

# AON SPRINKLER CERTIFICATION



## Aon New Zealand

Aon Sprinkler Certification  
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<b>Aon Sprinkler Certification Technical Note</b>		
<b>Note Number:</b> TN-16-28	<b>Issue:</b> One	<b>Date:</b> 1. December 2016
<b>Subject</b>	<b>Certification of Sprinkler Systems</b>	
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.		

## 1. Purpose

This Technical Note has been prepared to clarify the standard scope of services provided by Aon Sprinkler Certification (ASC) in its role as a Sprinkler System Certifier (SSC) pursuant to Standard NZS4541. It also provides guidance to improve the efficiency and effectiveness of the sprinkler system certification process. While this document has been prepared primarily with reference to NZS4541, the broader concepts also apply for systems being certified to other standards, including NZS4515 (which relates to fire sprinkler systems in sleeping occupancies).

## 2. Role of a Sprinkler System Certifier in Certifying Sprinkler Systems

### 2.1. Background: NZS4541

Protocols for the certification of sprinkler systems have been established and followed in New Zealand for the past 40 or 50 years. These protocols have led to New Zealand's sprinkler systems as being recognised as being amongst (if not) the most reliable in the world, with a successful record of controlling somewhere in the order of 99.8% of fires in sprinkler protected buildings.

The role of the SSC has been established within NZS4541 (as an Authority Having Jurisdiction) since NZS4541P:1972 was published. The traditional responsibilities of the SSC are generally well understood by industry, albeit, they appear to never have been formally documented. This Technical Note has been prepared to ensure that all parties who rely on ASC, as a Sprinkler System Certifier, are aware of the processes, responsibilities and the limitations thereof.

### 2.2 The Defined Role of the SSC

NZS4541 defines the role of the SSC as an auditor, which entails a systematic approach to verifying that the installation complies with the requirements of the standard. Annexure One outlines the roles and responsibilities of a SSC as listed within NZS4541.

The term "audit" was introduced into the 2003 edition of the standard to recognise that the SSC is not on site for the duration of the contract, and cannot be responsible for ensuring that every component, pipe and fitting has been installed correctly.

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## 2.3 Processes Involved in the Audit

The process that ASC adopts in auditing an installation for compliance is as follows, unless otherwise agreed:

### 2.3.1 Design Parameter Review

The Applicant is required to submit a Design Parameter Application for review by ASC. This consists of a completed Form 1, along with supporting evidence as nominated in section 112.1 of the Standard.

Key issues to note are:

- Form 1 is designed to ensure that the SSC understands the project scope to allow the detailed design for the sprinkler system to be assessed and approved. If the scope of the project cannot be adequately described in Form 1, additional information needs to be provided, along with a cover letter.
- It is important that Form, 1 provides an accurate description of the building, its processes and its occupancy.

#### *Comment*

- *On occasion, ASC finds that as the contract progresses, key issues have not been disclosed which can impact on the ability to certify an installation.*
- NZS4541 requires that Form 1 be submitted prior to commencement of installation.
- - *Where information is provided after fabrication or installation has commenced, then the contractor risks that the design may be rejected, requiring rework. While this may be unlikely with a simple extra light hazard installation, it may pose a significant risk with complex or extra high hazard installations.*
  - *If all information required is not available, ASC suggests that a partial submission be made. For example, it is common that a storage declaration has been drafted, but has not been signed. If that is the case, ASC recommends that the draft storage declaration be appended to the submission. ASC's review would state that it is tentative subject to the storage declaration actually being signed.*
- In some cases, ASC may request documents earlier than required by the Standard. For example, clause 112.2(f) requires that fire reports be submitted at the completion stage. ASC requests that this document be provided at the Design Parameter Stage, as ASC's audit of this document may (and has) identified issues that could preclude a Code Compliance Certificate being issued for the building, despite the sprinkler system being certified as complying with the Standard.
- Where the Contractor or designer proposes a design in accordance with clause 117 of NZS4541 the details of this design need to be fully and carefully detailed in the

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Form 1 submission to ensure the certificate is consistent with the terms of the building contract and building consent.

Following the review of the basic design parameters, ASC will normally issue a letter confirming approval (“Design Parameter Review letter”), or requesting additional information. Please note that if ASC is satisfied by the additional information provided it will not issue a follow-up letter unless specifically requested by the Applicant.

### **2.3.2 Construction Phase Review**

#### **2.3.2.1 The Role of the Certifier**

During construction ASC will respond to requests for clarification or interpretation of the Standard.

