New Zealand Fire Service Building Memorandum

Memo Issue	1
Date	15 March 2017
Design Review No	10026

In accordance with section 47 of the Building Act 2004 the New Zealand Fire Service (NZFS) provides advice to the Auckland Council in respect of the following building:

Building Consent Authority (BCA) Reference

File Ref	B/2016/10829/2	**Contact**	Ian Hay

Property Information

Street Number	69-105	**Legal Description**	-
Street Name	Customs Street East		
Town/Suburb	Central	**City/Region**	Auckland
Owner/Registered Proprietor			
Premises / Company Name			

Design Details

Architect	Peddle Thorp Architects Ltd
Fire Engineer	Tony Enright, Enright Consulting
Fire Report Title	Fire Engineering Report 69-105 Customs Street Est Auckland Volume 1 Customs Residential
Fire Report Date	1 December 2016
Version	8
Identifier	EC-1502-FER-101(8)

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Drawings Referenced

Description	Date	Project No.	Revision
Enright Consulting Fire Sketches FSK-112 to FSK-632	1 Dec 2016	1502	4A
Peddle Thorp Architectural Drawings (Detailed Design)	31 Oct 2016	1457	I

This memorandum is provided based on the information shown above. Note that the memorandum provides advice on the following matters:

1. Provision of the means of escape from fire.

2. The needs of persons who are authorised by law to enter the building to undertake fire fighting.

The fire report uses the Verification Method Amendment 4 as a basis for design. The NZFS has also referred to this compliance route when providing the advice contained in this memo.

The consent documentation indicates that this is a new building. Under s.17 of the Building Act 2004, the NZFS considers this building should comply with all clauses of the Building Code, and has assessed the design accordingly.

Introduction

The development located at 69-105 Customs Street East includes a residential tower (L8 to L52) upon a mixed-use podium (GF to L7) of retail, car parking, office and recreation, and with five basement levels (B5 to B1) for plant and further car parking. The adjacent existing Ballantyne House building will be undergoing a change of use in the future. The proposed linkage to new tower on B1 will be fire separated with a fire shutter. The numbering convention is such that levels 4, 14, 24, 34 and 44 are excluded upon client request.

The building is served by two stair shafts, except for L41 and above, and as well in the basement carparks, where only a single means of escape is available. As part of the fire safety strategy, a phased evacuation is proposed.

The proposed fire safety systems in the building include: Type 7 fire sprinkler system with smoke detectors, Type 5 local smoke detection in the apartment units, Type 9 smoke detection in air handling systems, Type 18 fire hydrant system in the stairs (in the east stair for levels B5 to B1, and in the west stair for levels G to L51). Pressurisation in the west stair from L39 to L52, and to the passenger lift shafts, EWIS system and fire control room, emergency lighting and illuminated exit signs, emergency generator, and firefighting lifts (SE passenger lift and goods lift).

FDS modelling has been undertaken for 8 challenging fire scenarios and 5 robustness check scenarios to assess tenability in terms of visibility and/or FED_{co}. RSET has been assessed based on hand calculations for all scenarios.

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New Zealand Fire Service Advice Under Section 47

1. MEANS OF ESCAPE

1.1. ***Occupancy / Occupant density –*** The following issues with regards to the occupancy within the building require further clarification.

a. It is unclear if the basement and L2/L3 carparks as well as the L7 pool//spa/gym area are provided solely for the occupants of the building, or if these will also be available to customers within the retail and restaurant tenancies. Occupant familiarity with the building has an impact on the allowable dead end travel distance on these levels under C/VM2, section 4.1 for the BE scenario.

A dead end travel distance of 49 m has been indicated on fire drawing EC-1502-FSK-222-(4) L07 which is only permitted for occupants that are familiar with the building. Fire report section 13.1.3 also assumes that occupants in the basement carpark are familiar with the building when adopting a pre-movement time of 30 seconds without justification.

b. Occupancy for the proposed L7 tenancy is unclear. Currently an occupant density of 10 m^2/p has been adopted in fire report Table 2-4, without justification for this reduced occupant density on a level providing recreational activities.

The NZFS recommends that the BCA requires the applicant to provide further information with regards to occupant familiarity and occupancy within the building, in order to demonstrate compliance with the Building Code.

