



9am–4pm

16 March 2020

InterContinental, Wellington, New Zealand

FOREWORD

To mark the end of the BRANZ's medium-density housing (MDH) research programme in its current state, BRANZ held an industry-wide forum on the programme's findings in March 2020 with the goal of fostering change through transferring gained knowledge regarding MDH to decision makers and key industry representatives.

BRANZ has developed a broad body of knowledge about the challenges associated with MDH and a series of recommendations for how these challenges could be made easier.

To ensure that this body of research gains impact, BRANZ invited representatives of government and the building industry to attend the forum to hear about the research and to discuss how it can be practically applied.

This document contains PowerPoint presentations made to the Forum, broadly categorised into three themes.

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Welcome

He waka eke noa – we are all in this together



MEDIUM-DENSITY HOUSING RESEARCH FORUM



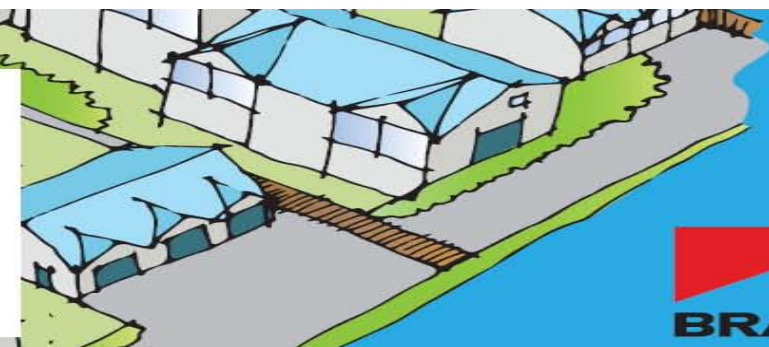
Introducing BRANZ

Challenging Aotearoa New Zealand to create a building system that delivers **better outcomes for all**

- We are passionate about **co-creating enduring solutions** by being champions for better building system performance
- Using an **evidence based approach** to ensure real barriers to **improving the building system** are uncovered, debated and resolved



**MEDIUM-DENSITY
HOUSING**
RESEARCH FORUM

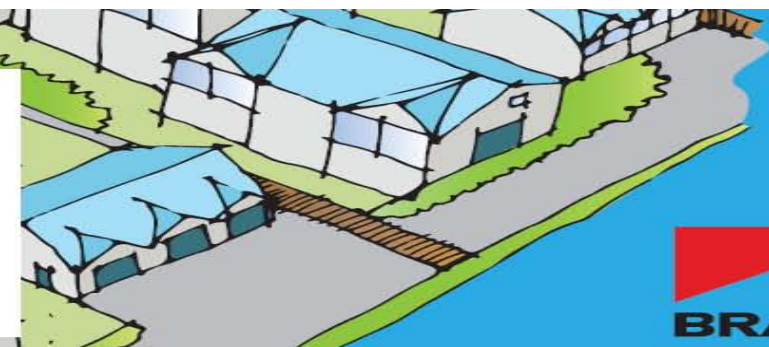


Introducing Our Research Programmes

- A strategic imperative was to develop a portfolio approach to align investments to industry need
- Programmes as a way of grouping similar projects into inter-dependent and synergistic efforts to achieve greater outcomes (1+1=3)
- Designed to focus effort on *the* most pressing issues that have been identified with industry
- All have very specific goal and intended outcomes
- They have a finite operational life



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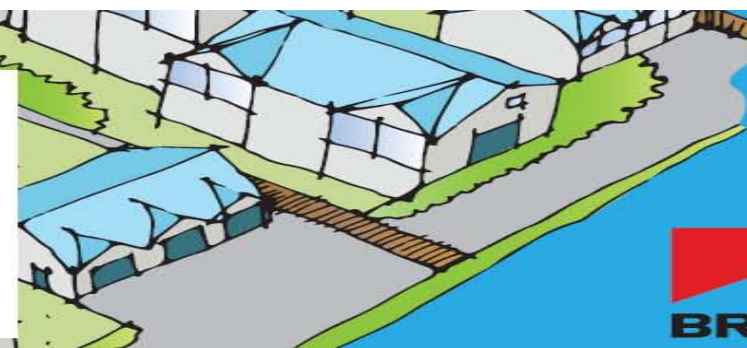


MDH Programme Goal

New Zealand will have access to high quality MDH solutions that meet the demand now, and in the future



