



Determination 2017/023

Regarding the compliance of the substitution of automatic fire sprinkler systems for heat detectors in a basement carpark at 1 Havelock Road, Havelock North



Summary

This determination considers the compliance of a Type 6 automatic fire sprinkler system in a basement carpark. The determination discusses whether heat detection is required, or if the installed Type 6 automatic fire sprinkler system satisfies the Acceptable Solutions for heat detection. The determination discusses whether there are any significant differences between a sprinkler system and heat detectors that would affect life safety.

1. The matters to be determined

- 1.1 This is a determination under Part 3 Subpart 1 of the Building Act 2004¹ (“the current Act”) made under due authorisation by me, John Gardiner, Manager Determinations and Assurance, Ministry of Business, Innovation and Employment (“the Ministry”), for and on behalf of the Chief Executive of the Ministry.
- 1.2 The parties to the determination are:
 - the owner of the building, Lowmac Properties Ltd (“the owner”) acting through their agent, G. Lethbridge (“the agent”) who is also the applicant
 - Hastings District Council (“the authority”), carrying out its duties as a territorial authority or building consent authority.
- 1.3 I have provided the New Zealand Fire Service Commission (“the NZFS”) with the determination documentation for comment by way of consultation under section 170 of the Act.

¹ The Building Act, Building Code, compliance documents, past determinations and guidance documents issued by the Ministry are all available at www.building.govt.nz or by contacting the Ministry on 0800 242 243.

- 1.4 This determination arises from the authority's proposed decision to refuse to issue a code compliance certificate for the building work on the basis that it did not comply with the Building Code (First Schedule, Building Regulations 1992). The agent applied for a certificate of public use for the constructed carpark and ground level. While the authority issued the certificate of public use, it advised the agent that the code compliance certificate would be refused because the building work did not comply with Clause C4.3². The authority was of the view that heat detectors were required in the carpark, and that the automatic fire sprinkler system was not a replacement for heat detection. It believed that the fire safety system differed from the consented documentation and this did not comply with the relevant Building Code Clauses.
- 1.5 The matter to be determined³ is therefore whether the use of a Type 6 automatic fire sprinkler system in the carpark is compliant with the Building Code. In making this decision I need to consider:
- whether a Type 3 heat detection system with manual call points⁴ is required
 - if there are significant differences between sprinklers and heat detectors that would affect life safety
 - whether the installed sprinkler system satisfies the Acceptable Solutions as heat detection.
- 1.6 In making my decision, I have considered the submissions of the parties, the report of the independent expert commissioned by the Ministry to advise on this dispute ("the expert") and the other evidence in this matter.

2. The building work and background

- 2.1 The building work considered in this determination is a commercial development, with construction and consent occurring over two stages. The proposed development will comprise three multi-level mixed-use buildings, with the basement carpark running underneath the entire site. Stage 1, which has been consented and constructed, includes the carpark up to the ground level.
- 2.2 The buildings covered in the consented fire report and their uses are as follows:
- Carpark (Basement level)
 - Building A – Hotel complex, Conferencing, Bar and Restaurant (three levels)
 - Building B – Retail and Commercial (Apartment on the 2nd level)
 - Building C – Retail and Commercial (three levels)
 - Building D – Retail/Commercial uses (single level)
- 2.3 The carpark is situated in a single level in the basement. A ramp provides car access to the carpark, with stairs and lifts installed to enable people to move outside to the ground level and the other levels in the buildings over the carpark once constructed.
- 2.4 The buildings in this complex have been designed using the Acceptable Solutions for the C Building Code Clauses. The consented drawings and fire report specify that the development required a Type 7 automatic fire sprinkler with combination heat and

² In this determination, references to sections are to sections of the Act and references to clauses are to clauses of the Building Code.

³ Under sections 177(1)(a) and 177(2)(d) of the current Act. I note that no application for a code compliance certificate.

⁴ Manual call points are a manual means for an occupant to activate the fire alarm system in the event of a fire.

smoke detection alarm system with manual call points. However, it is noted in the fire report that:

...the smoke detection shall not be extended into the basement carpark level of the building, heat detection shall be provided instead (C/AS2 paragraph 2.2.3). Installation of the system must meet NZS 4541:2013 amended by paragraph B2.1 of Appendix B to C/AS2 and C/AS4 in all respects, and F7/AS1 standards.