1.2. ***Fire safety systems*** – the following fire safety systems have been noted in the fire report, which requires further clarification.

a. Fire sprinkler system **–** fire report section 10 assessed external vertical fire spread, including fire plumes spreading fire from a lower firecell through an unprotected lower roof. Please confirm that the adjacent Ballantyne House is equipped with an automatic fire sprinkler system, as no evidence has been provided in the consent package demonstrating its effectiveness to control a fire, in order to demonstrate compliance with the vertical fire spread (VS) scenario as outlined in C/VM2 paragraph 4.6.

b. EWIS system **–** As part of the phased evacuation, an EWIS system is provided with means of two-way communication to facilitate the proposed phased evacuation. However, the fire report is silent on the proposed extent of two-way communication coverage, which should be clarified.

As part of the NZFS operational requirement, provision of two-way communication at the following locations are essential.

i. the fire control room,
ii. sprinkler valve room,
iii. within the West Stair on all levels above ground,
iv. within the East Stair in all basement levels,
v. in the SE passenger lift car,
vi. in the goods lift, and

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vii. within all lift lobbies on all levels

c. Jet fans on carpark levels **–** It appears that jet fans have been specified as part of the mechanical smoke control system in fire report Appendices A, C and D. However no references to the jet fans have been made within the fire report except for in the appendices. The following issues are required to be addressed in order to demonstrate compliance to the NZBC.

i. Does the proposed jet fan system form part of the buildings fire safety systems,
ii. If so, reasoning for ignoring its impact and excluding it from the FDS models,
iii. On which levels will the jet fans be incorporated (whether or not this includes the VIP carpark levels on L2 and L3).

Provision of controls for the jet fans are also required to be located in the fire control room for firefighting operations.

d. Power supply – Continuous power supply should be provided to the following essential systems, as a minimum, in the event of fire or loss of main power supply. Without relevant electrical documentation, it is unclear from the fire report if these systems are also provided with an emergency power supply:

i. Ventilation to the refuge area during fire event
ii. Lifts for fire fighting operations (and for occupant egress, if deemed appropriate)
iii. Electric pump to the hydrant risers

The NZFS recommends that the BCA requires the applicant to address the above issues relating to provision of fire safety systems, in order to demonstrate compliance with the Building Code.

1.3. ***Door mechanism –*** The NZFS notes the following with regards to the door mechanisms:

a. It is unclear if the stairs doors are provided with the necessary re-entry mechanism to cater for the proposed use of refuge area.

b. Fire report section 2.6.2 indicates that for a fire occurring on the residential levels, all stair doors on L8 to L51 will be unlock. However, the extent of stair doors unlocking to levels L7 to B5 is unknown.

c. Where lift lobbies are provided with locking devices, preventing NZFS access to the stairs for carrying out firefighting operations (such as on levels 47 to 51), these shall also unlock on fire signal.

Capability to manually unlock the stair and lobby doors shall also be in the fire control room for firefighting operations.

The NZFS recommends that the BCA requires the applicant to provide clarification with regards to the door mechanism design, in order to demonstrate compliance with the Building Code.

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1.4. RSET assessment –

a. RSET appear to be assessed for the fire floor in isolation. No consideration on the effect of merging flows for all occupants from initial evacuation zones. This applies to all RSET assessments.

b. CFGF **–** RSET for CFGF shall also consider people in the Grand Lobby (150 people) and the potential delay from queuing.

c. CF01 **–** Multiple compartments have been created to allow for different tenancies on L1, as such, the 60s pre-movement times should be adopted for areas remote from the fire origin instead of the proposed 30s in Section 13.3.3.

d. CF05 - The travel distance considered in RSET calculation is 54 m from the south balcony. As this is an exterior space and the fire is placed within the building, a 60 s pre-movement times should be adopted instead of the proposed 30s in Section 13.4.2.

The NZFS recommends that the BCA requires the applicant to amend the above RSET assessments, in order to demonstrate compliance with the Building Code.

1.5. *ASET assessments –*

a. Sensitivity analysis **–** The proposed FDS simulation grid sizes are justified with D* alone which no longer in accordance with the FDS technical documentation. Given the results are on the low side of the previously accepted D* range (e.g. for CF05 D* = 4.7), sensitivity analyses should be undertaken per FDS User Guide to confirm suitability of the proposed grid size.

b. Device locations for tenability assessment **–** Where more than one storey is modelled, tenability devices shall be placed at 2 m above *every floor level*, especially within the stairs as occupants will be traversing the stairs during escape.

c. CFB5 - The stair lobby on the left west stair is modelled differently to the B5 floor plan (Peddle Thorp plan 1457-A-2-112 and fire sketch EC-1502-FSK-112-(4) B5). Furthermore, two vertical slots have been modelled from the stair lobby, allowing smoke to enter two enclosed spaces adjacent to the stair lobby without justification.

