

Sprinkler heads in clothes dryer enclosures

1 THE MATTER TO BE DETERMINED

- 1.1 The matter before the Authority is a dispute about whether the automatic sprinkler system in an apartment building should extend to enclosed spaces containing electric clothes dryers (“dryer enclosures”).
- 1.2 The Authority takes the view that it is being asked to determine whether the sprinkler system for the building concerned is required to extend to dryer enclosures in order for the building to comply with New Zealand Standard 4541:1996 *Automatic Fire Sprinkler Systems* (“NZS 4541”)¹ as cited in the acceptable solution C/AS1 and therefore with clause C3 of the building code (the First Schedule to the Building Regulations 1992).
- 1.3 The Authority was not asked to determine whether the sprinkler system complied with clause C3 as an alternative solution even if it did not comply with NZS 4541. There were no submissions to that effect from the applicant, and insufficient information about the fire safety features of the building concerned to enable the Authority to make such a determination.
- 1.4 In making its determination the Authority has not considered any other aspects of the Building Act 1991 (“the Building Act”) or of the building code.

2 THE PARTIES

- 2.1 The applicant is the owner of the building acting through a fire protection company. The only other party is the territorial authority concerned. The Insurance Council of New Zealand (“ICNZ”) was considered to be an “appropriate person” in terms of section 19(1)(b) of the Building Act 1991 and was accordingly provided with copies of the relevant documents and given the opportunity to make submissions.

3 THE BUILDING

- 3.1 The apartment building concerned is protected by an automatic fire sprinkler system.
- 3.2 Each apartment contains a dryer enclosure, described by the applicant as a “laundry cupboard”, which contains an electrical washing machine and clothes dryer unit. The dryer is physically connected to a mechanical extract system and vents through ducts in the ceiling space to the outside. The Authority was not informed as to the

¹ The current version is NZS 4541:2003, but in all relevant respects that is identical to NZS 4541:1996 as cited in the acceptable solution C/AS1.

composition of the ducts. The dryer enclosure extends from the floor to the underside of the ceiling and has a volume of less than 2 m³. The dryer enclosure is in the bathroom but separated from it by walls and doors with no fire resistance ratings. The ceiling above the enclosure also has no fire resistance rating. The bathroom contains a sprinkler head but no smoke detector. The ceiling space is less than 800 mm deep and is bounded by the fire rated walls between apartments. There are no sprinklers in the ceiling space.

- 3.3 Apparently, the fire design of the building as a whole is an alternative solution in that it does not comply with the Fire Safety Approved Document but has been accepted by the territorial authority as complying with the building code except as to the disputed detail of the sprinkler system.

4. THE BUILDING CODE, THE APPROVED DOCUMENT, AND NZS 4541

- 4.1 The relevant provisions of the building code are:

C3.3.2 Fire separations shall be provided within buildings to avoid the spread of fire and smoke . . .

C3.3.4 Concealed spaces and cavities within buildings shall be sealed and subdivided where necessary to inhibit the unseen spread of fire and smoke.

- 4.2 Those performance criteria can be achieved by complying with acceptable solution C/AS1 in the Fire Safety Approved Document, which includes requirements for sprinklers. It provides:

Appendix D: Fire Sprinkler Systems

D1.1 Introduction

D1.1.1 Wherever sprinklers are required by this acceptable solution, they shall comply with [NZS 4541] . . .

- 4.3 The relevant provisions of NZS 4541 are:

204.2

Any firecell of any building which is required to be sprinkler protected in accordance with this Standard shall be sprinklered throughout except where the omission of sprinklers is specifically permitted by the Standard. . . .

511.1.1

Concealed spaces not exempt from sprinklering shall be sprinkler protected. . .

511.11 Other situations

In any other situation where the meaning of 'throughout' in section 204 is uncertain, the need for additional sprinklers shall be determined by having regard to whether the heat will reach the sprinklers sufficiently early and whether the discharge from other sprinklers will satisfactorily control the source of heat.

515.1

The following cupboards or wardrobes shall be protected:

- (a) Cupboards housing electrical switchboards;
- (c) Cupboards and wardrobes which exceed 2 m³ in volume;

- (e) Full height cupboards or wardrobes which do not have an FRR of --/30/30 on their ceiling . . .