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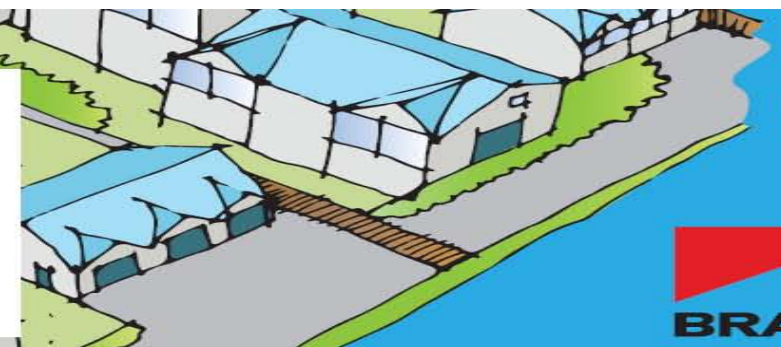
Our First Research Programmes

The portfolio approach to research enables programmes of research:

- Eliminating Quality Issues
- Exceeding the Minimum
- Warmer, Drier, Healthier Buildings
- Medium Density Housing



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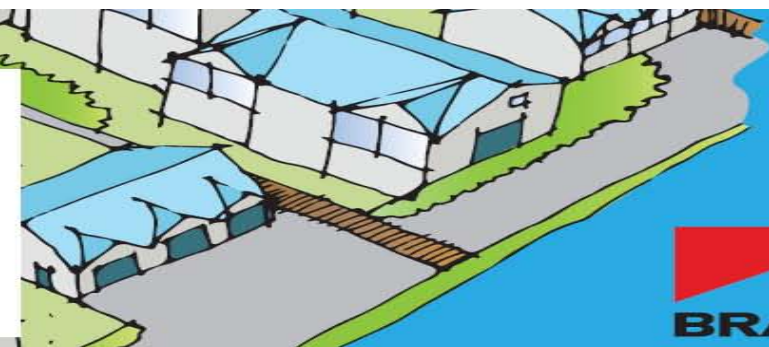
Our Current Research Programmes

Following review against progress and current industry priorities:

- Eliminating Quality Issues
- Warmer, Drier, Healthier Homes
- Transition to a Zero Carbon Built Environment
- Building Fire-Safe Densified Housing in New Zealand



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Introductions

- Natalie Allen, Urban Strategist, The Urban Advisory
- Simon Opit, Post-Doctoral Fellow, SHORE, Massey University
- Verney Ryan, Director, Beacon Pathways
- Morten Gjerde, Assoc. Professor, Wellington School of Architecture
- Kevin Golding, Winstone Wallboards Ltd



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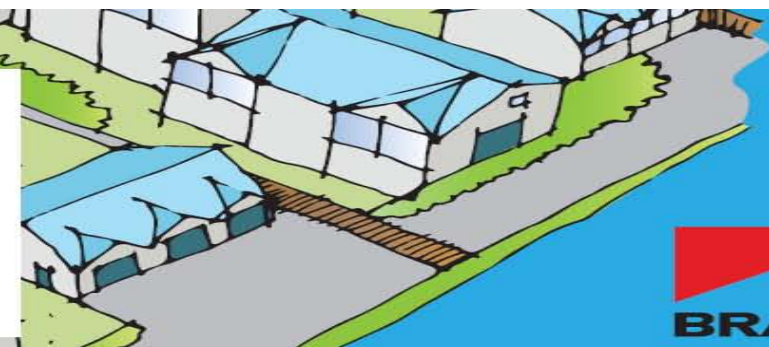


The BRANZ team

- Chris Litten, General Manager Industry Research
- Anne Duncan, Industry Performance & Social Research Team Leader and MDH Programme Leader
- Michael Nuth, Social Scientist and Forum Organiser
- Orin Lockyer, Associate Social Scientist
- Dave Carradine, Senior Structural Research Engineer
- Kevin Frank, Fire Research Engineer



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Your Participation

We want to **strengthen our connections to others**, so that we work in partnership with you to co-create solutions that will make a difference.

You will see and interact with a wealth of information today.

We want to understand from you, how to get this knowledge out – what works/doesn't – so that this work will deliver better outcomes for New Zealanders.



MEDIUM-DENSITY HOUSING RESEARCH FORUM



Thank you

...for your time and energy

...for your thoughts, input, challenge and support

...making use of the body of knowledge created in this programme



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Introduction to the MDH Programme

Anne Duncan - MDH Programme Leader



Why an MDH Programme?

