FIRE ENGINEERING UNIT

SIMON DAVIS: FIRE ENGINEERING MANAGER

FENZ FIRE ENGINEERING UNIT

- Established 2005 (amalgamation of regional positions set up in 1998)
- Fire engineering unit part of the National Risk Reduction Directorate
- FEU consists of 14 engineers in four centres: Auckland, Tauranga, Christchurch and Wellington and a coordinator

Work consists of:

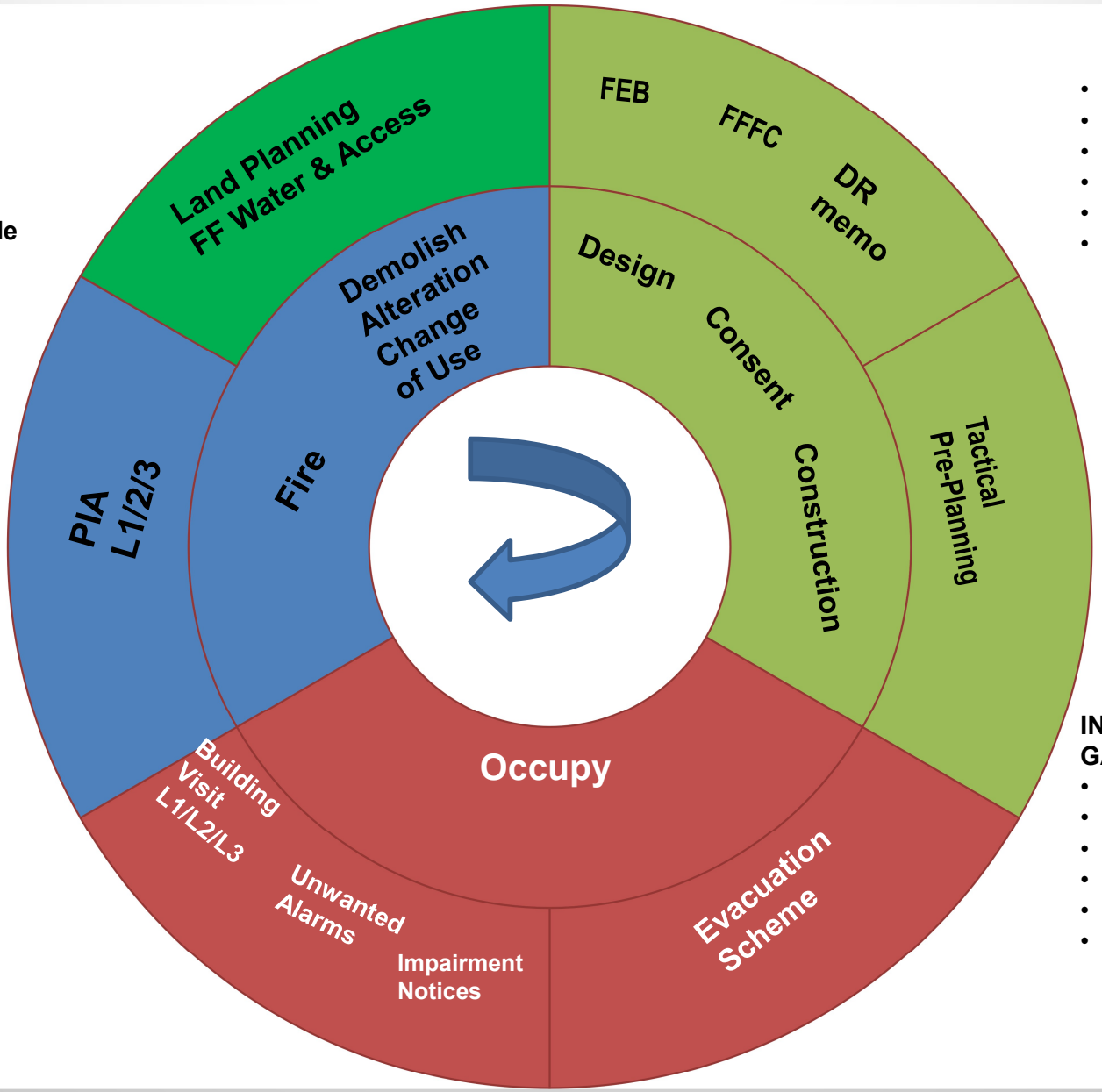
- Building Consent reviews (S46) [Board]
- Fire engineering briefs
- Technical advice
- Building Visit (Dangerous)
- Post incident analysis
- Projects (FENZ Property)
- Research

TEAM AT ILAM OFFICIAL OPENING

LIFE OF A BUILDING

FENZ ROLE

- CoP FF water
- Appliance Guide



- Design Guide
- NZ Standards
- PN 22 Practice Note
- MBIE Guides
- Operational Guide
- IFEG

INTELLEGENCE GATHERING:

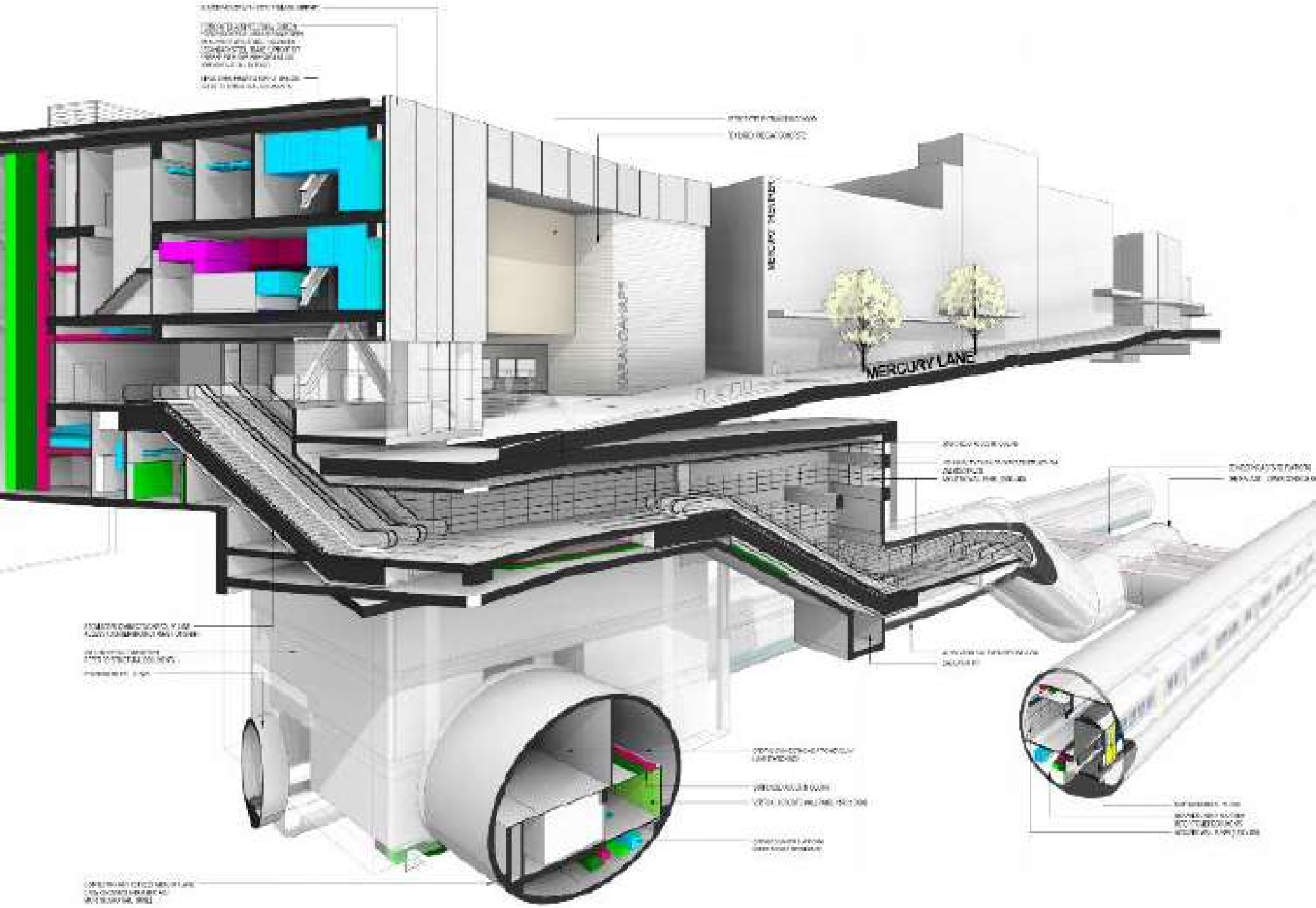
- Water
- Building Layout/Location
- Fire Safety Systems
- Hazardous Substances
- Evacuation Methodology
- Population Type/Size

EMERGING TRENDS

- Evacuation (partial/disabled): Low FRR
- Use of Lifts (Egress/Access)
- Massive Timber
- Buildings in Wildfire prone areas
- Multiple use buildings
- Car stackers
- PV systems/ Li-Ion storage (MW!)
- Electric vehicles (Charging?)
- Hydrogen vechicle (Bus/Ferry/Trucks: refuelling)
- Urban Intensification (no vechicle access)


KINGS Plant Barn


ZURICH
citi


MERCURY LANE

MASSIVE TIMBER

KAIKOURA COUNCIL

Storeys	New Zealand		USA		Australia		Canada		England **	
	With Sprinklers	Without sprinklers	With Sprinklers	Without sprinklers	With Sprinklers	Without sprinklers	With Sprinklers	Without sprinklers	With Sprinklers	Without sprinklers
20+			180		90		120		120	
20	30		180		90		120		120	
19	30		180		90		120		120	
18	30		180		90		120		120	
17	30		180		90		120		120	
16	30		180		90		120		120	
15	30		180		90		120		120	
14	30		180		90		120		120	
13	30		180		90		120		120	
12	30		120		90		120		120	
11	30		120		90		120		120	
10	30		120		90		120		120	
9	30	60	120		90		120		90	
8	30	60	120		90		120		90	
7	30	60	120		90		120		90	
6	30	60	60		90		60		60	
5	30	60	60		90		60		60	
4	30	60	60		90		60		60	60
3	30	60	0 *	§	90	90	45	45	60	60
2	30	60	0 *	§	90	90	45	45	30	30
1	0 *	0 *	0 *	§	0 *	0 *	0 *	0 *	0 *	0 *
	FRR	FRR	FRR	FRR	FRR	FRR	FRR	FRR	FRR	FRR

§ International Residential Code can be used for one- and two-family dwellings and townhouses up to 3 storeys without fire sprinklers.

* FRR may be required to protect tenancies and egress routes, or to limit fire spread across boundaries.

** ADB only applies to "common building situations".

ENERGY DISTRIBUTION

20’ or 40’ Container

To level peak demand (New Lynn)

- High energy storage requires cooling
- Battery cell rupture produces H_2 gas
- H_2 gas, same energy as LPG but 5 times deflagration speed