5 THE SUBMISSIONS

5.1 *The applicant*

- 5.1.1 The applicant submitted that the proposed sprinkler system complied with the acceptable solution C/AS1 in that it complied with NZS 4541, arguing that the dryer enclosures were properly described as cupboards, and citing various dictionary definitions, including “a small room” (*Webster’s*) and “a small part of a room with a door” (*Cambridge Advanced Learners*).

5.2 *The territorial authority*

- 5.2.1 The territorial authority made no specific submissions. However, the determination arose because the territorial authority told the applicant that it would issue a building consent only on condition that the dryer enclosures were sprinklered. It based that decision on advice from the consulting engineer whom it had engaged to review the fire safety design of the building (“the territorial authority’s consultant”).

- 5.2.2 The territorial authority’s consultant had said:

. . . although dryer spaces may be called a ‘cupboard’ or a ‘wardrobe’ on the plans, that is in fact an incorrect description, and these spaces should more correctly be described as either a ‘dryer annex’ or a ‘laundry annex’.

The territorial authority’s consultant cited definitions from the *Concise Oxford English Dictionary*, and concluded that:

The essence of a cupboard or a wardrobe from the dictionary therefore appears to be that it is for passive storage.

- 5.2.3 The territorial authority’s consultant also provided a list of “Fires where a Dryer is Involved” compiled by the New Zealand Fire Service. That showed a total of 618 such fires had been reported in New Zealand between 1 July 1998 and 22 July 2003.

5.3 *ICNZ*

- 5.3.1 ICNZ made submissions and provided information about the incidence and causes of clothes dryer fires in US homes from the National Fire Protection Association and the Consumer Products Safety Commission. There had been a total of 74,000 such fires reported in the years 1994-8, resulting in 81 deaths and 1,543 injuries.

- 5.3.2 The ICNZ submissions included:

In ICNZ opinion, electrical appliances located in enclosures while operating require sprinkler protection within to satisfy the intent of NZS 4541 Clause 204, 511.1, and 515.1.

This opinion was published in the form of an ICNZ Technical Directive to the Sprinkler Industry in 1999 . . .

. . . clothes dryers [are] a significant hazard that would likely result in personal injuries in residential occupancies . . .

. . the life safety performance of a sprinkler system will not be achieved if the clothes dryer is located in an unprotected enclosure.

5.3.3 The ICNZ technical directive (“TD247/99”) reads:

Dryer cupboards

With reference to NZS4541 515.1, and 515.11, and NZS4515 4.1.2 and 2.1.1, sprinklers shall be installed in all built in cupboards housing clothes dryers.

5.4 *The Authority’s consultants*

5.4.1 The Authority obtained reports on the matter from two consulting engineers (“consultants 1 and 2”). Those reports were copied to the parties and ICNZ.

5.4.2 Consultant 1’s report said:

. . . a cupboard containing a washer and dryer would have no greater quantity of fuel present than for example a wardrobe, or linen cupboard of similar volume. . . . the sprinkler [in the bathroom] would control the fire to no less extent than that originating in any of the cupboards or wardrobes not required to have a sprinkler under clause 511.1 of NZS 4541, notwithstanding that the probability of ignition is higher for the dryer.

. . . the extract duct from the dryer goes through the ceiling into a roof space. The ceiling does not provide an FRR of -/30/30 and there is no indication of any fire damper in the duct where it penetrates the ceiling. The cupboard is therefore considered not to comply with NZS 4541 clause 515.1(e), and under this clause either a sprinkler would be required in the cupboard or the ceiling constructed with an FRR of --/30/30, including fire damper for the duct.

Consultant 1 also discussed whether the sprinkler system was an alternative solution complying with the building code. Those parts of the report are not discussed for the reasons set out in 1.3 above.

5.4.3 Consultant 1’s report concluded:

- the exception permitted in NZS 4541: 2003 could be applied to the washer/dryer cupboard under clause 515.1(c) since the Standard does not place any restriction on the contents of cupboards and wardrobes.
- the lack of sprinklers in the washer/dryer cupboard renders the system non-compliant in accordance with NZS 4541 in that it does not qualify for the exception under clause 515.1(e), due to the absence of a fire rated ceiling preventing possible fire spread to the ceiling cavity.

5.4.4 Consultant 2’s report discussed the incidence of dryer fires, and described one such New Zealand fire in which people had been fortunate to escape with their lives. It said:

As the dryer cupboard would have neither a sprinkler head or a smoke detector, the fire would grow to its full potential size, inside the cupboard, undetected. The ‘dryer cupboard’ doors will presumably be about 20 mm thick and if combustible could add to the fire load inside the cupboard.

