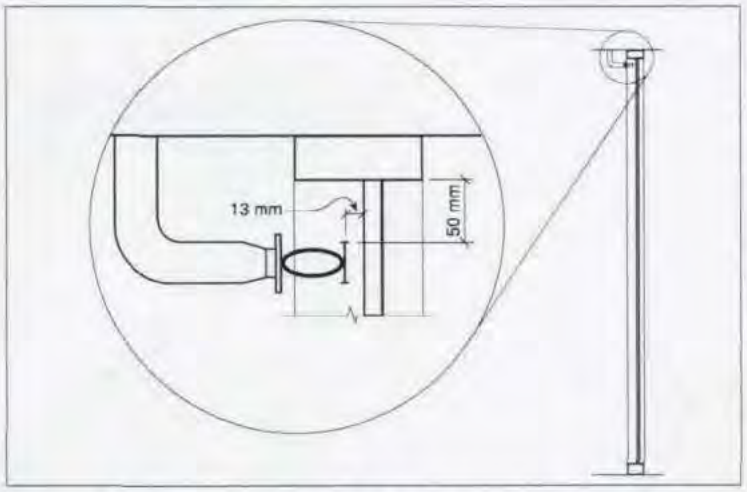

Figure 2. Sprinkler location relative to full-height window assembly (section)

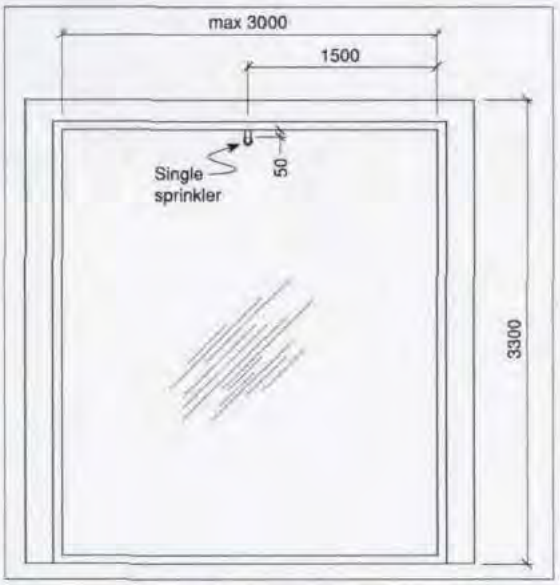

Figure 3. Location of single sprinkler for protection for full-height window assembly (elevation)

13 mm from the glass (see Figure 2). The sprinkler was activated by the fire, and the water pressure at the sprinkler was maintained at 145 kPa.

To provide adequate protection, the fast-response sprinkler must have a temperature rating of 74°C and a Response Time Index (RTI) of 22.7 $m^{1/2}s^{1/2}$ or lower.

Window Width

Tests were conducted to determine the maximum width of glazing that can be protected using a single sprinkler. For glazing 3000 mm wide, with no separating mullion, the water spray from a single sprinkler provided good coverage for all surfaces of the window and frame, with adequate water film flow on the glazing surface (see Figure 3). Glazing temperatures reached steady conditions in less than 10 minutes and the window system maintained its integrity for the 2-hour test duration.

Mullion Depth

Tests were conducted with 10-mm and 25-mm deep mullions. The results indicated that mullions with depths of 25 mm or more interfered with the water spray to the glazing on both sides of the mullion. The conclusion is that a single sprinkler will not provide adequate protection for such a glazing assembly. For windows with mullions more than 25 mm deep, therefore, multi-sprinkler protection systems should be considered.[4]

Multi-Sprinkler Systems

When a multi-sprinkler system is used to protect a wide window or a window with a deep mullion, the water spray from the first

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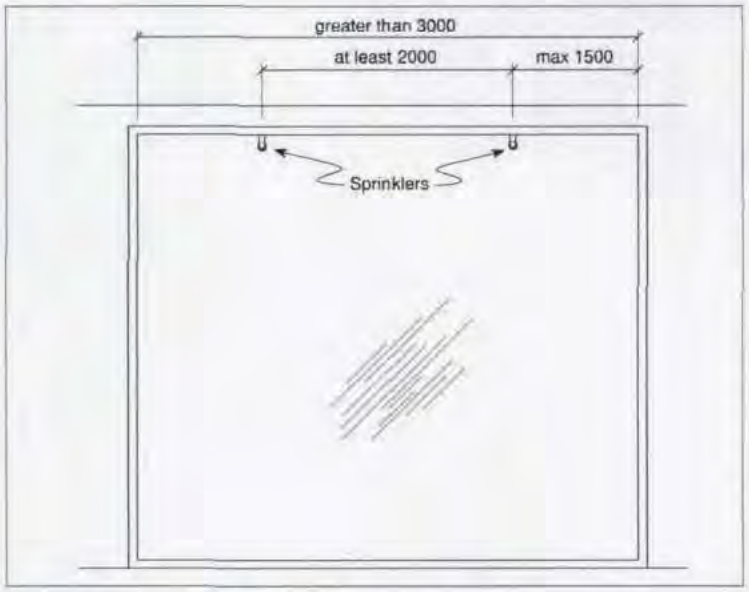