Storage Density: 170 kWh/m^2

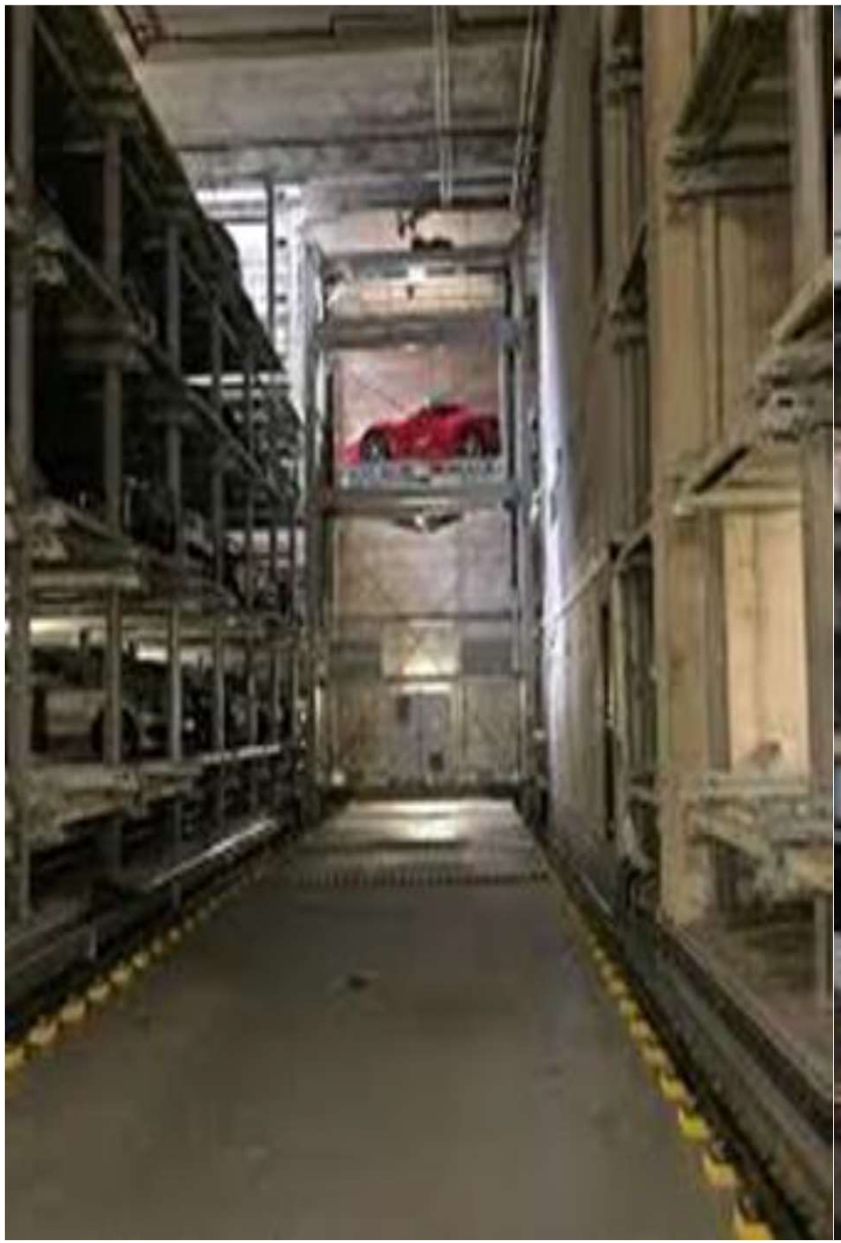
Gas Generation: 55 m^3/m^2

Volume of Gas: 2500%

ENERGY STORAGE

April 19, 2019

- Containerized ESS
- Smoke showing
- Fire suppression system activated
- After 2 hours, firefighters opened door
- Explosion occurred 3 minutes later
- Firefighters thrown 22 m, suffered serious injuries
- Walls bent
- Doors blown off hinges



CAR FIRES

Liverpool Car Park Fire; 31 Dec 2017: 1150 vehicles lost

Plastic fuel tanks releasing fuel into plastic stormwater pipes

EV CHARGING (Juicers!)

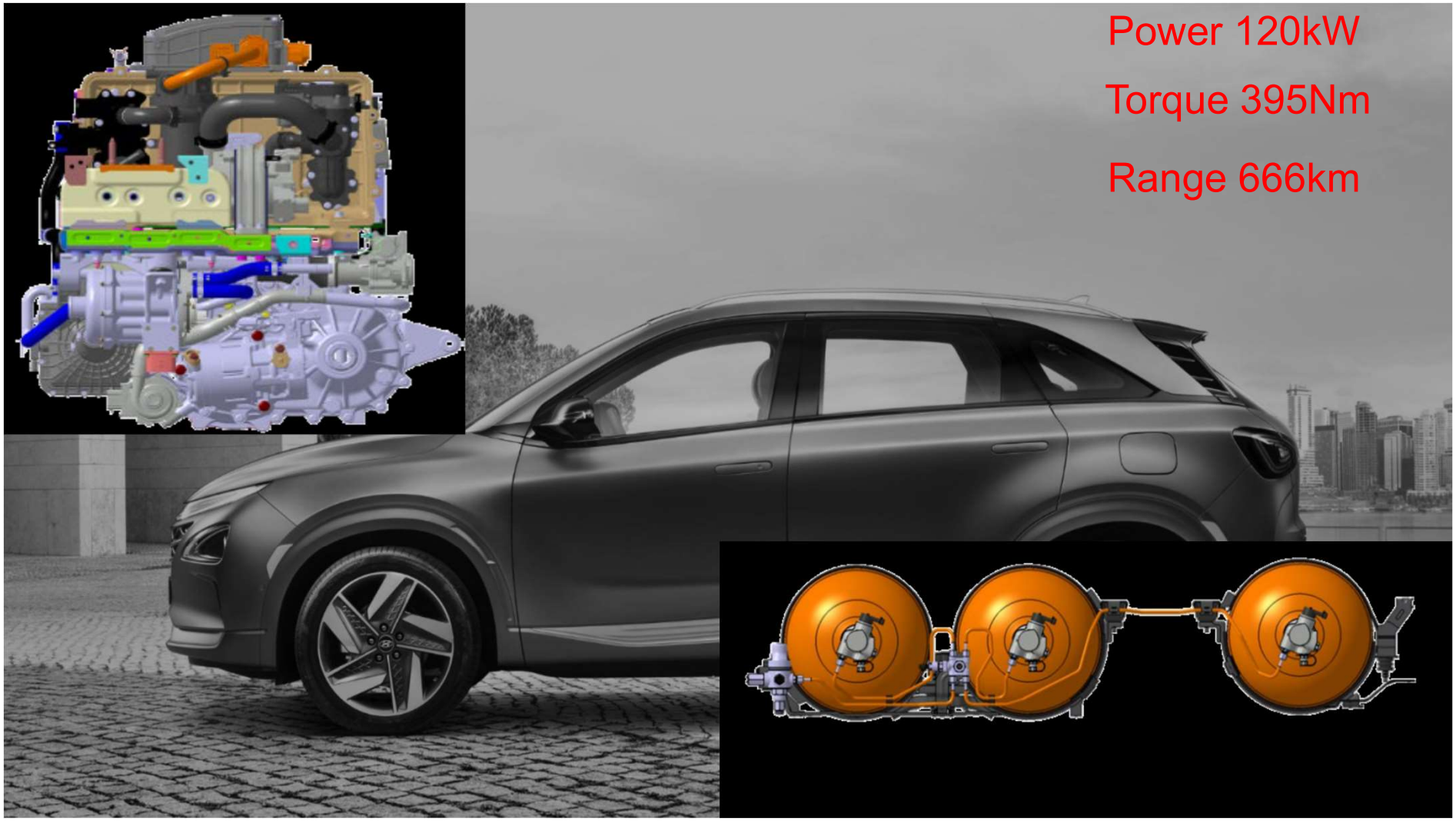
TRANSPORTATION:

ZERO EMISSION

NEXO:

Hydrogen fuelled: Fuel Cell technology, converting hydrogen into electricity and producing water as by-product.

HYDROGEN POWER

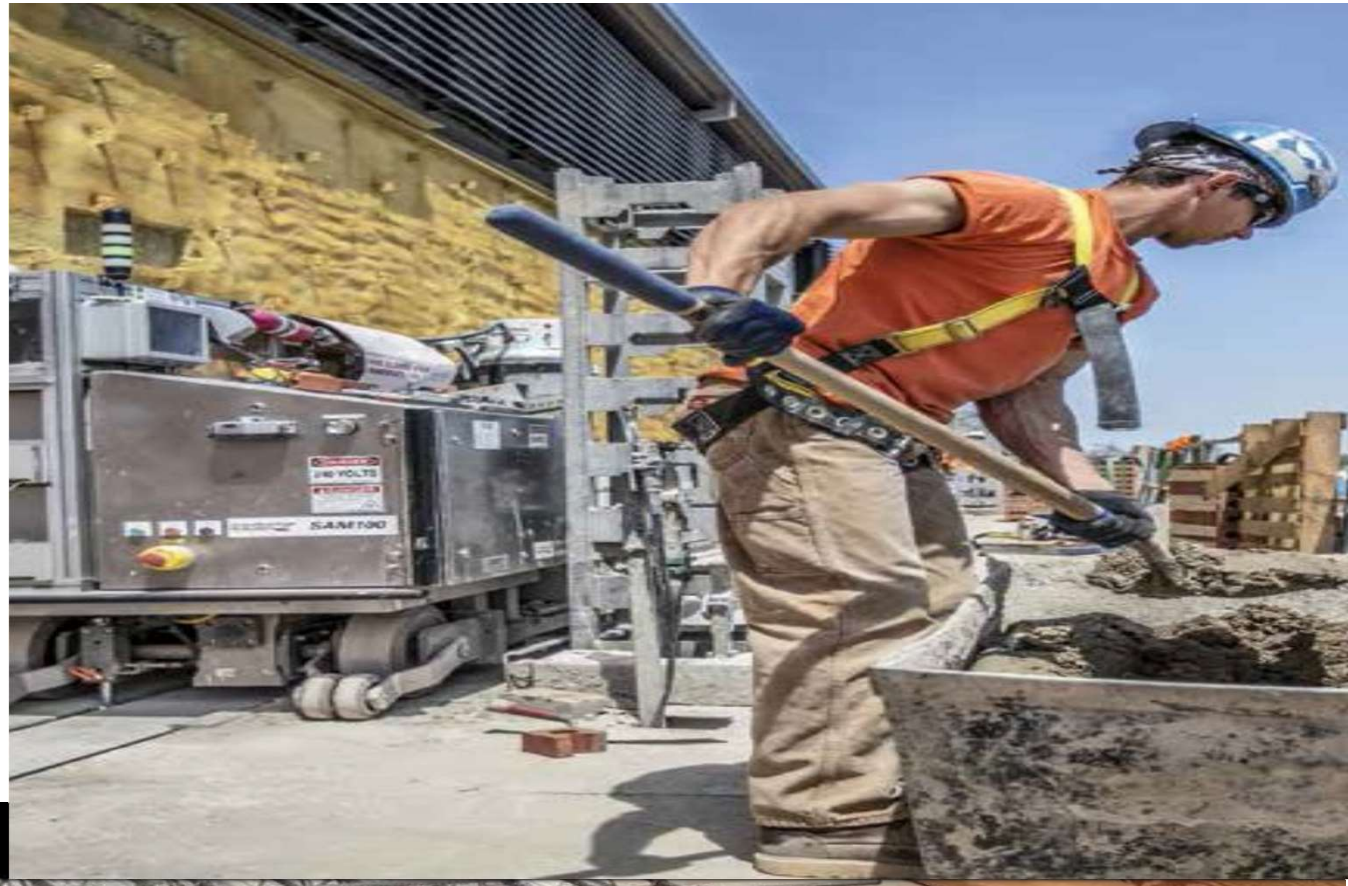


ROBOTS

An automated mason builds walls and gets a mortar

refill from its human friend.

Rebar robot.



INTENSIFICATION

Approximately 0-2% of the cost of a residential dwelling is spent on fire protection

Social impact

- **50 firefighters** put their personal safety at risk to extinguish this fire
- At least **4 family units** will not be ready for people to move into them (incurring stress and monetary costs)
- **Insurance administration** time and **loss of business** for developers
- **Criminal justice** costs if it is proven to be arson and the prosecuted $**2,316**

Property and debris

- **4 properties** damaged. Average cost of a property in Auckland is over **1.2m**
- Over **20- 30 tonnes** of debris per full house. Costing **$1,260 - $3,7800**

