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# Protection of Openings in Buildings – Version 2, July 2010

Fire and Security Consulting Services (FSCS) is frequently consulted on the methodology of protecting openings in buildings. FSCS has some concerns about the BCA DtS solutions and the following paper explains the limitations of the use of sprinklers.

This Version of the paper (V2) now takes into account the comments in "Guide to Volume 1" to the Building Code of Australia (BCA) 2010 edition. The Guide now states that "*For openings other than doorways or windows, C3.4 (a) (iii) (A) clarifies that internal or external wall wetting sprinklers are not recognised as an acceptable method of protection for voids under the Deemed-to-Satisfy provisions. Conventional wall-wetting sprinklers need a medium or surface to at on. An opening consisting of a void does not provide such a medium or surface.*"

This is now consistent with AS2118.2 which states that *"openings without infills cannot be protected"*

This paper only addresses buildings which are not sprinkler protected. A companion paper entitled "Protection of Openings in Sprinkler Protected Residential Buildings" should be referenced. This paper addresses Class 2, 3, 4 and 9c buildings and other residential buildings such as class 9a where Quick Response residential sprinklers are installed.

## Background

BCA clauses C3.2 and C3.3 require protection of openings in external walls of buildings to prevent fire spread from either an external fire source or from one fire compartment to another. Compliance with these clauses is detailed in BCA C3.4 and Specification C3.4, including the use of "internal or external wall wetting sprinklers as appropriate" . The functional objectives of the requirement are listed in BCA CF2 (d) and (e). CV1 and CV2 in the BCA are cited as acceptable verification methods. The FSCS paper entitled "Heat Flux Calculations and Assessment" provides further information on this subject.

The concept for protection is that a combination of distance from the fire source and the sprinkler discharge on the receiver building surfaces will attenuate the heat flux (radiation) such that ignition of materials in or on the surface of the receiver building will be prevented. The guide to the BCA under CV1 lists the radiant heat levels that materials will ignite is between 10kw/m$^2$ and 35kw/m$^2$ dependant on various circumstances.

A typical compliant arrangement to BCA C3.4 is shown in Figure 1 below where the fire source is either an external fire or a fire in an adjoining building or fire compartment.

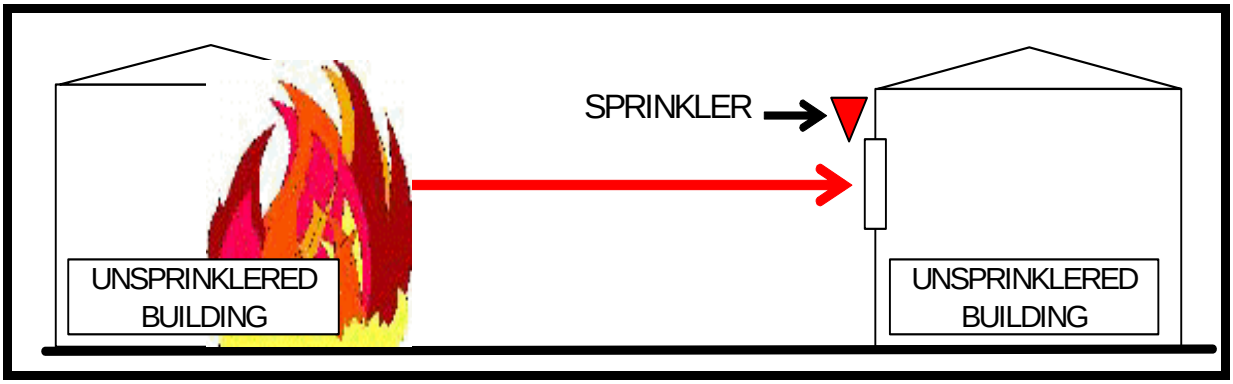


Figure 1 – BCA Compliance

**The Australian Standards**

The BCA only recognises (adopts) Australian Standard (AS) 2118.1, however AS2118.2 is considered to be the appropriate design document and is referenced in. Clause 2.6 of AS2118.2 states that "the receiver building shall be provided with sprinklers at all openings"

From an engineering standpoint, the fire source is known as the **emitter** and the opening to be protected is known as the **receiver**.

AS2118.2 details certain requirements for the spacing, hydraulic design and use of sprinkler heads in the manner in which they have been tested. Such test data will include spacing, flow, sprinkler orientation and constraints on obstructions such as mullions and transom (glazing) bars.

Whilst BCA C3.4 (a) is correct in that it is required that the openings have (automatic) self closing doors or windows or permanently shut windows or a surface on to which the sprinklers can discharge, the BCA fails to clarify that the DtS arrangement is for protection of openings in the **receiver** building.

Accordingly there is a misconception that openings in the **emitter** building can be protected with sprinklers. This is not an acceptable solution to be used when compliance with the Deemed to Satisfy provisions (DtS) of the BCA is required. The rationale here is that sprinkler protection of openings in the **emitter** building may be ineffective because:-

1. Windows and / or doors may not be closed;
2. If closed, window glazing will fail (see Figure 2);
3. The sprinkler system may fail.

Figure 2 below shows fire emitting from an apartment fire. It is obvious that glazing in this window would have failed.

Figure 2 – Fire Emission

It can be argued that where the emitter building is sprinkler protected, then compliance with BCA C3.2 is not necessary and openings in the receiver building do not need protection because the fire in the emitter building will be suppressed by the sprinkler system. This is not necessarily valid because this means that the owner / occupier of the receiver building will be reliant on the owner / occupier of the emitter building to maintain the sprinkler system or the owner of the adjoining property not to have a fire. This is especially relevant where the emitter building is located on an adjacent lot.

However the FSCS companion paper entitled “Protection of Openings in Sprinkler Protected Residential Buildings” addresses buildings on the same lot where both the emitter and receiver buildings are sprinkler protected and is especially relevant to BCA Clauses C3.2 (a) (iii), C3.3 and Verification Method CV2.

However there are circumstances where it may be valid to protect the emitter building. This is especially so in other circumstances where persons egressing past openings in a building need to be protected from radiant heat flux. A Fire Engineer is required to carryout this assessment.

**Summary**

1. Openings in the receiver building need to be protected in accordance with BCA C3.4.
2. AS2118.2 must be the Standard to which the sprinklers are to be installed. It is not acceptable that sprinklers are randomly installed over openings. The design and installation must be executed by properly qualified and licensed persons and Certified with both Form 15 and Form 16.
3. AS2118.2 states in a Note to Table 2 that sprinkler protection of openings glazed with tempered or wired glass in metal frames is not suitable where the received radiation exceeds 40kW/$m^2$ i.e. it is not a DtS solution.
4. Tests carried out in Canada show that tempered glass with special sprinklers can remain intact for 2 hours and that radiant heat flux can be attenuated by ~80% subject to specific design criteria to protect the integrity of the sprinkler system.
5. Emitted or received Heat Flux can be attenuated by stainless steel screens fitted to openings in either the emitter and / or receiver building and radiant heat flux can be attenuated by ~40% so that the need for sprinklers to be fitted to openings in the receiver building may be eliminated. Details of such are provided in FSCS paper entitled “Heat Flux Calculations and Assessment”.

Methods 4 and 5 above however, must be subject to a "Performance Based Alternative Solution" by a Fire Engineer.

I trust that this paper provides information that you will find helpful.

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