d. CF47 - This scenario would require a robustness check (RC) check on visibility per C/VM2 paragraph 4.10 as this is a single vertical escape serving L41 to L52. It is noted in the FDS file package that visibility within the stair has been plotted, and that visibility drops below 5 m between 154 s and 177 s which is not permitted under C/VM2.

e. RCB5 **–** The failed stair lobby door appear to have been modelled as half width only. This shall be modelled full width open for the entire modelling duration.

f. RC15A **–** Tenability should also be assessed outside the area of fire origin, i.e. in the corridor which forms part of the egress route.

g. RC15B **–** Visibility drops below 5 m for both stairs when occupants from NAFO open the stair doors. This appears to be different from Figure 14-10 in the FER, please clarify the discrepancies as this does not comply with the acceptance criterion of

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"visibility shall not be less than 5.0 m in more than one vertical escape route for the period of the RSET".

The NZFS recommends that the BCA requires the applicant to amend the models and/or justify the above ASET assessments, in order to demonstrate compliance with the Building Code.

1.6. ***Additional modelling –*** A challenging fire scenario ***and*** a robustness check in the Ground Floor double height void space should also be considered, as a fire in this space would result in a longer detection time and a larger fire size, while impacting occupants on both the Ground Floor and L1.

The NZFS recommends that the BCA requires the applicant to provide:

a. an additional CF assessment, as well as

b. an RC assessment on the ground floor in the double height space,

in order to demonstrate compliance with the Building Code.

1.7. ***Refuge areas –*** fire report section 2.6.2 refers to "designated places of safety" as part of the evacuation strategy whereby occupant can re-enter the corridors of the designated floors, indicated by safety green with white chevron stair side.

As these refuge areas are no different to the floors above, it is unclear how occupant safety could be ensured in the event of a fire located on one of these refuge floors and its potential impact on egress procedures.

The NZFS recommends that the BCA requires the applicant to clarify the proposed evacuation procedure in the event of these refuge areas being the fire origin in order to demonstrate compliance with the Building Code.

1.8. ***Surface finish requirements –*** Fire report Table 11-1 is silent on internal surface lining requirements for:

a. Internal surfaces of ducts for HVAC systems

b. External surfaces of ducts for HVAC systems

c. Acoustic treatments and pipe insulation within air handling plenums in sleeping uses

The NZFS recommends that the BCA requires the applicant to provide the requirements on above surface finishes, in order to demonstrate compliance with the Building Code.

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1.9. ***Inconsistent fire/smoke separations –*** The following fire/smoke separations have been noted in the fire report / fire sketches that shall be coordinated within the document, the architectural plan and between relevant services:

a. It is unclear if the L2 and L3 VIP carpark levels will form separate firecells as while 60 min fire separations are indicated on the plan, there appear to be no references to the car lift doors confirming that these car lift doors will be fire rated on both levels.

b. L39 fire separation of rising and descending flights to the west stair is proposed in the fire report section 2.6.3. Fire sketch EC-1502-FSK-512-(4) L39 and Peddle Thorp plans 1457-A-3-176, 1457-A-3-178 however appear to indicate smoke separation only within the west stair, which is inconsistent.

The NZFS recommends that the BCA requires the applicant to provide further information with regards to the above inconsistencies in terms of fire/smoke separation, in order to demonstrate compliance with the Building Code.

1.10. ***Documentation Coordination –***

a. Fire report sections 2.5.1 and 2.5.2 have denoted various areas with " * " without further explanations. "Type A", "Type B", "(upper)", "(lower)", and "(reduced)" have also been used to describe different areas of the building. While this appears to have no impact to the occupancy and occupant load of the building, no explanation have been provided to confirm this conclusion.

b. Building fire hydrants are provided in the building, on half landings, on levels B5 to B1 in the East Stair, and on levels ground to L55.

However, the Peddle Thorp plan 1457-A-3-176 shows the highest level indicated with internal fire hydrant is only up to L50. Furthermore, these are also shown on full landings as opposed to the half landing locations proposed in fire report section 2.6.4. Note this is a previously agreed arrangement at the FEB meeting held on 30 Nov 2015 (fire report appendix A.2, section 5. D) I.).

c. Yellow hatched areas have been indicated in fire sketches EC-1502-FSK-112 (4) to EC-1502-FSK-142 (4) on levels B5 to B2 without legend.

The NZFS recommends that the BCA requires the applicant to amend relevant documentations and coordinate the amendments to applicable services, in order to demonstrate compliance with the Building Code.

1.11. ***Completeness of documentation –*** The plans and specifications provided to the NZFS do not contain the following information, necessary to demonstrate compliance with the Building Code and/or carry out the proposed building work in accordance with the recommendations of the fire report:

a. Details of proposed surface finishes, including evidence that the specified product(s) will meet the Material Group Number(s) as specified in the fire report.

b. Details of propose flooring, including evidence that the specified product(s) will meet the critical radiant fluxes(s) as specified in the fire report.