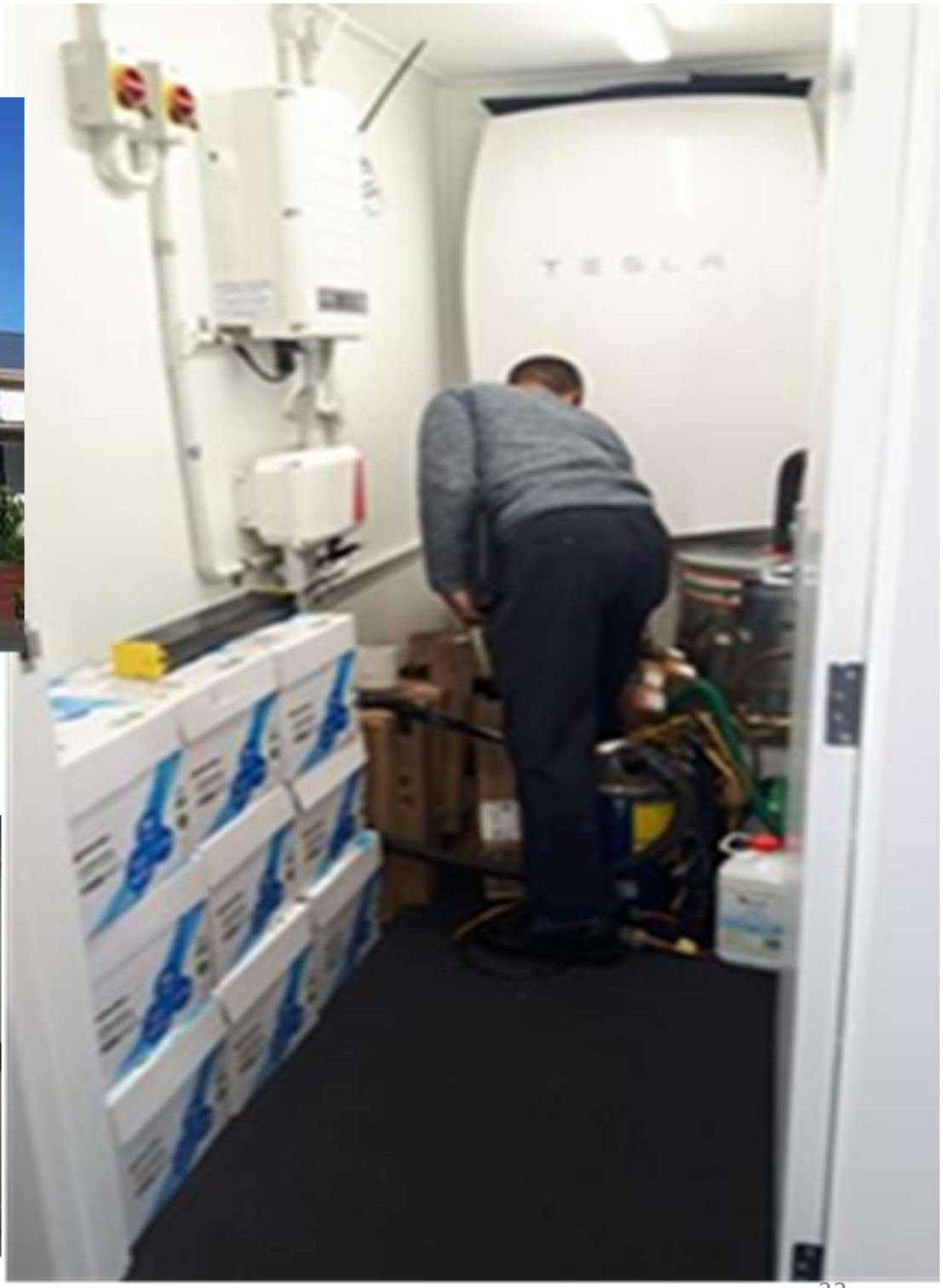
Water

- It is estimated that over **180,000L** of reticulated water was used in extinguishing the fire. Costing **$307,080**