- *It would assist ASC if the name of the contract and our file number (P-XXXX) is clearly identified in any requests. This is particularly pertinent if contracts have various possible names (such as building name, tenant name or street address). Any questions concerning a particular contract should be forwarded to the signatory of the Design Parameter Review Letter.*

During this phase, ASC is conscious of client confidentiality. If questions are received from other parties (such as the main contractor, architect or fire engineer), ASC will normally respond to the Applicant and the party asking the question. If there are specific issues of sensitivity in replying to questions, please ensure ASC is aware of them.

It is imperative that when requesting advice on a specific contract that the information provided to ASC is complete and does not omit any pertinent facts that would impact on ASC’s answer. If, after answering a question, ASC are alerted to a pertinent fact that would have impacted on the advice, ASC may withdraw its earlier response.

- *An example of where this has occurred was when ASC was questioned by a contractor with reference to clause 511.8.1, about the omission of sprinklers under a walkway. When asked this question, ASC were not alerted to the fact that the canopy actually was supported between two buildings, forming a tunnel. Given that the dynamics of any fire in a tunnel substantially differ to that of an open-sided canopy, we were forced to withdraw our earlier advice that the omission of sprinklers within this area was in compliance with the Standard.*

#### **2.3.2.2 The Role of the Inspector in the Construction Phase**

Inspections during construction are carried out by an Accredited Inspection Company.

- *The role of the inspection company for the certification of new systems is not defined in NZS4541. Figure E1 of NZS4541 shows that the site inspections may be carried out by either the SSC or a Type A Inspection Body.*

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- *The differing roles of the SSC (AHJ) and the inspection companies is a traditional one that commenced around 1984 when the Insurance Council of New Zealand divested itself of the inspection role leading to the separation of inspection and certification roles. .*
- *ASC will work with any listed accredited third party inspection company. Again, traditionally the accredited inspection company is usually employed directly by the sprinkler contractor*

### 2.3.3 Completion Phase Review

#### 2.3.3.1 Role of the Certifier in the Completion Phase Review

At the end of the project, the Applicant submits to ASC the documentation described in 112.2 of the Standard.

*Key issues that are considered in ASC's review are:*

- *Confirming any questions that arose from the Form 1 review or during the construction phase have been adequately addressed. ASC would highlight that the early resolution of Form 1 review queries is preferable and will typically expedite certification.*
- *ASC is treats the Completion Statement as a Producer Statement PS-3 Construction A revised Aon Form 5 is being issued in conjunction with this Technical Note. This Form includes a check list summarising the key items that ASC will expect to sight before certifying a sprinkler system.*
- *Drawings must be certified as “as-built” and need to show seismic resistance provisions. If the provisions for seismic resistance require a specific design (i.e. – anything other than clamping hard to the structure or compliance with the “150mm rule” [clause 403.13.2.2]), then either calculations for the bracing design or some other suitable evidence of compliance shall be provided.*
  - *Evidence of correct bracing design could include a PS1 signed by a Chartered Professional Engineer for the design of the bracing system, plus confirmation that the design has been installed (A PS3 or PS4 as appropriate.)*
- *ASC will not normally expect to see data sheets for sprinklers as required by clause 112.2(e.) The sprinkler heads should have been nominated in Form 1 citing SIN numbers in lieu of data sheets.*
- *The producer statements for any tank and its supporting foundations must be clear as to their scope.*

On receipt of the requisite information, ASC will conduct its audit. The audit includes a desk top review of the drawings, looking for any significant issues and a review of at least one hydraulic calculation for the project. Other information we may review includes pump test results (to ascertain that the pump is performing to at least 95% of the manufacturer's

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performance curve,) pneumatic test certificates, flushing certificates and integrated services commissioning results.

*The node diagrams that support the supplied calculations need to show what area of the building the calculation refers to. On small simple building the automatic node schematic generated by the software may be sufficient but for more complex works a fully node overlay on the as built drawings is required to allow an informed review of calculations to be achieved.*

*If the review of the hydraulic calculations shows significant errors, the submission will be rejected, and the Contractor requested to resubmit. Where a significant error is noted, this could be symptomatic of other significant errors therefore ASC would not normally specifically identify the error, but request that the contractor review all calculations to ensure no further errors exist.*

After the Completion Submission is accepted, and on receipt of all evidence required to reasonably assure ASC of compliance of the sprinkler system, a Sprinkler System Certificate of Compliance will be issued.