- 2.5 On completion of Stage 1 work, the agent applied to the authority for a certificate of public use. The authority refused to issue the certificate of public use, because heat detection was not provided in the carpark. I note that the certificate of public use has since been granted by the authority for a limited time to enable the installation of a Type 3 system or for the agent to apply for a determination.
- 2.6 The fire systems contractor (“the contractor”), who installed the fire safety systems, sent an email dated 16 November 2016 to the agent and the authority, outlining their reasoning that the heat detection component of the fire alarm system could be sprinkler heads, and not electronic heat detectors. The contractor believed that a sprinkler system is not a substitution because the sprinkler head is a thermal device and is part of a heat detection system.
- 2.7 Following this, on the same day, the agent sent an email to the authority outlining their view that the substitution of sprinkler heads in lieu of heat detectors was adequate, as sprinkler heads would activate within a similar temperature range.
- 2.8 There was various correspondence between the Ministry, the contractor, the agent’s fire design consultant (“the consultant”) and the agent on 29 November – 30 November 2016. The issue was not resolved.
- 2.9 The Ministry received an application for determination on 20 December 2016.

3. The submissions

- 3.1 The agent provided copies of:
- plans and drawings of the complex
 - the original fire report for the complex
 - correspondence between the parties.
- 3.2 The agent submitted with their application a letter prepared by the consultant that stated:
- Sprinklers are activated when they reach their activation temperature by the presence of heat at the detection point – the sprinkler heads are ‘in effect a thermal (heat) detector’.
 - In addition to being a heat detector, the sprinkler head when activated will provide fire control or suppression by releasing water.
- 3.3 The consultant included excerpts from the Acceptable Solutions and Standards that show the use of a sprinkler system as a heat detector:
- In a Type 5 system, where F7/AS1⁵ paragraph 1.2.5 states:
Type 5 is a variation of the Type 4 and Type 7 systems...

⁵ Acceptable Solution F7/AS1 *Warning Systems*

- c) Shall be permitted only where an automatic fire detection and alarm system activated by heat detectors (part of the main fire alarm system) is also installed in sleeping firecells which do not already have an automatic fire sprinkler system
- The use of a sprinkler system as heat detectors, is ‘clearly’ permitted by NZS 4512:2010⁶:
 - 216.7: “.....or where sprinkler heads are used as detectors.”
 - 401.3: “Where sprinklers are used as thermal fire detectors,.....”
 - 405.1.3: “To reduce unwanted alarm activations, smoke detectors may be replaced by heat detectors (or sprinklers – see 405.2.2(h)).....”
 - 405.2.2(h): “Where sprinkler heads are installed as part of a sprinkler system to NZS 4515 or NZS 4541, heat detectors may be omitted. The sprinkler system shall comply fully with these Standards, or any amendment to them, as specified in the Compliance Documents for the New Zealand Building Code.”
- Appendix B of NZS 4512 states:
 - B3 Type 3: “An automatic fire alarm system activated by heat detectors and manual call points with automatic signalling to a remote receiving centre.
 - NOTE – Sprinkler coverage to NZS 4541 or NZS 4515 may be allowed to be substituted for all or part of the heat detection in a Type 3 system.”
- Formal Interpretation No. FI-104 issued by Standards New Zealand on 30 July 2012 states:
 - 5) “Sprinkler heads are an alternative to heat detectors, but otherwise do not influence the requirements for smoke detector coverage under this clause.”

3.4 The consultant then stated the following based upon her interpretation of the Acceptable Solutions and Standards:

- If the sprinkler system is compliant with NZS 4541:2013⁷ then it is acceptable using NZS 4512 to substitute all or part of the heat detectors in the carpark with a NZS 4541 compliant sprinkler system without providing additional heat detection.
- A building where the installation of the sprinklers complies with NZS 4512 will meet the requirements of the Acceptable Solution for heat detection. Therefore, the design is not an alternative solution and does not require specific design to prove Building Code compliance.
- The authority was incorrect to withhold issuing the code compliance certificate and require the installation of heat detectors alongside the ‘NZS 4512 and NZS 4541 compliant sprinkler system’.

