

Aon New Zealand
 Aon Sprinkler Certification
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Aon Sprinkler Certification Technical Note

Note Number: TN15-17	Issue: 1	Date: 21 August 2015
Subject	Contractors and Designers Newsletter Number 1 Bracing and Hanging.	
<small>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.</small>		

This newsletter (in the form of a Technical Note) has been published to update contractors and designers with a number of issues that have come to Aon’s attention, that have the potential to cost them time or rework costs.

We sometimes hear “we have always done it this way, why should we change it.” This newsletter also is intended to point out that installation practices have changed, and that your installation staff need to be trained on these changes.

We intend to publish a number of these newsletters, with varied topics as Technical Notes. The FPA have agreed to have our notes available on their website:

<http://www.fireprotection.org.nz/online-resources/aon-technical-notes>

1. Seismic Bracing

Contractors are reminded that there is an increasing emphasis on seismic bracing for all trades, following a study of building systems failures following the Christchurch and Wellington Earthquakes of the past few years.

Key changes in practices between the past and the modern era include:

- Consultants are now specifying seismic design criteria which exceed the de facto design acceleration of 1.0g specified in NZS4541. We have recently seen a project where the specified acceleration was in the order of 4g.

The implications of increased design loads can include:

- Requirements for more substantive braces.
- Requirements for closer spacing of braces.
- Requirements to allow for upwards thrust loads on braces.
- Inability to use the “150mm threaded rod” rule.
- Requirement to present a Producer Statement under the authorship of a Chartered Professional Engineer for bracing (and hanging) designs.
- Selection of seismically rated fixing – in particular, masonry anchors that have been listed for seismic applications.

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- Contractors are reminded that NZS4541 requires that bracing designs are shown on as-built drawings. NZS4541:2013 clause 112.2(b) refers.
 - Unless the bracing design is evident, (in that pipe work is clamped hard to the structure, or the length of threaded rods used as part of the bracing design is less than 150mm), calculations to substantiate the design need to be included with the Completion Documentation submission.
 - By copy of this note to Inspection Companies, Aon asks that they report on whether the completion documentation designs should include bracing calculations.
- Contractors are also reminded that attention to detail is required. For example:
 - Where are the bracing attachment points?
 - Is the structural engineer aware of the attachment points?
 - What kind of fixings are being used?
 - Are they seismically rated?
 - Are installation requirements being met?
 - Edge distances.
 - Minimum separation between fasteners
 - Rated loads?
- NZS4541 has also clarified that cognisance needs to be made of differential movement between ceilings and sprinklers. This is as a direct observation of failures in Christchurch (where in particular, gib type ceilings sheared a large number of sprinklers throughout the city) and some overseas earthquakes, such as the Northridge, California earthquake of 1994. If ceilings are not braced to the same structure and will not move with sprinkler pipework, then the design choices will largely be:
 - Install flexible dropper assemblies.
 - Provide oversized escutcheon plates.
- NZS4541 also states that if drops are longer than 1.2m, that they need to be braced. This could entail the use of longer flexible droppers, In some cases, we have seen designs which incorporate 4 way bracing wires. In other cases, it may be possible to brace the bottom of the drop to the ceiling structure itself.
- While it is not specifically stated in NZS4541, NZS4219 requires that clearances be provided between all services. This is being applied to Sprinkler Systems. Aon's Technical Note 14-14 outlines the requirements of NZS4219 in this regard. While it could be argued that sprinkler systems are exempt from complying with NZS4219, the overarching requirement of NZS4541 to ensure that a sprinkler system remains functional after an earthquake will require that these separation distances are complied with.

One very common omission in bracing designs is the lack of 4 way bracing on risers. Often risers are located without consideration to the need for such braces.

2. Pipe Hanging

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Related to seismic bracing issues are pipe hanging issues that have come to our attention. NZS4541 requires that hangers and fixings are designed to support five times the weight of water filled pipe plus 100kg.

In design supports to meet this standard, it is noted that manufacturer data sheets:

- Generally will show different safety factors, which do not meet the requirements of NZS4541; and
- When analysing their suitability for use in sprinkler systems, it is permissible to remove the manufacturer’s safety factors and then determine if the component is suitable for the load required to be applied by NZS4541.

To illustrate this, we have carried out a review of a widely available hanger, namely a Unistrut UN-18 pipe clamp.