. . . a strict interpretation of NZS 4541 modified in accordance with Appendix D of the Acceptable Solution C/AS1, means that the Standard does not yet require sprinklers in dryer “cupboards”. From this it follows that the Building Code also does not require sprinklers in dryer “cupboards”. I use the word “cupboard” in quotations because I consider the whole of this debate hangs on whether the dryers are in a “cupboard”, or “annex”, or a “small room”. If a “room” turns out to be the correct definition of the space, in this case then the Building Code does require sprinklers in “rooms”.

5.4.5 Consultant 2 agreed with the ICNZ technical directive, said that clause 515.1(a) of NZS 4541 “indicates that NZS 4541 recognises that electrical equipment in a cupboard is a hazard that needs to be addressed”, and concluded:

I am of the opinion that cupboards containing electrical dryers should be sprinkler protected in accordance with TD 247/99 to ensure the safety of the occupants of the building.

5.5 Responses to the Authority’s consultants’ reports

5.5.1 ICNZ responded to the reports by the Authority’s consultants, saying:

1.0 There are two issues involved in this determination.

- a) Does the Standard as written require sprinkler protection in spaces containing clothes dryers.
- b) In the [building concerned] has the NZBC Regulation C2 objective C2.1(a) and functional requirement C2.2(a) been achieved without sprinklers in the dryer enclosures.

[The consultants] in their reports address item (a).

Neither report addresses item (b). ICNZ is of the opinion that the performance requirements of the NZBC Regulations will not be achieved as the dryers in question are located on a single width open path egress route from the apartment.

i.e. It is probable that a person evacuating the apartment would have to pass within 500mm of a burning dryer in the event of a dryer fire and sustain injury.

2.0 The debate of the word cupboard is not relevant.

The principle involved is whether the contents of the cupboard are likely to initiate a fire, and whether the sprinkler system can detect and suppress that fire.

Clearly when there is a door preventing products of combustion being detected by a sprinkler and then obstructing the discharge, the purposes of the sprinkler system as set out in the Standard cannot be achieved and the life safety performance compromised.

3.0 When the original cupboards clause was put in the Standard in NZS 4541:1987 and NZS 4541:1996 the practice of putting clothes dryers in enclosures did not exist and has only emerged as a serious issue since the NZ and American fire statistics on fires, injuries and deaths from dryer fires emerged after NZS 4541:1996 was published.

4.0 Clearly both reports believe that sprinklers are required in dryer enclosures but for different reasons.

5.0 The fact that enclosures containing electrical switchboards require sprinklers confirms the intent of the Sprinkler Committee on potential sources of ignition in enclosures. Dryers have a far higher incidence of initiating fires than electrical switchboards.

6.0 Dryer fires in enclosures do cause injury and loss of life.

In a sprinkler protected building such enclosures shall be protected to achieve the intended life safety and/or property safety purpose of the Standard.

The ICNZ comments about compliance with the building code as distinct from NZS 4541 are not discussed below for the reasons set out in 1.3 above.

5.5.2 The applicant agreed in general with the report by consultant 1, but said:

The following significant error was noted affecting the report’s conclusions:

1. The cupboard in question is a ceiling height cupboard, not a full height cupboard as assumed by [consultant 1], which would require a -/30/30 rating. . .
2. A full height cupboard would extend to the underside of the structure. The cupboard under review is ceiling height only, identical to other cupboards/wardrobes in the unit that do not require protection and have plastic access hatches to fan units above.

5.5.3 The applicant did not consider the report by consultant 2 to be adequate, saying that it referred to “misleading statistics from another country”, saying:

. . . statistics from the NZ Fire Service . . . show recorded instances of dryer fires in apartment building dating back to 1992 are few. We chose not to submit NZFS statistics . . . because they are misleading and not applicable to the technical query.

Nevertheless, consultant 2 “has concluded that a strict interpretation of NZS 4541 does not require sprinklers in dryer cupboards”.

5.5.4 The applicant responded to the ICNZ submissions, concluding:

. . . the dryers in question are not located on a single width egress path, they are located in a bathroom containing a sprinkler and inside a cupboard.

A person evacuating an apartment would not pass within 500 mm of a dryer fire and sprinklers are installed in the egress path and the bathroom in any event. . .

Electric switchboards are not a suitable method for comparison. . .