Figure 4. Location of sprinklers in multi-sprinkler system for protection of wide windows (elevation)

sprinkler activated could delay the activation of an adjacent sprinkler. Tests were conducted to study the problem.

For very wide windows without a mullion, the activation times of sprinklers, located 2000 mm from a sprinkler operating at a pressure of 145 kPa, were in the range of 5 to 7 minutes. However, the critical temperature for the glazing was not reached until 10 to 11 minutes. As such, the second sprinkler would activate before critical conditions are reached. Therefore, a wide window or a window without mullions can be protected by a multi-sprinkler system, without the concern of delayed sprinkler activation, when sprinklers are located at least 2000 mm apart (see Figure 4).[4]

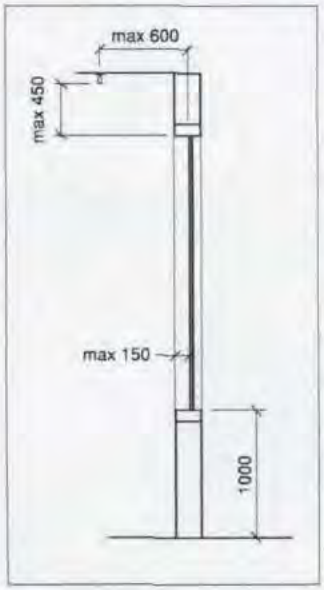

Figure 5. Limiting distances for ceiling-mounted pendent sprinklers (section)

When there is a centre mullion (of at least 50-mm depth) between the sprinklers, the influence of water spray from the adjacent sprinkler is not significant; in this case, the second sprinkler activated in less than 40 seconds.[2]

The activation time of the second sprinkler is dependent on sprinkler orientation and location. If the geometry is changed, the overall protection system should be evaluated to determine the effectiveness of the dedicated sprinkler system.

Ceiling-Mounted Sprinklers

The use of ceiling-mounted pendent sprinklers to protect glazing assemblies is of particular interest to building designers for aesthetic reasons. A study to determine the effectiveness of such a system revealed two concerns: sprinkler activation time and water spray pattern onto the glazing surface.

Sprinkler activation time. Ceiling-mounted sprinklers, both standard and fast-response, did not activate in time to protect full-height tempered glazing from a small fire located on the floor adjacent to the glass.[4] This limits the use of ceiling-mounted sprinklers in protecting glazing assemblies. They can, however, be used in those cases where the base of the glazing is at least 1000 mm above the floor. In such instances, the chances of having a localized fire impinging directly on the glazing are small and, thus, the system would not likely be faced with this challenge.

Spray pattern. A series of spray-pattern tests indicated that the probability of glass breakage from fire exposure increases generally with an increase in sill depth, an increase in sprinkler height above the top of the glazing and an increase in sprinkler distance from the window.[2] This is based on the size of the dry area on the glazing observed for each configuration. As the dry area increases, there is an increased probability of glass breakage from thermal stress. Based on these studies, maximums for each parameter were established as follows (see Figure 5):

- a sill depth of 150 mm,
- a sprinkler height above the window of 450 mm, and
- a sprinkler distance of 600 mm from the window.[4]

For design purposes, the three parameters are interrelated. The designer should select distances that will maximize water spray to all areas of the glazing.

Fire tests using a ceiling-mounted sprinkler with a 1800-mm-wide tempered glazing system at these maximum distances showed that the water spray was sufficient to provide 1-hour fire protection.

If a ceiling-mounted fast-response sprinkler is located at an ideal position — 300 mm away from the glazing surface, and 300 mm above the top of a window with a window-sill depth of 50 mm or less — the water spray provides sufficient protection for a window assembly with tempered glazing and a maximum width of 2600 mm (see Figure 6) for at least one hour.[2] For a wider window, a multi-sprinkler system should be used. The delay in sprinkler