3.5 The authority acknowledged the application for a determination on 18 January 2017 and provided a response on 17 February 2017. The authority submitted:

- The requirement for a Type 3 system was documented in the consent fire report, and this had not been installed.
- C/AS7⁸ paragraph 2.2.1 ‘demands’ that a Type 3 fire safety system be installed to the carpark:

⁶ New Zealand Standard NZS 4512:2010 *Fire Detection and Alarm Systems in Buildings*

⁷ New Zealand Standard NZS 4541:2013 *Automatic fire sprinkler systems*

⁸ C/AS7 Acceptable Solution for Buildings Used for Vehicle Storage and Parking (Risk Group VP)

If a risk group VP is within a building that is protected with an automatic fire alarm system, the risk group VP must have at the minimum a Type 3 automatic heat detection system.

- The agent had not demonstrated that a Type 6 system would provide the similar levels of response as a Type 3 system. In addition, a Type 3 system is ‘designed to activate earlier than a Type 6 system’ enabling people to ‘promptly evacuate’.
- The authority noted that advice received from an officer of the Ministry to the agent confirmed that a Type 6 system substituted for a Type 3 did not satisfy the Acceptable Solutions.
- The agent should have lodged an amended plan before installing the ‘alternate fire safety system’, and using C/VM2⁹ was the ‘correct compliance pathway’ to establish compliance with the Building Code.
- The compliance schedule in the building consent referred to a Type 3 fire safety system for the carpark.
- Paragraph 2.2.1 of C/AS4¹⁰ permits a substitution only where there are ‘no sleeping firecells elsewhere in the building’, and consequently a Type 6 could only be substituted for a Type 3 in Building C (see section 5.2).

3.6 A draft determination was issued to the parties for comment on 3 March 2017.

Responses to the draft determination

3.7 On 17 March 2017, the authority responded to the draft determination stating it did not accept the decision. It included a further submission that stated (in summary):

- The determination should ‘identify the appropriate method of demonstrating the compliance pathway’.
- The final design (with a Type 6 sprinkler system only in the basement) ‘may well achieve compliance to the Building Code’.
- The authority’s interpretation of the Acceptable Solutions does not allow for the substitution of a Type 6 sprinkler system in situations where there is car parking under a sleeping risk group.
- It requires a ‘new fire design with appropriate supporting evidence’ to be submitted to the authority as an amendment to the building consent. As a result of the amendment the authority will be able to issue a code compliance certificate when it is ‘satisfied, on reasonable grounds that the building work complies with the building consent’. (I note that the building work is required to comply with the Building Code and be built in accordance with the building consent).

3.8 The agent accepted the draft determination on 28 March 2017, subject to non-contentious amendments. The agent in response to the authority’s submission was concerned that it wanted a revised fire report as an amendment to the building consent, as it ‘takes us right back to the position’ they were in. They requested:

- the findings of the determination are accepted

⁹ C/VM2 Verification Method: Framework for Fire Safety Design

¹⁰ C/AS4 Acceptable Solution for Buildings with Public Access and Educational Facilities (Risk Group CA)

- the current fire engineering report is accepted in its current form allowing the substitution of NZS 4541 sprinkler protection for heat detectors in the carpark
- the code compliance process is allowed to continue and the result is that the authority issue the certificate of code compliance.

3.9 The NZFS on 29 March 2017 stated that they agreed with the draft determination decision.

3.10 I have taken the parties' submissions into account and altered the final determination as appropriate.

4. The expert's report

4.1 General

4.1.1 As mentioned in paragraph 1.6, I engaged an independent expert to assist me. The expert is a fire engineer and an associate member of the Institution of Fire Engineers. The expert's report was received on 23 February 2017, and was sent to the parties on the same day.

4.1.2 The expert was briefed to provide advice to the Ministry regarding:

- the compliance of sprinklers as a substitute for heat detectors
- whether the proposed substituted design satisfies the Acceptable Solutions
- whether the deletion of the heat detectors is a deviation from the Acceptable Solutions.

4.2 Suitability of sprinklers as a substitution for heat detectors

4.2.1 The expert's view was that the discussion regarding the suitability of sprinklers as a substitution for heat detectors had been 'well documented' in the submissions, and would instead focus on the relative response time and the functions performed by each system (see paragraph 3.3).

4.2.2 The expert stated that both sprinklers and heat detectors rely on a heat sensitive component. A sprinkler activates when the temperature is high enough to activate the heat sensitive element, which breaks, dislodging the cap and allowing water to flow. Heat detectors have different modes of operations, either relying on a temperature sensitive element to melt or fall to interrupt a circuit or expand to close a circuit, or actively measuring the temperature and reacting to a sudden increase.