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c. Details of proposed external wall cladding, including evidence that the specified product(s) will not exceed the acceptable peak rate of heat release and total heat released as specified in the fire report.

d. Fire-rated construction details, showing how the assembly is to achieve the fire resistance rating specified in the fire report.

e. Details of all materials and systems being used to restrict the spread of fire for penetrations through fire separations, and the standard of fire resistance that will be achieved.

f. The location of proposed emergency lighting shown clearly on the drawings.

g. Confirmation that the design meets the combination actions for fire requirements of AS/NZS 1170[1].

h. Confirmation that the design meets the post-fire structural requirements of NZS 3101[2] with specific reference to section 4.8 and the requirements to prevent walls collapsing outwards in the event of fire.

i. Confirmation of Construction Monitoring arrangements to include details of fire design features or of safety-related systems (as specified in Practice Note 22, Appendix C) that require specific installation or commissioning inspections during the Construction Monitoring phase.

The NZFS recommends that the BCA ensures the applicant provides the information listed above in order to demonstrate compliance with the Building Code.

2. FIREFIGHTING OPERATIONS

2.1. ***Fire service vehicular access –*** fire report section 12 indicates that fire service access is available from both Customs Street East and Gore Street Lane. Please refer to Appendix B.3 NZFS comments dated 23 Dec 2015, item 2.1. This states that Gore Street as not acceptable for fire service access due to its width and one-way arrangement, despite multiple critical access points being off Gore Street.

The NZFS recommends that the BCA requires the applicant to amend the fire documentations and provide suitable access for fire service, in order to demonstrate compliance with the Building Code.

2.2. ***Canopy for firefighting protection*** – Peddle Thorp plan 1457-A-3-211 indicates a glass canopy (on Customs St E) supported by exposed steel frame for protection against falling glass. The NZFS considers that given the impact of a falling glass or object for this building of this height, potentially damaging the firefighting hoses or cause injury to the firefighters, a canopy shall be provided in compliance with NZS 4510:2008, and satisfy the following performance criteria:

a. Withstand impact of a 100 kg object (file cabinet / person) from the highest floor

[1] AS/NZS 1170.0:2002 Structural design actions - General Principles
[2] NZS 3101:2006 CONCRETE STRUCTURES Part 1 - The Design Of Concrete Structures

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b. Provides protection for a minimum 1.0 m width either side of the panel/FSI/FHI and project at least 1.0 m out from the building

The NZFS recommends that the BCA requires the applicant to provide safe access to the building and to conduct firefighting and rescue operations, in order to demonstrate compliance with the Building Code.

Considering the height of the proposed building, the following additional features are considered essential to facilitate NZFS operations as described in the MBIE Practice Advisory 18.

2.3. ***Fire control room –*** To facilitate firefighting operations, the NZFS would normally require the fire control room be co-located with the security room and have them located on the fire service access level (i.e. the ground floor). This does not appear to be the case where the fire control room and the security / comms room are located separately and in basement level B1.

It is also worth noting, the single means of escape arrangement in the basement levels would cause counter-flow to occur as the fire crew access the fire control room in B1.

In addition, the proposed design and facilities provided within the fire control room should be clearly stated for review.

In light of the fire control room being accessed off Gore Street lane, the NZFS recommends the relocation of the FHI and FSI to Gore Street lane (within 20m of an appliance located at the corner of Gore Street and Gore Street lane). This is also considered of benefit to the client as this shift would maximise street frontage for retail display and may reduce the bracing requirements for the canopy on the Customs Street East elevation.

2.4. ***Schematics of means of escape / access –*** Due to the complexity in firefighting access caused by discontinuity of the stairs and lifts, as well as single means of escapes occurring within the building, a ***3D schematics*** is required to be provided in the fire control room including all of the information below:

a. Location of the fire control room, sprinkler valve room, pump room, and VDU repeater
b. Floor levels accessed by the SE passenger lift (note L5 and L6 are not accessible via this lift)
c. Floor levels accessed by the goods lift
d. Locations of refuge areas
e. Levels where single means of escape occur
f. Levels in the residential tower where common corridors are available for firefighting set-up
g. Location of the “cross-over” level where the fire crew can no longer utilize the SE passenger lift for firefighting operations

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2.5. ***Fire hydrant system –*** With a building of this height, the NZFS requires specific consideration and design for the hydrant system to allow for:

a. The hydrant to be fed directly from town's main, and
b. In the event of town's main failure, that any fire service inlets need to be connected ***prior*** to the pump