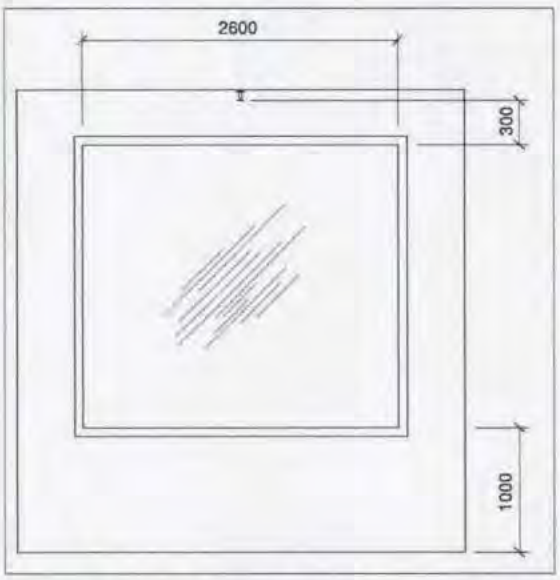

Figure 6. Location (ideal) of ceiling-mounted pendent sprinkler relative to window assembly (elevation)

activation due to adjacent sprinkler operation is not a problem if the sprinklers are spaced at least 1800 mm apart.

Summary

The IRC studies indicated that tempered or heat-strengthened glazing could be protected for more than one hour using a dedicated sprinkler system. However, there are certain limitations on glazing width, mullion depth, the use of single vs. multi-sprinklers, and the use of ceiling sprinklers. For the sprinkler system to perform effectively in protecting window assemblies, these limitations must be taken into account. They are summarized as follows:

- A dedicated fast-response sprinkler can be used to protect a full-height window assembly from both a large compartment fire and a small fire located on the floor immediately adjacent to the glazing. The sprinkler should be mounted adjacent to the glazing at the top centre of the window assembly.
- A single sprinkler should not be used to protect glazing wider than 3000 mm.
- A single sprinkler should not be used to protect a window assembly with a mullion having a depth of 25 mm or more.
- A multi-sprinkler system can be used to protect glazing wider than 3000 mm if the sprinklers are spaced at least 2000 mm apart.
- If there is a centre mullion with a depth of at least 50 mm located between the sprinklers, the spacing between the sprinklers need not be limited.
- A ceiling-mounted pendent sprinkler can be used to protect a window assembly whose base is at least 1000 mm above the floor.
- For a ceiling-mounted pendent sprinkler, the maximums for certain parameters were established as follows: a sill depth of 150 mm, a sprinkler height above the window of 450 mm, and a sprinkler distance from the window assembly of 600 mm. Because these three parameters are interrelated, the designer should select distances that maximize water spray to all areas of the glazing.
- For a ceiling-mounted fast-response sprinkler at the ideal location (300 mm above the window and 300 mm from a window with a sill depth of 50 mm or less), glazing with a maximum width of 2600 mm can be protected for up to 1 hour.
- For multi-sprinkler arrangements mounted on the ceiling, the sprinklers should be spaced at least 1800 mm apart.

References

1. Richardson, J.K. and Oleszkiewicz, I. Fire Tests on Window Assemblies Protected by Automatic Sprinklers, Fire Technology, Vol. 23, No. 2, May 1987, pp. 115-132.
2. Kim, A.K. and Lougheed, G.D. The Protection of Glazing Systems with Dedicated Sprinklers, Journal of Fire Protection Engineering, Vol. 2, 1990, pp. 49-59.
3. CAN4-S101-M82, Standard Methods of Fire Endurance Tests for Building Construction and Materials, Underwriters' Laboratories of Canada, Scarborough, ON, 1982.
4. Kim, A.K. Protection of Glazing in Fire Separations by Sprinklers, Proceedings of the Sixth International Interflam Conference, Oxford, UK, 1993, pp. 83-93.

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Permit AL401959 Street number To Street name Search

General Information

Permit	AL401959	Type	AL - ALTERNATIVE SOLTNS
Permit address	900 W GEORGIA ST	Status	ACCEPTED
Specific address		Opened	10 Oct 2014
Place name	VANCOUVER HOTEL	Issued	
Addressing data			
Coordinate	- - -		
Legal Description	LOT BLOCK PLAN DIST		
Project value	$0.00	Purpose to	-
Assessed value	$0.00	Subtype	-
Temporary bldg		to	
Temporary use		to	
Complexity	-	Sets of plans	0
Signature on	-	Metric?	

Permit AL401959 Street number To Street name Search

Note Types

Note Type	Number of notes for this permit
09 - INTERNAL NOTES	1

Notes

Number	Title	Included?	List seq	Updated By	Date Updated
002	OFFICE OF THE CBO		002	B TURISHEV	09 Mar 2015

Oct 17, 2014. AL accepted after sketches were updated.

Jan 15, 2015. Comments sent to CFT (dry sprinklers, sketches, scope of responsibilities discussions).

Mar 09, 2015. Revised AL accepted.