4.2.3 The expert noted two 'critical aspects' that must be considered when investigating the activation time of either heat detectors or sprinklers:

The set activation temperature, i.e. the temperature at which the element is designed to operate; and

The delay caused by heat transfer time

4.2.4 The expert also noted other factors that influence activation times including the 'height above and radial distance from the fire'. While their vertical distance from the fire is similar, NZS 4512 allows 'approximately 50% greater separation distance' for heat detectors compared to what NZS 4541 allows for sprinklers. This could result in the heat detectors being further away from a fire, delaying their activation when compared to the sprinklers.

- 4.2.5 The expert has concluded that due to the variety of available devices and different modes of operation, it is not possible to state whether heat detectors or sprinklers would activate first; they are generally comparable.
- 4.2.6 The expert compared the capabilities of the different systems, noting that heat detectors are only intended to respond to a fire by raising the alarm, while sprinklers are designed to control and ‘possibly extinguish the fire by spraying water on it’. The heat detectors provide an accurate location of the fire, whereas the sprinkler system is unable to identify the individual sprinkler head that activated first. However, the expert noted that identifying the fire with a sprinkler system may take longer, but this ‘would not directly impact on the life safety aspects.’
- 4.2.7 The expert noted that detection and alarm systems are primarily designed to warn the building occupants of a fire. He noted that the time of detection is only one consideration of the overall evacuation time, which includes:
- Detection time, in most cases the time for automatic detectors to activate
 - Alarm processing time, or the time taken by the alarm panel to translate the detection signal into an evacuation signal
 - Pre-movement time, which is the time taken by occupants to start moving towards an exit; and
 - Travel time, which can include queuing at exits
- 4.2.8 The expert stated that pre-movement and travel times tend to be the ‘major component’ of the time to evacuate, with pre-movement times for occupants of commercial buildings tending to range from 0.5 to 2 minutes. Therefore, the expert considers the variation of a few seconds in the detection time will rarely make a significant difference to the overall evacuation time.
- 4.2.9 The expert concluded the response time of sprinklers and heat detectors are comparable, and that there is no ‘significant life safety benefit’ that would be achieved from installing heat detectors in addition to the sprinkler system in the carpark.

4.3 Compliance with the Acceptable Solutions

- 4.3.1 The expert has considered whether the substitution of sprinklers for heat detectors will satisfy the Acceptable Solutions. The consent documents states the Acceptable Solutions to which the development has been designed as C/AS2¹¹, C/AS4, C/AS5¹², and C/AS7.
- 4.3.2 The expert considered the authority’s submission that the carpark does not align with the consented design as a Type 6 system has been installed instead of a Type 3. The expert notes that the fire report¹³ proposes a Type 7 system, which normally consists of sprinklers and smoke detection. However, the smoke detection is noted as not extending to the carpark and ‘heat detection shall be provided instead’. The fire report also states:
- However, smoke detection shall not be extended into the basement car park level of the building, heat detection shall be provided instead (C/AS2 2.2.3). Installation of the system must meet NZS4541:2013...
- 4.3.3 The expert observed that these statements in the fire report are misleading, as it is possible to assume that heat detectors will be provided to the basement, whereas

¹¹ C/AS2 Acceptable Solution for Buildings with Sleeping (non institutional) (Risk Group SM)

¹² C/AS5 Acceptable Solution for Buildings used for Business, Commercial and Low Level Storage (Risk Group WB)

¹³ In Revision J of the fire report which was approved as an amendment to building consent ABA20141878 dated 8 November 2016

NZS 4541 indicates that sprinklers will be provided instead. The expert also noted that the fire report does not refer to a Type 3 system.