To meet a current, urgent need to ensure more MDH can be built to meet housing need

Why Was the MDH Programme Set Up?



The original aim:

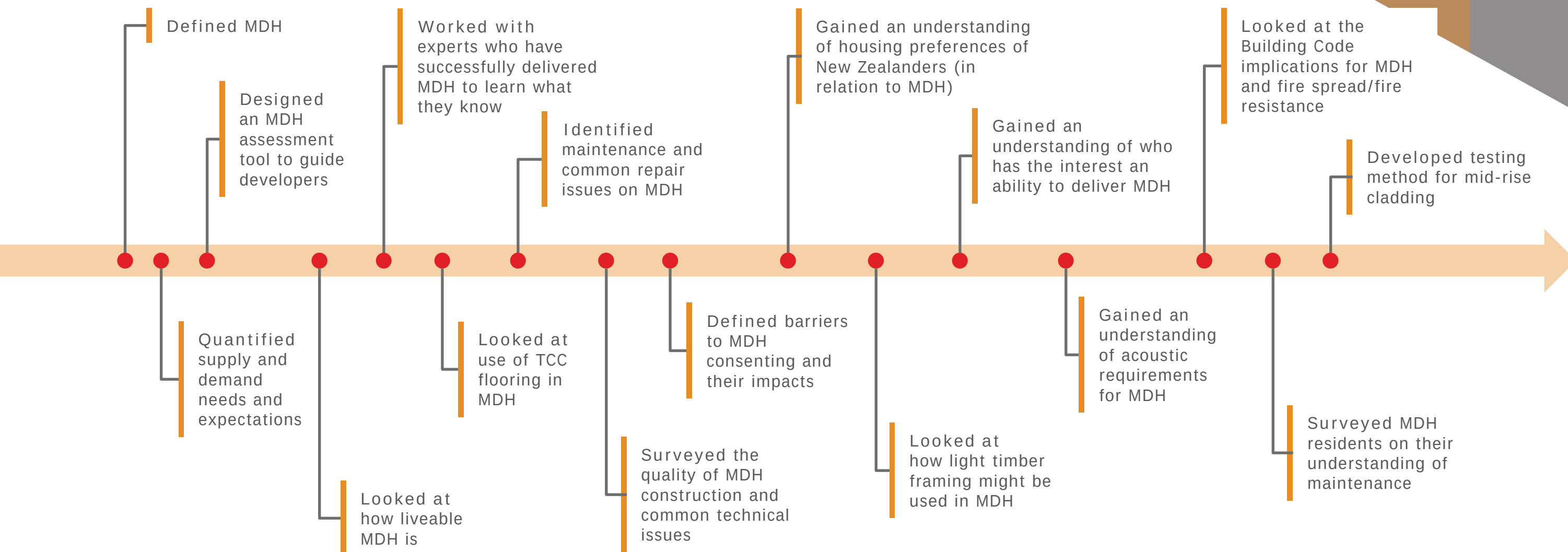
To give industry the tools it needs to build high quality, affordable medium-density housing (MDH) that meets the needs of the people who live in it and be accepted by the wider community.



Programme success criteria

- ✓ 1 The building industry has the technical information to enable the design of quality, affordable and desirable MDH
- ✓ 2 The building industry has the skills needed to design and build quality, affordable and desirable MDH
- ✓ 3 Everyone has a shared understanding of how to optimise the journey through the building and consent process for MDH
- ✓ 4 MDH buildings are maintained to sustain long term performance
- ✓ 5 There is increased acceptance of MDH in communities

So what have we been doing for the last four years?



What is changing and why?

We think there is a better way we can address these questions than through an MDH research programme.

Two issues:

We asked ourselves if medium-density was really an issue as a stand-alone, or if it wasn't rather higher density. MBIE is looking at higher density.

Should we be too?



We have found there were two main streams of activity – one investigating technical issues and one investigating social or liveability issues.

We asked ourselves how best we could manage these.

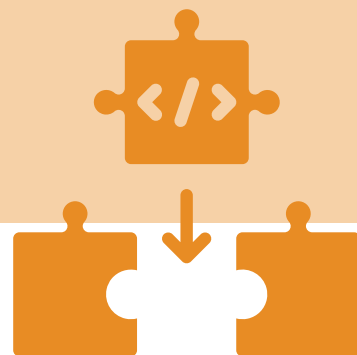


The Process: Consultation and Decision

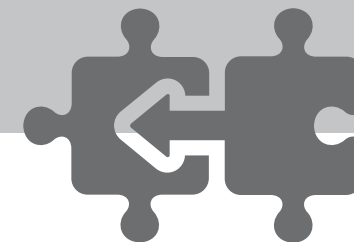
We asked our Programme Advisory Group. They agreed it was sensible to change.

