AON SPRINKLER CERTIFICATION

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Aon Sprinkler Certification Technical Note		
Note Number: TN17-35	**Issue: 1**	Date: 18/17/2017
Subject	**Challenging Ceilings**	
Notice: Aon Sprinkler Certification Technical Notes provide guidance notes which may be used in certification of sprinkler installations by Aon New Zealand. If sprinkler installations are being certified by any other Sprinkler System Certifier, these Technical Notes may not apply.		

There is a current architectural trend for more open grid ceilings and suspended ceiling clouds. In some cases, these ceiling designs do not fit within the parameters given in NZS4541:2013. The purpose of this technical notice is to provide guidance to contractors and architects for those cases that do not.

Open Grid Ceilings

NZS4541:2013 requires 1000mm vertical separation between the slatted ceiling and the level of the sprinklers however AS2118.1:2006 clause 5.5.9.5, allows for 800mm and NFPA13:2016 clause 8.15.14 allows as little as 450mm. Subject to the sprinkler discharge design criteria from these standards being applied, the open grid ceiling clauses of AS2118:2006 or NFPA13:2016 may be applied under the provisions of NZS4541 clause 117, with specific approval of the SSC.

Where there are ducts or other similar objects within the clear space, the sprinklers need to be spaced to comply with the obstruction table. In the case that a duct requires sprinklers beneath to comply with clause 512.4 and the minimum vertical distance to the ceiling is not maintained, reference to the published spray patterns from the sprinkler head manufacturers can be made. By using the published spray patterns, the contractor can determine the diameter of the spray pattern when it reaches the ceiling grid and reduce the spacing of the sprinklers beneath the duct to the corresponding value.

Ceiling Clouds

Ceiling clouds are suspended features that hang beneath the level of the main ceilings. They are manufactured normally from hard materials, when used exclusively as a decorative feature, or soft materials, when utilised as a sound attenuation feature.

It is necessary to achieve both coverage across the whole floor and adequate detection. To meet both requirements it may be necessary to install sprinklers

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beneath every cloud although an element of designer's judgement is required. Where such judgement is applied it must be conservative.

Where the clouds are level and coplanar, it is not necessary to install sprinklers beneath every cloud based on the following criteria:

1) Calculate the gap area fraction: mm/mm. This is the gap in millimetres between the clouds divided by the height of the cloud ceiling in millimetres;
2) Determine the size of the smallest cloud in the subject area in metres;
3) Apply the Sprinkler Spacing Rule Table to determine if some clouds may be skipped.

Sprinkler Spacing Rule Table for Cloud Skipping			
Cloud Size	Gap Area Fraction to Ceiling Height		
	Each cloud	Every Other Cloud	Every Third Cloud
Over 3 m	Up to 0.833		
1.5 m to 3 m	>0.0021	<0.0021	
0.9m to 1.5 m	>0.0038	0.0025 ≤ gap ≤ 0.0038	<0.0025
0.6 m. to 0.9 m.	>0.0041	0.0029 ≤ gap ≤ 0.0041	<0.0029
Under 0.6m	>0.005	0.0033 ≤ gap ≤ 0.0050	<0.0033

Table copied from NFPA13:2016.

Where clouds are of unequal size and spacing, apply the Table based upon the combination of largest cloud size and maximum gap.

In all cases of extensive cloud ceilings, the design requirements are for 50% of the design area at ceiling level to operate and 100% at the level of the cloud ceilings. Where cloud ceilings have been installed sporadically, the design requirement is 100% of the design area at the ceiling plus all sprinklers in the cloud ceilings within the footprint of the ceiling level design.

<u>Tension Fabric or Membrane Ceilings</u>
We can accept this product being used in sprinkler protected buildings in a limited fashion. The following restrictions apply:

1. May be used in small discrete areas subject to:
   a. The tensioned fabric is at, or about, the same level as the ceiling, and

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b. The sprinklers are located within rule, whether the tensioned fabric was installed or not;

or

2. May be used as a lining closing in a ceiling pocket, subject to:
   a. Each ceiling pocket is separated by a bulkhead with sprinkler heads in the bulk head.
   b. The ceiling pocket is no deeper than 350 or 450mm (refer clause 503.1), or
   c. the ceiling pocket comply with the ceiling pockets rules in in clause 503.4.

Option 2 is an attempt to accommodate when the tension fabric is being used as a back lit lighting box.

Where extensive use of tensioned fabric or membrane ceilings has been used reference shall be made to FM1-59 or another recognised design standard.

Stephen Ridder
Fire Protection Consultant

References:
AS2118.1: 2006
NFPA13: 2016
Floyd, Jason and Dinaburg, Joshua. July 2013. "*Sprinkler Protection for Cloud Ceilings*." Quincy, MA: Fire Protection Research Foundation.
Floyd, Jason, Strege, Steve, and Benfer, Matt. August 2014. "*Sprinkler Protection for Cloud Ceilings – Phase 2: Small Area Clouds*" Quincy, MA: Fire Protection Research Foundation.
FM1-59 *Fabric and Membrane Structures*.