- 4.3.4 The expert observed that the submissions have attempted to address two separate questions:
- Is a Type 3 system required in the basement car park of the [development] to comply with the Acceptable Solutions? And
 - Can a sprinkler system be regarded as a (compliant) Type 3 system?
- 4.3.5 The expert considers C/AS7 paragraph 2.2.1 where if the carpark is within a building that is protected with an automatic fire alarm system it must have at ‘the minimum a Type 3 automatic heat detection system’. However, the expert observed that it is unclear if the reference to a minimum implies that the building requires a ‘Type 3 in addition to any other system’ or the building requires a ‘Type 3 system or a system providing a better level of performance.’ The expert considered that the latter is correct. The expert expressed the view that a Type 6 system is superior to a Type 3, because the response times are comparable, but the sprinkler system has the additional benefit of controlling or extinguishing the fire.
- 4.3.6 The expert considered that while the Acceptable Solutions does not address where it is permissible to substitute heat detectors with sprinklers, this does not mean that it is not permitted. There are situations in the Acceptable Solutions where specific reference is made to the substitution of a prescribed system for another, and limitations are identified where a system is not suitable for use, or where it is not directly comparable. For example, the Acceptable Solutions state that Type 4 smoke detection cannot be substituted for a Type 6 system if there is a sleeping firecell within the building (see paragraph 5.2.2).
- 4.3.7 The expert considers that the Acceptable Solutions does not discuss the substitution of heat detectors and sprinklers, because there is no significant difference in their activation times and they are comparable. The expert considers that the Ministry did not ‘consider it critical to clarify’ because the topic is ‘extensively covered in NZS 4512’ (see paragraph 3.3).
- 4.3.8 The expert noted that the carpark requires a Type 7 system in line with the Acceptable Solutions, except that heat detection shall be provided. The expert stated that substitution of a sprinkler system for heat detection, while not explicitly addressed in the Acceptable Solutions, is permissible; and a Type 6 exceeds the ‘minimum provision of a Type 3’. Therefore, the carpark only requires a Type 6 system, albeit interfaced with the fire alarm system.
- 4.3.9 The expert then considered whether a sprinkler system compliant with NZS 4541 could be considered to meet the requirements of NZS 4512 for a Type 3 system. The expert noted that there are numerous references throughout NZS 4512 to the substitution of sprinklers for heat detectors. Therefore, the expert considered that NZS 4512 establishes that sprinkler heads can replace heat detectors provided the sprinkler system is compliant with either NZS 4515 or NZS 4541, and subject to additional modifications in NZS 4512¹⁴.
- 4.3.10 The expert concluded that the Acceptable Solutions do not explicitly require only a Type 3 system to be provided to the carpark. Nevertheless, the system sprinkler can, if designed appropriately, meet the requirements of a Type 3 system as per NZS 4512.

¹⁴ The modifications are not related to life safety but to reducing the search area for the NZFS personnel by increasing the accuracy of the sprinkler system in locating the fire by splitting the firecell into zones.

4.4 The expert's conclusion

4.4.1 Regardless of whether a Type 3 system is required to satisfy the Acceptable Solutions, a sprinkler system compliant with NZS 4541 and adequately modified by NZS 4512 would meet the design requirements of a Type 3 system. A Type 3 heat detection system provides no significant life safety benefits to the building occupants, as they are comparable to sprinkler systems in activation times and variations are negligible where it affects evacuation time. The expert has concluded that he does not believe that a Type 3 system is required in the carpark in addition to the sprinkler system provided.

5. Discussion

5.1 The legislation and Acceptable Solutions

5.1.1 Clause C4.1 requires that buildings must be provided with:

(a) effective means of giving warning of *fire*,

5.1.2 Clause C4.3, which is the performance requirement states:

The *evacuation time* must allow occupants of a building to move to a *place of safety* in the event of a fire so that occupants are not exposed to any of the following:

(a) a *fractional effective dose* of carbon monoxide greater than 0.3:

(b) a *fractional effective dose* of thermal effects greater than 0.3:

(c) conditions where, due to smoke obscuration, visibility is less than 10 m except in rooms of less than 100 m² where visibility may fall to 5 m.

5.1.3 The Acceptable Solutions are a prescribed means of achieving compliance with the Building Code. The fire solution for the development has been designed using a combination of Acceptable Solutions, including C/AS2 and C/AS7 for the carpark, with the risk group VP¹⁵, which outlines the relevant fire safety systems. The fire safety systems are required to enable occupants, in the event of a fire, to have reasonable warning and protection while exiting to a safe place.

5.1.4 The fire safety systems that are discussed in this determination (taken from C/AS2):

Type of system	System description	Relevant Standards for installation	Descriptions of alarm systems (F7/AS1)
Type 2	Alarm system with manual call points	NZS 4512	A single or multiple zone system with an alarm panel to provide defect warning, zone index diagram, and suitable for connection to the Fire Service. The system shall comply with NZS 4512.
Type 3	Heat detection system with manual call points	NZS 4512	A Type 3 system comprises a Type 2 system plus heat detectors and shall comply with NZS 4512.

¹⁵The risk group VP is a classification under the Acceptable Solutions for vehicle storage and parking within either a building or a separate building.

