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## Sprinkler Based Alternative Solutions Performance and Reliability Issues

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The use of sprinkler protected glazing and water curtains are often considered as providing an equivalent means of protecting openings and fire hazards in buildings where the prescriptive requirements of the Code present functional conflicts. However, two issues related to long term reliability and effectiveness of these systems need critical appraisal in any proposal for alternative solution under Subsection 2.3 of Division C of the Vancouver Building By-law (VBBL).

Noting that there are already over 60 “trade-offs” or relaxations permitted for sprinklered buildings in the Vancouver Building By-law, designers need to be aware of the potential risks in placing total reliance on the operation of sprinkler systems to control fire. Many of the conditions which can lead to failure of a sprinkler system are also likely to affect fire rated glazing systems and water curtains. Care needs to be taken in preparing alternative solution submissions in order to ensure that some balance between active and passive fire protection is maintained in case of sprinkler or water supply failure.

### **1. RELIABILITY**

The basic Code requirement to provide two independent means of egress is not relaxed in sprinklered buildings as exits are required to protect the occupants whilst evacuating the building, particularly in the event of failure of active fire protection systems. In order to enhance the reliability of exit enclosures, Article 3.4.4.4. of Division B of the VBBL restricts protected openings in exits to those necessary for the use of essential services and doorways. Accordingly, the City will not accept that exit enclosures employing sprinkler protected glazing or water curtains can provide a level of safety to the occupants equivalent to that provided by a conventional fire rated enclosure in which protected openings are limited in accordance with Article 3.4.4.4. of the VBBL. Where glass is required to meet security or functional requirements, the use of ceramic glazing listed for use in fire rated assemblies with temperature rise limits may be considered.

As of the 2014 edition of the VBBL, criteria for protection of exit exposure have been introduced (see Sentence 3.2.3.13.(4) and (5) ). It is expected that the level of performance of these measures where addressing occupant loads of 10 persons or less is sufficient. Where larger occupant loads are considered, an Alternative Solution is required and must include a discussion considering the reliability of such designs. Examples of previously accepted features include passive measures such as: Alternative exits in close proximity, or secondary water supplies.

**2. POST EARTHQUAKE FIRES**

The City also has legitimate concerns that its vulnerability to post earthquake fires not be increased significantly in any alternative solution dealing with spread of fire across property lines or between buildings on the same site. Several major earthquakes in this century have been accompanied by uncontrolled spread of fire due to numerous factors including failure of the water distribution system, degradation of the emergency response capability, communication problems and damage to gas and electrical systems.

It should be noted that current Code provisions for maintaining spatial separation of buildings are based on a Fire Department response time of 10 minutes with allowable unprotected openings doubled for sprinklered buildings. As a rapid Fire Department response and unimpaired operation of the water supply cannot be relied upon in the period following a major earthquake, prudence suggests that further dependence on sprinkler systems to control fire spread in this scenario would be unwarranted. Accordingly, the City does not consider that water curtains or fire rated glazing systems should be used to provide protection against spread of fire to adjacent properties or buildings unless a separate and independent seismically resistant water supply can be provided. This issue is not a concern where a loading bay creates an exposure condition onto an adjacent lane provided the loading bay does not contain combustible linings. An independent seismically resistant water supply is also not required for water curtains where they are proposed to address spatial separation requirements of existing window openings.

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