The manufacturer’s data sheet for this clamp shows that for pipe outside diameters of 114mm and greater, that it is rated for a working load of 1.78kN, with a safety factor of 2.5.

If this Safety factor is backed out, and NZS4541’s requirement to support five times the weight of water filled pipe plus 100kg is applied, then this clamp can be used to support a total pipe mass of 71kg.

As the weight of 100mm water filled pipe (medium grade) is 21.1kg/m, hence if these clamps are being used, they need to be spaced at approximately 3.3m centres. (Two per stock length.) They would not normally be suited for use to support 150mm pipe.

Pipe Clamps - Medium Duty

Part No.	Dimensions					W x T	Working Load	Mass kg
	OD	A	B	C	DR			
UN18-060	60	154	114	75	14	40 x 5	1.24 kN	1.10
UN18-076	76	170	130	88	14	40 x 5	1.24 kN	1.16
UN18-089	89	183	143	99	14	40 x 5	1.24 kN	1.24
UN18-102	102	196	156	108	14	40 x 5	1.24 kN	1.32
UN18-114	114	210	170	116	14	40 x 6	1.78 kN	1.36
UN18-127	127	221	181	124	14	40 x 6	1.78 kN	1.46
UN18-140	140	234	194	132	14	40 x 6	1.78 kN	1.56
UN18-152	152	246	206	139	14	40 x 6	1.78 kN	1.60
UN18-165	165	259	219	146	14	40 x 6	1.78 kN	1.66
UN18-178	178	272	232	153	14	40 x 6	1.78 kN	1.77
UN18-203	203	297	257	167	14	40 x 6	1.78 kN	1.80
UN18-219	219	313	273	175	14	40 x 6	1.78 kN	1.86
UN18-230	230	324	284	181	14	40 x 6	1.78 kN	2.10

Note: Standard Finish: Hot Dipped Galvanized.
Safety Factor: 2.5

Other issues that we have been alerted to is that we understand that pressed boss type base plates and split clips (munzing rings and the like) have no formal rated load capacity. While the pressed boss type plates have provided many years of service with no reported incidents of widespread failure, given the increasing need to provide Producer Statements from Chartered Professional Engineers for pipe support and bracing systems, unless the manufacturers can provide evidence of their load ratings, alternatives to these hangers need to be employed in sprinkler installations.

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We stress that the issue with some of these products is one of simply not being able to be provided with information that they meet the requirements of NZS4541. We do not suggest that a retrospective upgrade of existing systems is required.

Other issues we have encountered include:

- Pipes supported from purlin stiffeners/ties/braces. Has the structural engineer approved the loads being imposed on these items?
- 10mm threaded rod used to support 150mm pipe at 6.5m centres.
- Hangers fixed into infill panels in Stalton type construction. Has the strength and load capacity of the timber been assessed?
- Hangers being fixed into the bottom of EPS type panels, using pop rivets or tek screws.
- Sprinkler pipes being hung or braced off other services such as cable trays and the like.

3. Designs

Following on from the recent earthquakes, there is a lot more scrutiny on all services' support and bracing system. While we have been a fairly well controlled and regulated industry, it appears that there can be some improvement in how we hang and brace pipe work.

While we are unaware of any widespread issues in industry (albeit, we are well aware of isolated cases of poor work), the industry needs to lift its game.

Hanging and bracing needs to be part of the design considerations for any project. In particular, hanging and bracing needs to be shown on drawings. Design and selection of hanging and bracing should not be a site decision by sprinkler fitters.

The construction industry is changing, and we are finding that more and more specifications will call for Producer Statements by Chartered Professional Engineers to cover the support of services in buildings. While in many cases, our standard practices have been shown to provide adequate service, contractors will find that they will not be acceptable, as they will not be able to be verified due to a lack of supporting documentation.

4. Listing Of Pipe Brackets and Seismic Braces

NZS4541 does not require pipe brackets and seismic bracing elements to be listed. This is in contrast to some other sprinkler standards such as NFPA13.

Aon will be recommending to Standards New Zealand that the need to require listing along the lines of NFPA13 be incorporated into the next edition of NZS4541.

In the meantime, if manufacturers wish to provide proof of compliance with NZS4541, Aon is willing to accept applications for the listing of such components.

5. Future Notes

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We currently have some 60 or so topics that we wish to prepare newsletter articles on. Some that relate to seismic issues include long drops, and connections to rack systems.

We welcome suggestions for any other topics that we can issue some guidance on.

Chris Mak
Technical Services Manager