Type 4	Smoke detection and alarm system with manual call points	NZS 4512	A Type 4 system comprises a Type 2 system plus smoke detectors and shall comply with NZS 4512.
Type 6	Automatic fire sprinkler system	NZS 4541	Type 6 system is a combined automatic fire sprinkler system and Type 2 alarm. Activation of the sprinklers shall automatically activate the audible alerting devices of the alarm system. Sprinkler installation shall comply with either NZS 4515 or NZS 4541, as modified by Appendix B of Acceptable Solutions C/AS1 to C/AS6.
Type 7	Automatic fire sprinkler system with smoke detection and alarm system	NZS 4541, NZS 4512	A Type 7 system is a combined Type 6 and Type 4 alarm system (including a Type 2 system). Sprinkler installation shall comply with the requirements of a Type 6 system.

5.2 Substitution of fire safety systems in the Acceptable Solutions

- 5.2.1 I agree with the expert's conclusion that a Type 3 system is not required in addition to the installed sprinkler system. However, I consider it relevant to discuss the submissions made by the parties that reference the Acceptable Solutions and Standards in regards to the use of sprinkler systems as heat detection.
- 5.2.2 The authority has referred to paragraph 2.2.1 of C/AS4 (and C/AS5), which outlines the various fire safety systems required for a firecell depending on occupant load or escape height. For an area where a Type 4 alarm is required, it can be substituted in certain situations (emphasis mine):
- A Type 3 with supplementary smoke detection may be substituted if the environment is challenging for smoke detection...
- A Type 6 alarm system may be substituted provided...
- (iv) There are no sleeping *firecells* elsewhere in the *building*.
- 5.2.3 It is not in dispute that smoke detection is not required to the carpark level. In this circumstance, if paragraph 2.2.1 was applicable, a Type 3 with supplementary smoke detection could be substituted for a Type 4 because of the challenging environment.
- 5.2.4 The authority has submitted this paragraph in the Acceptable Solution as evidence that a Type 3 heat detection system cannot be substituted with a Type 6 sprinkler system. The authority is of the view that because there are sleeping firecells within Buildings A, B, and D (only C it observes has no sleeping firecells), a Type 6 system cannot be substituted with a Type 3 heat detection system. However, I am of the view that the reason a substitution is not permitted within these Acceptable Solutions is due to the need for smoke detection.
- 5.2.5 The Acceptable Solutions require smoke detection to be installed to the requirements of NZS 4512 where there are sleeping risk groups. The Acceptable Solutions recognise that carpark areas are considered 'challenging' as the environment is prone to false alarms if smoke detection was installed, and instead allow for heat detection, aligning with the concessions in NZS 4512. To satisfy the Acceptable Solutions the basement carpark must be both fire and smoke separated from the above ground levels. This includes smoke stop lobbies to stairs and lifts as well as independent

means of escape. The Acceptable Solution addresses the life safety aspect by including additional passive separations (lobbies and fire separations) and the Standard addresses the high probability of false alarm by requiring a thermal detector.

- 5.2.6 Where there are sleeping firecells, smoke detection is crucial, because of the higher risk and vulnerability for sleeping occupants. The expert has stated that smoke detectors react to smoke particles at lower temperatures, and would react faster than a sprinkler system could, providing early warning to the sleeping occupants. I note that a Type 4 can only be substituted with a Type 3 if there is ‘supplementary smoke detection’ alongside the heat detection system. The additional requirement I consider important to highlight that it is the smoke detection provision that is critical, not the heat detection system.
- 5.2.7 I am of the view that the authority has incorrectly interpreted paragraph 2.2.1 of C/AS4 in its opinion that a Type 3 heat detection system cannot be substituted for a Type 6 sprinkler system in the carpark, because of the sleeping firecells. I believe that the Acceptable Solution does not allow a substitution because a Type 6 sprinkler system does not have a smoke detection component, unlike a Type 7 sprinkler system, which incorporates a Type 4 smoke detection system. However, I consider that paragraph 2.2.1 is not relevant to this development because smoke detection is explicitly excluded from the carpark level, and a Type 4 smoke detection system is not being substituted.
- 5.2.8 I note the Acceptable Solutions require smoke control to be considered in carpark levels when automatic sprinklers are not installed. The automatic sprinkler system in this development addresses the Acceptable Solution smoke control criteria.