Architects/builders have adopted the practice of framing up tightly around washing machines/dryers in bathroom units for aesthetic purposes, in effect forming a cupboard.

This does not prevent a fire load larger than what may be contained in other cupboards exempt under the NZ Standard/Acceptable solution.

Any addition or alteration to the NZ Standard requiring sprinklers in cupboards with washing machines/dryers needs to go through the normal process giving due consideration to economic impact under the Standards Act 1988.

6 DISCUSSION

6.1 *Interpretation of the word “cupboard” in NZS 4541*

6.1.1 The design of the sprinkler system was claimed to comply with NZS 4541 and the Authority was not asked to consider whether the omission of sprinklers from the spaces concerned was acceptable as an alternative solution. Accordingly, the submissions on that point, principally from ICNZ and consultant 1, are not discussed.

6.1.2 The Authority agrees with consultant 2 that “the debate hangs on whether the dryers are in a ‘cupboard’”. It does not agree with the ICNZ submission that “the debate of the word cupboard is not relevant”. NZS 4541 is cited in C/AS1 and, as a matter of law, must be accepted as establishing compliance with the relevant provision of the building code. In other words, no-one can be forced to do more than NZS 4541 requires. The question is whether the dryer enclosure is a cupboard that NZS 4541 does not require to be sprinklered. That must be determined on the words that are actually used, not on what the Standards New Zealand committee responsible for drafting NZS 4541 is thought to have intended.

6.1.3 Considering the word “cupboard” in NZS 4541, the Authority takes the view that because the word is not defined in NZS 4541, it must be given its ordinary and natural meaning in context.

- 6.1.4 In this case, the context is that of a technical fire safety document. In the context of a real estate advertisement or the like, the space concerned might well be properly referred to as a “cupboard” simply on the basis that it is behind doors in a room. However, in the context of NZS 4541, that is too simplistic. In particular, NZS 4541 must be read in the light of the fire safety aspects of any particular situation described in it.
- 6.1.5 The Authority accepts that dryer enclosures will not contain a greater fire load than the ordinary run of cupboards and wardrobes.
- 6.1.6 However, despite the applicant’s submission that both the New Zealand Fire Service statistics cited by the territorial authority’s consultant and the US statistics cited by ICNZ are “misleading”, the Authority accepts that clothes dryers are known to be a relatively frequent cause of fires, which is not the case with the ordinary run of cupboards and wardrobes.
- 6.1.7 The ICNZ technical directive has no statutory authority, but clearly represents an expert opinion that may be taken into account in the application of NZS 4541.
- 6.1.8 In the fire safety context, therefore, the Authority considers that dryer enclosures involve significantly different fire safety considerations than the general run of cupboards and wardrobes. The Authority concludes that dryer enclosures are not “cupboards” for the purposes of NZS 4541 and are therefore not exempted from the need for sprinklers by clause 515.1. That being so, clause 511.11 must be considered and “the need for additional sprinklers determined by having regard to whether the heat will reach the sprinklers sufficiently early and whether the discharge from other sprinklers will satisfactorily control the source of heat”.

6.2 *Clause 511.11 of NZS 4541*

- 6.2.1 The Authority accepts consultant 2’s opinion that a fire in the space concerned would reach its full potential, including the involvement of any other combustible such as the doors, before the heat of that fire reached the sprinkler in the bathroom. Furthermore, the dryer enclosure is vented through ducts in the ceiling space, and in the absence of a fire rated ceiling and of any information about those ducts and about the fire load in the ceiling space, the Authority must recognise the possibility that a fire originating in the dryer enclosure might involve the ceiling space before the sprinklers operated. The Authority does not consider that to be acceptable in terms of clause 511.11 of NZS 4541.

6.3 *Conclusion*

- 6.3.1 The Authority concludes that the sprinkler system concerned, without sprinkler heads in the dryer enclosures, does not comply with NZS 4541.

6.4 *“Full height cupboards”*

- 6.4.1 It is not relevant to this determination, but the Authority notes that it considers that the term “full height cupboard” as used in clause 515.1(e) of NZS 4541 includes a cupboard that extends from floor to ceiling (see 5.4.2 and 5.5.2 above).

7 THE AUTHORITY'S DECISION

- 7.1 In accordance with section 20 of the Building Act, the Authority hereby determines that the sprinkler system without coverage of the dryer enclosures does not comply with NZS 4541.

Signed for and on behalf of the Building Industry Authority

on 23 April 2004

John Ryan
Chief Executive