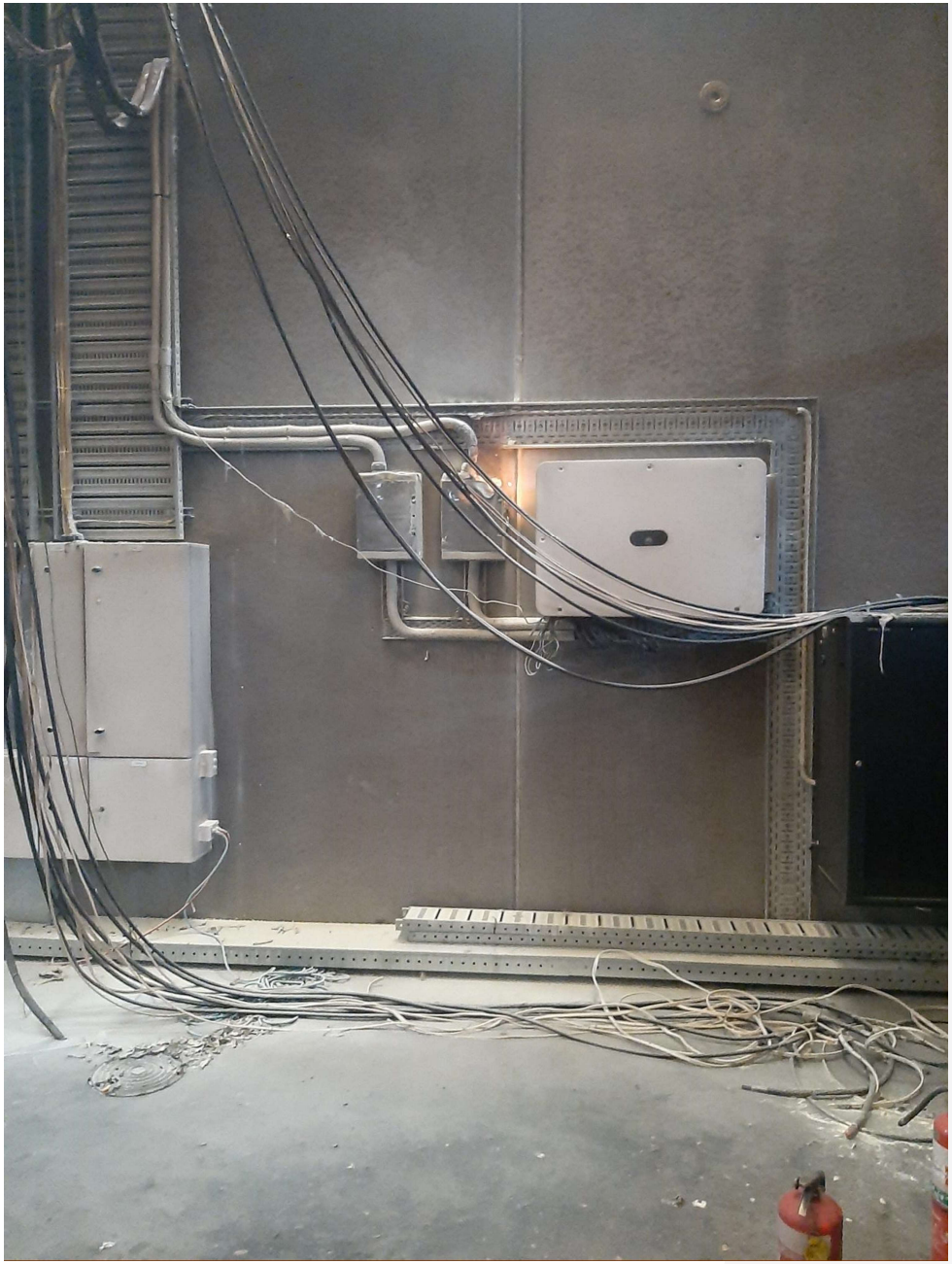
GHG Emissions

- Emissions for a complete fire loss of exemplar house is **27-38 tonnes of Co2** Equivalent.
- GHG value estimate **$1,702-$2,395**
- **Does not include GHG emissions from FENZ fire response activities**

“Apartment Hybrid” Pedestrian Paths


TESLA

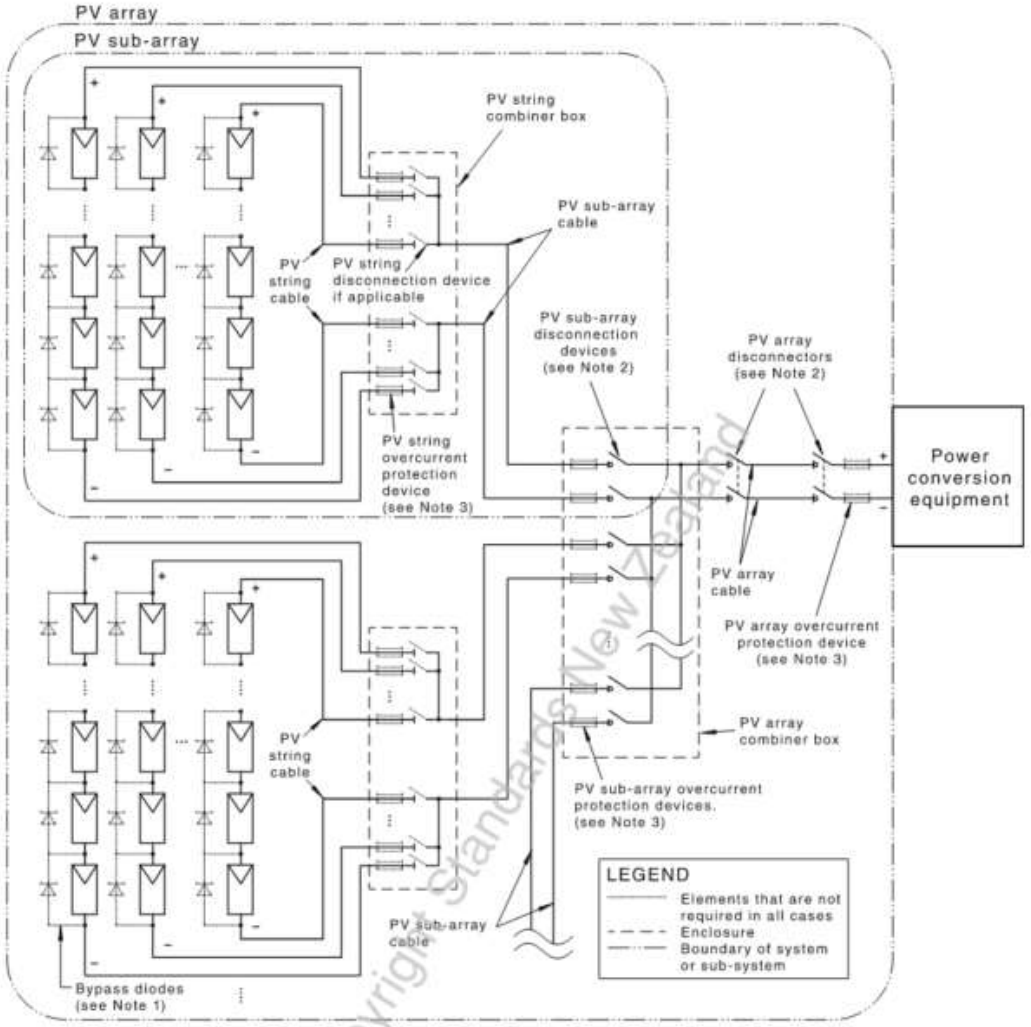
Inverter ignited after PV panels began to generate power



NZ 5503

- Section 4.4 requires power convertor equipment (PCE – or inverter) to include mechanical isolation usually near to ground level
- Table 4.3 lists the ‘disconnection device requirements in PV arrays’
- For Low Voltage systems, disconnection devices are required on sub-array and full array cables in accordance with Section 4.4.1.5 (Aus) and 4.4.1.6 (NZ)

A1



NOTES:

1 Bypass diodes are generally incorporated as standard elements of the PV modules by manufacturers.

2 See Clauses 4.3.5 and 4.4.1 for PV array disconnector requirements. These clauses include requirements that all such disconnectors be load breaking disconnection devices. This figure shows the disconnector as a switch disconnector (i.e. making, breaking and on-load isolating), however this Standard allows for it to be either a switch disconnector (i.e. making, breaking and on-load isolating) or a circuit-breaker (i.e. suitable for isolation—non-polarized).