5.3 Satisfying the Type 3 heat detection requirements

- 5.3.1 A Type 3 system is described in C/AS2 as a ‘Heat detection system with manual call points’ and the relevant Standard for installation is NZS 4512. In F7/AS1 the system is described as a Type 2 system plus heat detectors that shall comply with NZS 4512. In NZS 4512 a detector is described as (emphasis mine):

A device that operates automatically at predetermined conditions associated with fire and which initiates a fire alarm.

- 5.3.2 A heat detector is described in NZS 4512 as:

A detector designed to operate when the temperature at the detector exceeds a predetermined value.

- 5.3.3 I am of the view that NZS 4512 describes a device that will operate automatically when ‘predetermined conditions’, which for heat detection is the temperature, exceed a predetermined value. The heat detection system is required to activate when the temperature is exceeded, and must initiate a fire alarm.

- 5.3.4 I note that in the fire report the automatic fire sprinkler system ‘must meet NZS 4541:2013...’ and the relevant Standards for installation are NZS 4541 and NZS 4512. In NZS 4541 a sprinkler system is described as:

A system including... (f) Any fire alarm signalling device...

- 5.3.5 The primary function of a sprinkler system is suppression. However, the fire report for the development required the sprinkler system to have ‘a direct connection to the Fire Service’. Therefore, when the sprinkler system activates, it will initiate a fire

- alarm, and as previously established the activation time between a sprinkler system and heat detectors is generally comparable.
- 5.3.6 Therefore, I am of the view that the sprinkler system will activate when the temperature exceeds a predetermined value, and will initiate a fire alarm, satisfying the heat detector definitions of NZS 4512.
- 5.3.7 Furthermore, the Acceptable Solutions, as noted previously, refer to NZS 4512 and NZS 4541 in regards to the installation of the different fire safety systems, with C/AS2 listing the relevant standards. The consultant noted there are multiple instances within NZS 4512 that establish a sprinkler system can be substituted for heat detectors.
- 5.3.8 There is minimal difference in activation time between the heat detectors and sprinkler systems. If the substitution of a sprinkler system would significantly affect the safety of the occupants by reducing their time to escape, I consider that this would not be permitted in the Standards.
- 5.3.9 However, I note that the Acceptable Solutions do amend the Standards, and that there are paragraphs that the authority has referred to as requiring heat detectors. In C/AS7 paragraph 2.2.1 states (emphasis mine):
- If a risk group VP is within a building that is protected with an automatic fire alarm system, the risk group VP must have at the minimum a Type 3 automatic heat detection system.
- 5.3.10 I am of the view that this paragraph recognises the lower fire safety requirements normally required for a carpark, because of the lower occupancy load in comparison to other risk groups. The basement carpark spans underneath all the buildings on the site, and the fire safety provisions for the most onerous risk group must be applied throughout to satisfy the Acceptable Solutions. The risk groups within the development are CA¹⁶, WB¹⁷ and SM¹⁸, and an automatic fire sprinkler alarm system has been specified in the fire report because of the higher occupancy loads and risk associated with them. I consider that C/AS7 paragraph 2.2.1 recognises that while a carpark has lower fire risk, there are higher fire risks within the building and the requirement for a minimum Type 3 reflects the difference in fire safety systems to satisfy the Acceptable Solutions.
- 5.3.11 I note that a sprinkler system is required for the more onerous risk group, and as it has been installed to the carpark it satisfies the Acceptable Solutions.
- 5.3.12 The expert has discussed the ‘minimum’ requirement of a Type 3 automatic heat detection system. I agree with the expert that a system that provides a higher level of performance is acceptable to be installed. I have previously discussed that a sprinkler system is suitable to use as a heat detector, and has the additional benefit of controlling and potentially extinguishing a fire. Therefore, I am of the view that a sprinkler system¹⁹ exceeds the minimum requirement of a Type 3 automatic heat detection system, and satisfies C/AS7.

¹⁶ The risk group CA is a classification under the Acceptable Solutions for public access and educational facilities, e.g. cinemas, shops, restaurant etc.

¹⁷ The risk group WB is a classification under the Acceptable Solutions for business, commercial and low level storage, e.g. offices, workshops etc.

¹⁸ The risk group SM is a classification under the Acceptable Solutions for Sleeping (non institutional), e.g. apartments, hotels, motels etc.