2.6. ***Fire fighting lifts –*** the fire report indicates that both passenger lifts and the goods lift may be used for firefighting purposes and will be "hardened". It is unclear what does a "hardened" lift constitute. To ensure the proposed lifts could be used in firefighting operation, the following parameters shall meet the requirements of BS 9999 (or other recognised standards for firefighting purposes) and to be licence certified:

a. Access floors clearly reflected on a 3D schematics firefighting operational planning
b. Lift car weight capacity to be sufficient in meeting the above standard
c. Lift car sizing to be sufficient in meeting the above standard
d. Provision of emergency power supply
e. Two-way communications to the fire control centre
f. Positively pressurised
g. Firefighting Lifts to be clearly labelled for easy identification by the firefighting crews

2.7. ***Fire service access to stairs –*** for safe and effective firefighting operations, a protected lobby shall be provided to connect the firefighting lift to the stair (to access the hydrants). Currently this does not exist on levels 47 to 51 for the full floor penthouses.

2.8. ***Manual override to the fire shutter in B1 –*** In the event of a fire shutter malfunction, a manual override shall be incorporated into the fire shutter mechanism. This is to provide fire crews with the ability to manually activate the fire shutter in the B1 carpark that links to Ballantyne House, in order to maintain fire separation between the buildings.

The NZFS recommends that the BCA requires the applicant to provide the above firefighting facilities in support of the NZFS operation for this tall building.

New Zealand Fire Service Recommendation

1. ***FEB process –*** The fire safety assessment work has been based on methodology outlined in C/VM2. Section 1.3 of C/VM2 states that the design requirements are to be ascertained via the Fire Engineering Brief (FEB) process. This is to ensure that all design parameters have been agreed between the stakeholders before any design work is carried out, thus reducing the risk of additional work being required at consent.

   The NZFS notes that while a meeting was held on 4 August 2015 between Auckland Council, NZFS, and Enright Consulting, and a FEB has been submitted. No response is received by the NZFS on email dated 23rd December 2015 with items relating to NZFS requirements hence the FEB was not closed out and the FEB process has not been completed. It should be noted that a significant number of these comments could have been addressed in advance of consent during the FEB process. Therefore the NZFS recommends that the BCA encourages the applicant to follow the FEB process for all C/VM2 designs.

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2. ***Phased evacuation –*** to optimise egress capacity and to facilitate firefighting operation in high rise buildings, a phased evacuation strategy is proposed in fire report section 2.6.2 and the fire matrix in Appendix C.

   The NZFS requires for firefighting operations that the initial evacuation zones typically be the ***firecell (or floor, whichever is greater) with the fire signal, and one firecell above***, except for the following locations due to egress arrangements:

   a. A fire in the basement carpark would require evacuation of the entire basement carpark (levels B5 to B1).

   b. A fire in the ground floor or L1 would evacuate the ground floor firecell and the firecell above it (L2 firecell).

   c. A fire on L40 to L52 would require ***all occupants*** on L40 to L52 to evacuate as L41 to L52 is served by a single means of escape.

   A voice message (in a language understood by the occupants as well as in English) is recommended be delivered to the entire building notifying of a fire within the building, and occupants are able to self-evacuate should they wish to do so. Firefighting operations will be staged at one floor below the fire floor.

   An automatic cascading alarm shall be provided as part of the EWIS system to expand the evacuation zone until NZFS's manual intervention of the system. This should be set on an agreed interval (e.g. 10 minutes) to cascade the evacuation signal to one firecell above and below the initial evacuation zone. This is part of the NZFS procedures for tall high rise building and the fire matrix shall be amended to reflect these requirements.

3. ***Evacuation Scheme –*** The NZFS notes that this building is subject to additional requirements under the "Fire Safety and Evacuation of Buildings Regulations 2006" as it provides accommodation for more than 5 persons. Among other things the building requires an evacuation scheme that must be approved by the NZFS.

   Specific procedures developed for occupants to safely egress through the building is of particular importance for a tall high rise building such as this. Even more so for the single means of escape provision on L41 to L52. An evacuation consultant should be engaged at early stage, any change in egress strategy should result in reassessment to ensure occupant safety.

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Disclaimer

This memorandum is provided in accordance with section 47 of the Building Act 2004 and as such does not constitute a regulatory review of all fire safety systems in the design.

Document Control

Action	Name	Signature	Date
Produced by:	**Jessie Hou**		13 March 2017
Checked by:	**Angela Chen**		15 March 2017
Approved by:	**Paul Richards**		15 March 2017

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