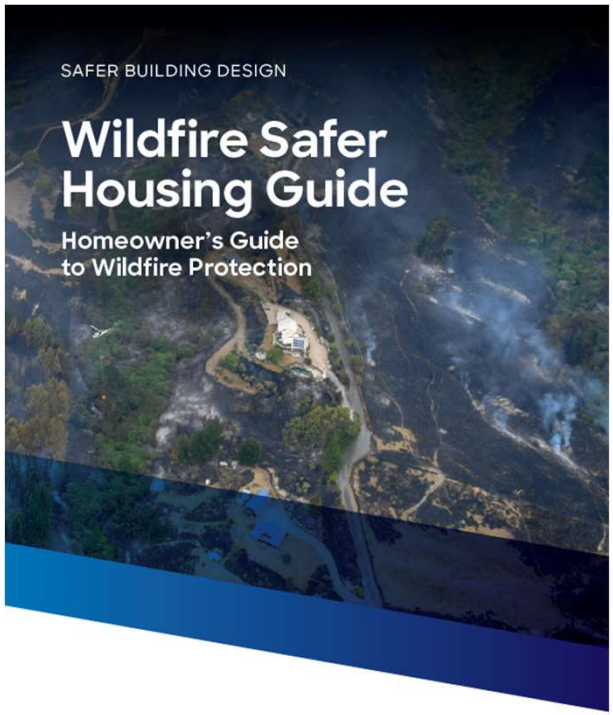
3 Overcurrent protection devices where required, see Clause 3.3.

FIGURE 2.4 PV ARRAY DIAGRAM—TYPICAL INSTALLATION FOR MULTIPLE PARALLEL STRING CASE WITH ARRAY DIVIDED INTO SUB-ARRAYS

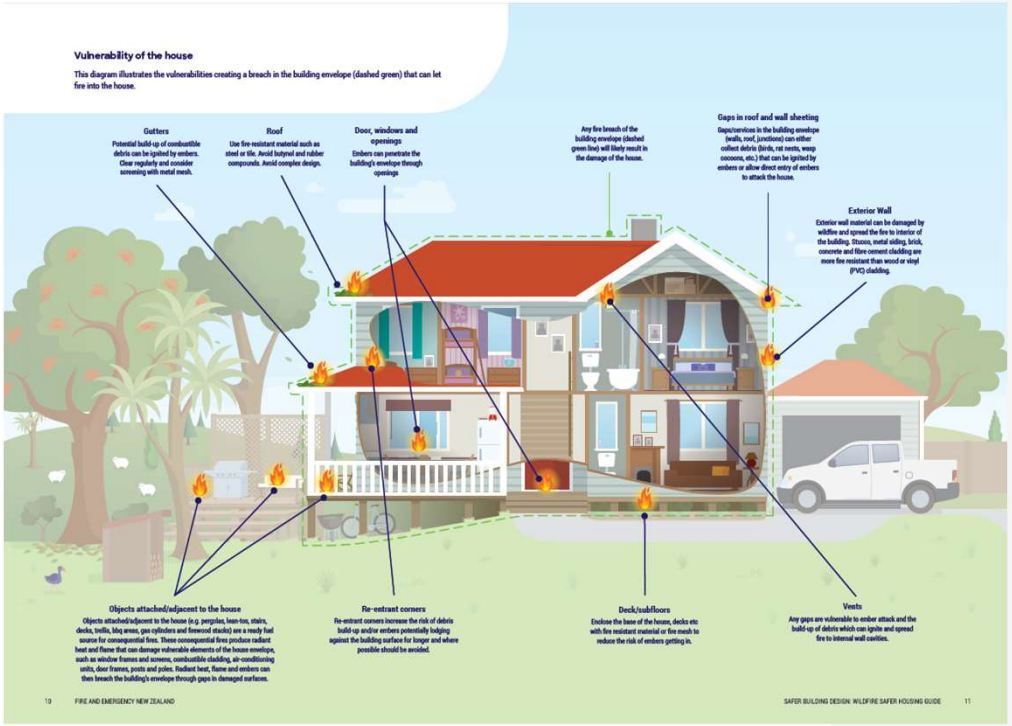
AUTOMATIC WAREHOUSE

https://www.youtube.com/watch?v=rlKUnR4hMD8

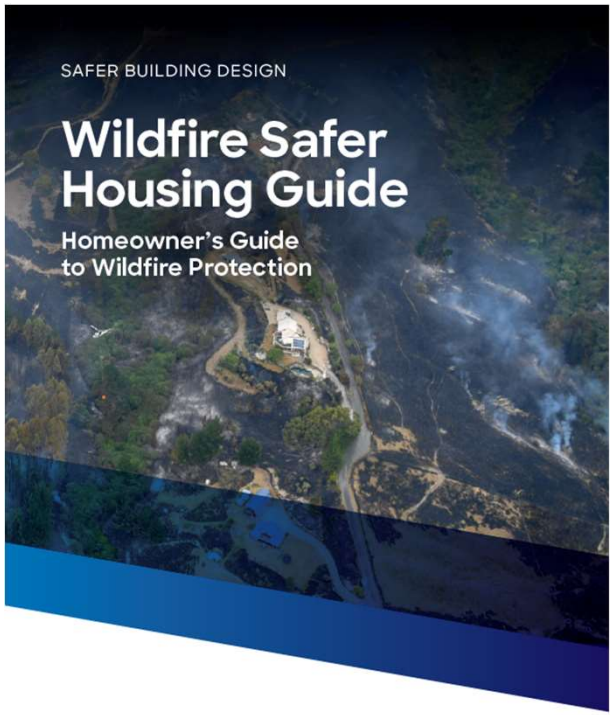
Wildfire Safer Housing Guide



August 2022



Wildfire Safer Housing Guide



FIRE EMERGENCY NEW ZEALAND

August 2022

Contents
Ngā Ihirangi

https://www.fireandemergency.nz/home-and-community-fire-safety/the-threat-of-rural-fire/

DESIGNERS GUIDE TO FIREFIGHTING

https://fireandemergency.nz/business-and-landlords/designers-guide-to-firefighting-operations/