¹⁹ A Type 6 automatic fire sprinkler system that is compliant with NZS451 or NZS 4515 and with the additional modifications of NZS 4512

5.4 The fire report

5.4.1 The authority stated in its submission that the compliance schedule in the fire report for the carpark has 'always referred to a Type 3 fire safety system'. I note that I have only been supplied revision C and revision J of the consented fire report, and the compliance schedule lists:

- Revision C: Type 6 system and a Type 4 system in the carpark and a Type 7 and Type 4 system in the other buildings
- Revision J: states a Type 7 system in the carpark and the other buildings.

5.4.2 Based upon the fire reports submitted, I have not seen any reference to a Type 3 heat detection system. Therefore, as previously stated, I consider that the report does not specify a Type 3 system, and the authority was incorrect to require the installation alongside the sprinkler system.

5.4.3 When the code compliance certificate is applied for, the fire report will need to reflect what has been constructed. I do not consider that a 'new fire design with appropriate supporting evidence' is required. I consider that the fire report will need to address the as-built situation to clarify the use of a Type 6 system in the carpark. I note that further evidence of the compliance of the Type 6 system cannot be required by the authority.

5.5 Conclusion

5.5.1 The fire report did not explicitly require a Type 3 heat detection system to be installed to the carpark, and the authority cannot require this system to be installed alongside the Type 6 sprinkler system.

5.5.2 The differences between the sprinkler system and heat detectors have been identified as minimal, and there is no negative impact to life safety as the systems are generally comparable.

5.5.3 The Type 6 sprinkler system when appropriately modified exceeds the minimum requirements of a Type 3 system. Consequently, the Type 6 sprinkler system satisfies C/AS7 paragraph 2.2.1, which requires a minimum Type 3 heat detection system in carpark.

5.5.4 Therefore, I consider that the authority's proposed decision to refuse to issue the code compliance certificate, in respect of the installation of Type 6 automatic fire sprinkler system without a Type 3 heat detection system to the carpark, to be incorrect.

6. The decision

6.1 In accordance with section 188 of the Building Act 2004, I hereby determine that:

- the authority was incorrect to require Type 3 heat detectors alongside the Type 6 automatic fire sprinkler system
- the use of a Type 6 automatic fire sprinkler system complies with Clause C4.3, if the system is compliant with either NZS 4515 or NZS 4541, and has the additional modifications to satisfy NZS 4512
- the installed Type 6 automatic fire sprinkler system satisfies the Acceptable Solutions as a means of providing heat detection.

Signed for and on behalf of the Chief Executive of the Ministry of Business, Innovation and Employment on 12 April 2017.

John Gardiner
Manager Determinations and Assurance

Appendix A: The Acceptable Solution C/AS7

- A.1 The relevant paragraphs from Acceptable Solution for Buildings Used for Vehicle Storage and Parking (Risk Group VP) for Clauses C1 – C6 Protection from Fire include:

2.2 Fire safety systems

2.2.1 The *fire safety systems for firecells* required for this *risk group* shall be as follows. *Fire safety system* types shall be as defined in Table 2.1. If automatic heat or smoke detection systems are provided in addition to the requirements of this paragraph, a direct connection to the Fire Service is not required.

Amend 3
Jul 2014

For ≤10 m escape height:

- a) Type 2 alarm system that need not be connected to the Fire Service (not required if there are less than 50 occupants and less than 10 vehicles), and
- b) Type 18 *building fire* hydrant system, unless the Fire Service hose run distance from Fire Service vehicular access to any point on any floor is less than 75 m.

Amend 2
Dec 2013

For >10 m escape height:

- a) Type 3 alarm system that need not be connected to the Fire Service, and
- b) Type 18 *building fire* hydrant system in all cases where the height from the Fire Service attendance point to any floor is greater than 15.0 m. Otherwise, a Type 18 system is required unless the Fire Service hose run distance from Fire Service vehicular access to any point on any floor is less than 75 m.

Amend 3
Jul 2014

Storage or parking using a vehicle stacking system

- a) Type 6 system, and
- b) Type 18 *building fire* hydrant system in all cases where the height from the Fire Service attendance point to any floor is greater than 15.0 m. Otherwise, a Type 18 system is required unless the Fire Service hose run distance from Fire Service vehicular access to any point on any floor is less than 75 m.

Amend 3
Jul 2014

If a *risk group* VP is within a *building* that is protected with an automatic *fire* alarm system, the *risk group* VP must have at the minimum a Type 3 automatic heat detection system.