### 2.3.3.2 Role of the Inspector in the Completion Phase

The role of an Accredited Inspection Company (ISO17020 Type A Inspection Body) is not defined within NZS4541. It is implied in figure E1 that the inspections may be carried out by either a Type A Inspection Body or the SSC. Since the Insurance Council divested itself of its site inspectors, traditionally the inspections have been carried out by a company independent of the SSC, engaged as a sub-contractor to the fire protection contractor.

The Accredited Inspection Company is expected to audit the installation itself, making progressive site inspections as required, to ensure that they have a reasonable level of surety that the installation complies with the installation Standard.

- *For a warehouse, this may entail a single site visit only at commissioning stage, (albeit, if defects are found at the end of the project, this may lead to delays in rectifying them). We would recommend that an additional inspection should be scheduled early in the construction phase, to ascertain whether issues such as clashes with wind-bracing can be highlighted.*
- *For high-rise buildings and other buildings with concealed pipework, multiple site visits would be required to ensure that first fix and second fix installation is sound. The first fix inspections include an audit of concealed space protection, fire rated partitions in lieu of concealed space protection, and the quality of flexible dropper assembly installation.*

Inspections need to be carried out against construction drawings, to ensure that the pipe layout, sizing and bracing reflects the designer's intent. If there are significant deviations from the construction plans, these should be noted by the Accredited Inspection Company, and a check made of the as-built drawings to ensure that these have been correctly recorded.

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At the completion of the project, the Accredited Inspection Company provides ASC an "endorsed report" which confirms compliance, or items which need to be addressed before compliance can be confirmed. Contractors should note that this is not the brigade connection letter.

In the event that the Accredited Inspection Company identifies a defect, it should require evidence that it has been rectified:

- If the defect identified is significant, a re-inspection should be undertaken following advice by the contractor that it has been rectified;
- If the defect is minor, the inspector may determine photographic evidence of rectification is minor, or the where there are doubts about the contractor's credibility, inspections may be required.

Where an Accredited Inspection Company is experiencing continued issues with either quality of installation or credibility of a particular contractor these can be raised with the SSC and will be taken into account as part of the annual contractor listing process

When inspecting sprinkler systems, an accredited inspection company typically carries out non-statistical sampling inspections, which indicate trends with respect to compliance or non-compliance.

- o *For example, ASC has previously published its concerns with respect to poorly installed concealed plate sprinklers, which would have rendered the subject sprinklers ineffective via a deceptive site fix. ASC has strongly suggested that with installations using concealed plate sprinklers, should the accredited inspection companies attend site after the cover plates are fitted off, that they remove a random sample of approximately 5% of plates to audit the quality of installation. If the sample appears to be properly installed, then it would be reasonable to assume that all the plates are adequately installed. But if one plate shows evidence of unsatisfactory installation practises, then 100% inspection would be required.*

This section is not intended to be an exhaustive guide to inspection services, but rather a high level summary of the role the inspectors place in the completion phase review by ASC.

## 2.4 Limitations of Services

There are limitations in the services provided by the ASC. For example, ASC does not carry out a detailed drawing review for a number of reasons:

- In order to carry out a meaningful drawing review, the reviewer needs to intimately understand the building and its features, to ensure that the sprinkler system has been coordinated with the buildings structure, fabric and services. This is not contemplated by NZS4541.
- The correct location, coordination and installation of the sprinkler system is verified by a physical site inspection by an Accredited Inspection Company, (See Section 2.3.3.2 of this Technical Note).

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- The intent of clause 112.1 of the Standard is that the SSC approves the basic design parameters of the installation. Clause 112.2 only requires that as-built drawings are submitted prior to the final inspection.

Another significant limitation of SSC services is that judgements are based on the quality of the information being provided, which must be taken at face value. This implicitly requires that the design be carried out by or under the supervision of a competent designer who understands the extent and potential limitations of their design and communicates with all parties involved in the project.