- **F5-01 GD Introduction to FFO in buildings** - [PDF, 783KB]
- **F5-02 GD FFO Emergency vehicle access** - [PDF, 842KB]
- **F5-03 GD FFO on radio communications** - [PDF, 405KB]
- **F5-04 GD FFO Fire alarm panels** - [PDF, 651KB]
- **F5-05 GD FFO Building hydrant systems** - [PDF 997KB]
- **F5-06 GD FFO on automatic sprinkler systems** - [PDF, 546KB]
- **F5-07 GD FFO on stairways in buildings** - [PDF, 462KB]
- **F5-08 GD FFO in lifts** - [PDF, 429KB]
- **F5-09 GD FFO Fire control centres** [PDF, 875KB]
- **F5-10 GD FFO Evacuation of high rise buildings** - [PDF, 428KB]
- **F5-12 GD FFO on construction sites** - [PDF, 503KB]
- **F5-13 GD FFO on multi-tiered vehicle stacking buildings** - [PDF, 431KB]

POST INCIDENT ANALYSIS

Heads-Up reports - a summary of findings from unusual fires

https://fireandemergency.nz/research-and-reports/product-recalls-and-heads-up/?category=Heads%20Up

RESEARCH

A study of the use of fire extinguishers (2015)

https://fireandemergency.nz/assets/Documents/Research-and-reports/Report-148-Impact-of-HOFFE-changes-for-nonresidential-buildings.pdf

LEARNING FROM INCIDENTS

Issue 14 - Building Paper Underlay in Warehouse Buildings

Released 3 April 2012

Fire Research & Investigation Unit

Heads Up

BACKGROUND

A deliberately lit fire was started against the external wall of a large warehouse which quickly spread to the internal surface linings of the building travelling up the wall and across the ceiling. Flaming pieces of building paper began to drop down onto stock below starting multiple fires within the building.

The multiple fires grew quickly and had the potential to overwhelm the sprinkler system.

The post fire investigation examined why the fire spread so quickly when it involved building products that should have been fire retardant.

Above: the rapid fire spread was promoted by flammable surface linings

INCIDENT DETAILS

For buildings of this nature, the Compliance Document for the NZ Building Code (C/AS1) requires that '*underlay to exterior cladding or roofing when exposed to view in occupied spaces*' is to be fire retardant[1] (not supporting a flame). For a sprinklered building this applies to ceiling linings only.

These underlays typically have a silver foil surface on one side and a white light reflecting surface on the other side. Once installed, building lining papers are not easily distinguishable between those that are fire retardant and those that freely support fire as they are not required to be marked or labelled. It is likely that builders and compliance officers would be unable to determine by visual inspection whether a product is flammable or if it meets the Flammability Index (FI) requirements of C/AS1 Table 6.2.

Above: visual comparison of products with a C/AS1 compliant product on the right hand side of each photo.

[1] C/AS1table 6.2 Flammability index ≤ 5 when tested to part 2 of NZS 1530 part 2.

Tests of surface linings

Samples of the lining material were taken from the fire scene for further examination and were found to promote the spread of flame when tested in a manner similar to part of the test required by C/AS1: NZS 1530.2:1993 – Methods for fire tests on building materials, components and structures.

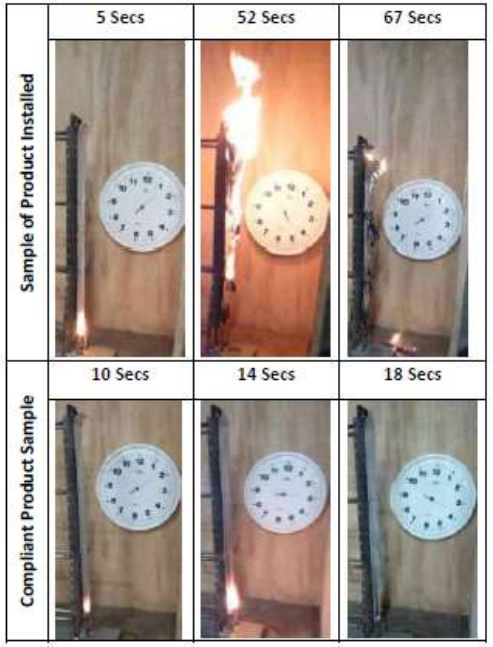
<u>*Test 1 - product sample taken from building*</u>

The sample (535 x 75 mm) was subjected to a small ignition source and the speed of flame spread was measured in seconds.

Flame quickly spread the full length of the sample. Flaming material can be seen on the final photo falling from the sample as occurred in the building fire.

<u>*Test 2 -sample of C/AS1 compliant material*</u>

A compliant material (having a FI value < 5) was subject to the same test as above and briefly ignited with a small flame (<100 mm) before self-extinguishing within 18 seconds. The material stayed intact.



LESSONS LEARNED/RECOMMENDATIONS

The installation of incorrect interior surface linings can, in the event of a fire, cause significant financial loss to building owners and business interruption for occupants.

Advice to manufacturers/suppliers - it would be helpful to builders and certifiers if product identification could be discretely marked (e.g. on leading edges) for easy identification of the product.

Advice to builders and compliance officers - ensure the product being used for linings is fire retardant as specified in the building consent documents.

Advice to building owners - to avoid potential loss and to protect business continuity, owners should ensure their building's interior surface linings meet the requirements of the Building Code. A simple indicative test can be to remove a small strip sample of surface lining (e.g. 500 mm x 50 mm) to a safe place and apply a small flame while the sample is held vertically. A product that meets the current code requirements (has a FI value less than 5) should not allow a flame to spread more than 100 mm upwards from the bottom edge within 160 seconds.

INFORMATION SOURCES

C/AS1, New Zealand Fire Service Post Incident Analysis Report & Fire Investigation Report - F1088022

For more information, or to contribute to 'Heads Up'
e-mail fireinvestigation@fire.org.nz

FUTURE STATE

- Building Intelligence gathering/verification
- Fire alarm interrogation *(PIA)*
- Digital alarm transport *(panels on appliances!)*
- Emergency communication *(EWIS/Radios)*
- Importance all fire safety systems are operational *(Passive!)*
- Changes to buildings **unlikely** to be part of consent process, Vigilance required