- *An example of where this created an issue in the past was a project where the client was storing goods in plastic storage boxes. The designer was under the impression that the goods were being stored in cardboard cartons. At the end of the project, the Accredited Inspector noted the use of plastic storage boxes did not comply with the design capability of the sprinkler system, and certification was delayed until the design was adjusted to a compliant system. In this example, the solution was relatively simple, entailing changing all roof level sprinklers and submitting revised calculations however at one stage, it appeared that a diesel pump was needed to be retrofitted to the installation, with resultant delays in occupying the building.*
- *Another very common example of an issue that arises within warehousing facilities is that no allowance is made for the storage of idle pallets. Unless the warehouse is designed for “uncartoned unexpanded plastics,” this precludes the ability to store pallets within the warehouse. This can be particularly significant if the warehouse is used to store food products, requiring pallet storage in a clean environment. We have had a number of projects where significant changes had to be made to the system after completion for this reason.*

## 2.5 Extensions to Existing Systems

When existing systems are being extended, then ASC consider that “an as nearly as reasonably practicable” approach, as enshrined in Building Legislation, can be applied. If this would require upgrading of an existing system, this would require that the costs of any upgrade be balanced against the benefits.

- *As an illustrative example, if an extension was increasing the sprinkler design flow, and the existing pump was capable of supplying that demand, but not capable of demonstrating 150% of the demand on the manufacturer’s curve, ASC would probably consider this as acceptable, after a careful case by case review.*

## 3 Appeals Process

ASC outlines below the processes that can be followed if a client disagrees with any of its advice or judgements.

If a client disagrees with any aspect of ASC services, they should first ask the ASC employee if they can review their decision. ASC would then undertake a peer review with other

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members of the team, or independent subject matter experts. These may include New Zealand and/or international sprinkler experts.

If resolution is not achieved through the peer review process, the [clients] may submit their own subject matter expert opinions for review.

If resolution is not achieved following ASC's review of this material, the client may seek a Formal Interpretation from Standards New Zealand (SNZ.) NZS4541 clause 111 refers.

Another appeals route, which may be used instead of, or after, a SNZ Formal Interpretation is received, is to seek a Determination under the provisions of the Building Act 2004, through the Ministry of Business, Innovation and Employment.

## **4 Closing Remarks**

This document has outlined Aon Sprinkler Certification's primary service as a Sprinkler System Certifier, in accordance with NZS4541.

ASC may negotiate to expand its role on a case-by-case basis. For example, it has been engaged in the past to carry out detailed drawing reviews, review the technical basis of design/build tenders and review installations against a client's Risk Management Manual.

ASC is committed to driving quality of design, installation and inspection to ensure the continuation of the historic success of fire sprinkler systems in New Zealand.

A handwritten signature in black ink, appearing to read "Chris Mak".

**Chris Mak**  
Technical Services Manager



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## **Annex One NZS4541 Clause 110**

### **ROLES AND RESPONSIBILITIES OF SSC**

An SSC shall be responsible for certification of the sprinkler system and making other determinations as provided for in the Standard. That role shall include, but not be limited to:

- (a) Auditing design;
- (b) Auditing installation;
- (c) Auditing commissioning;
- (d) Auditing testing, maintenance, and routine surveying;
- (e) Listing of contractors;
- (f) Listing of equipment;
- (g) Approving equivalent variations in the design and/or components;
- (h) Maintaining records;
- (i) Certification that the system complies with this Standard.

An SSC shall employ an appropriately qualified chartered professional engineer (CPEng) for the purpose of such certification.

Where the Standard refers to an SSC it shall be the SSC responsible for the certification of the particular automatic fire sprinkler system under consideration.

NOTE –

- (1) It is desirable that the CPEng be a professional member of IPENZ in the fire practice college.
- (2) CPEng is defined in the Chartered Professional Engineers of New Zealand Act.

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## **Annex Two – Glossary**

### **Accredited Inspection Company**

A specialist inspection contractor, accredited as a Type A Inspection Body to AS/NZS/ISO/IEC 17020:2012, and list by an SSC.

### **Applicant**

The organisation applying for approval of the sprinkler system's basic design parameters. This will normally be either the fire protection consultant, or the fire protection contractor installing the system. The Applicant is the organisation that signs Aon's Form 1 *Application for Approval of Basic Design Parameters for Automatic Sprinkler System Installations*

### **Authority Having Jurisdiction**

The Authority responsible for certifying sprinkler systems, defined as the Insurance Council of New Zealand and Ministry of Works and Development. This term was rescinded in the 2003 edition of the Standard and is replaced by Sprinkler System Certifier.

### **Contractor**

The listed contractor (as defined by NZS4541) responsible for ensuring that the installation complies with the Building Consent. The Contractor is the organisation that signs Aon's Form 5, *Contractor's Notice of Completion/Producer Statement*.

### **Sprinkler System Certifier (SSC).**

An organisation accredited by an internationally recognised accreditation body to AS/NZS ISO/IEC 17020 as a Type A inspection body as competent to fulfil the roles as defined in this Standard