We have decided to:

Move the technical aspects into either the Warmer, Drier, Healthier Homes programme, or the Eliminating Quality Issues Programme



Potentially bring the social or liveability issues into our new Building for Wellbeing programme (currently being scoped)



What difference will this make?



We consider a broader focus (including higher density) will add value as our research can apply to more homes.



We are also pleased that well-being is being considered as a programme on its own...
...and provided the investment in research that we think it deserves.

Our Forum Today – What Are We Aiming to Achieve?



Main Aims:

Share what we have
learned to date



Enable you to share our
evidence so it can have
more impact



Identify ways in which
the research can be
adopted and applied



The Programme for the Day – MDH Seminar Programme

9am Welcome to seminar

Presented by Chris Litten, General Manager Industry Research, BRANZ

9:15am Overview of BRANZ medium-density housing research programme, its objectives and achievements

Presented by Anne Duncan, Team Leader, Industry Performance and Social Research, BRANZ

Presentations on three key medium-density housing issues

9:30am Consumer experiences and perceptions of MDH

- Orin Lockyer, BRANZ
- Dr Simon Opit (SHORE Research Centre, Massey University)
- Dr Natalie Allen (The Urban Advisory)

10:15am MORNING TEA

10:30am Technical Issues

- Michael Nuth (BRANZ)
- David Carradine (BRANZ)
- Kevin Frank (BRANZ)
- Kevin Golding (Fletcher Building)

11:30am Consenting Issues

- Verney Ryan (Beacon Pathway)
- Associate Professor Dr Morten Gjerde (Wellington School of Architecture)

12:00pm BREAK FOR LUNCH

The Programme for the Day – continued

Workshops	1pm	Consumer experiences and perceptions of MDH	MDH Technical Issues	MDH Consenting Issues
		<i>Facilitator: Dr Natalie Allen</i>	<i>Facilitator: Michael Nuth</i>	<i>Facilitator: Verney Ryan</i>
2:30pm AFTERNOON TEA				
2:35pm Summary of conclusions from each workshop • Consumer experiences • Technical issues • Consenting issues				
3:30pm Final words <i>Presented by Anne Duncan</i>				

**Please share your
knowledge, your
expertise and
your views**



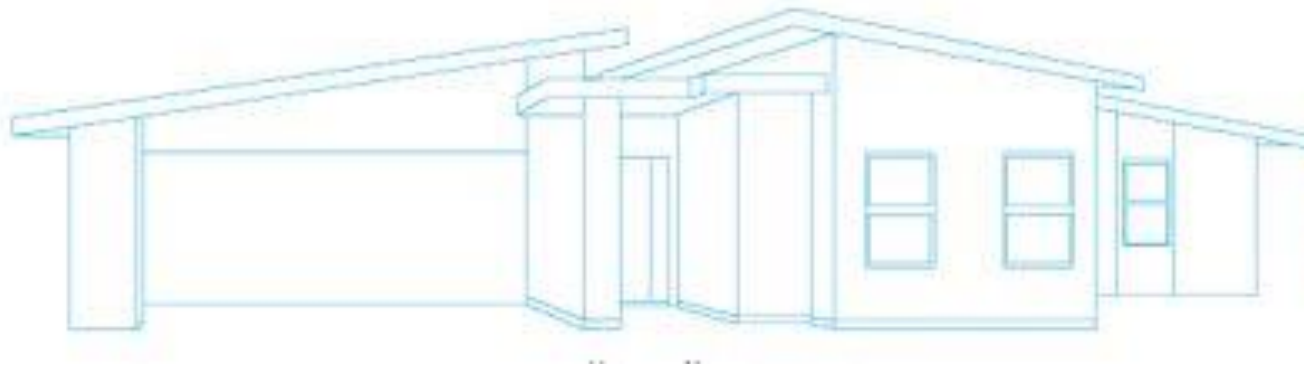


New Zealand attitudes to MDH in 2017

What we did

- As medium-density housing becomes more prevalent in the face of increasing housing pressure, its successful uptake partly depends on people's attitudes.
- Research findings are from more than 1600 householders across New Zealand

House typologies – not MDH

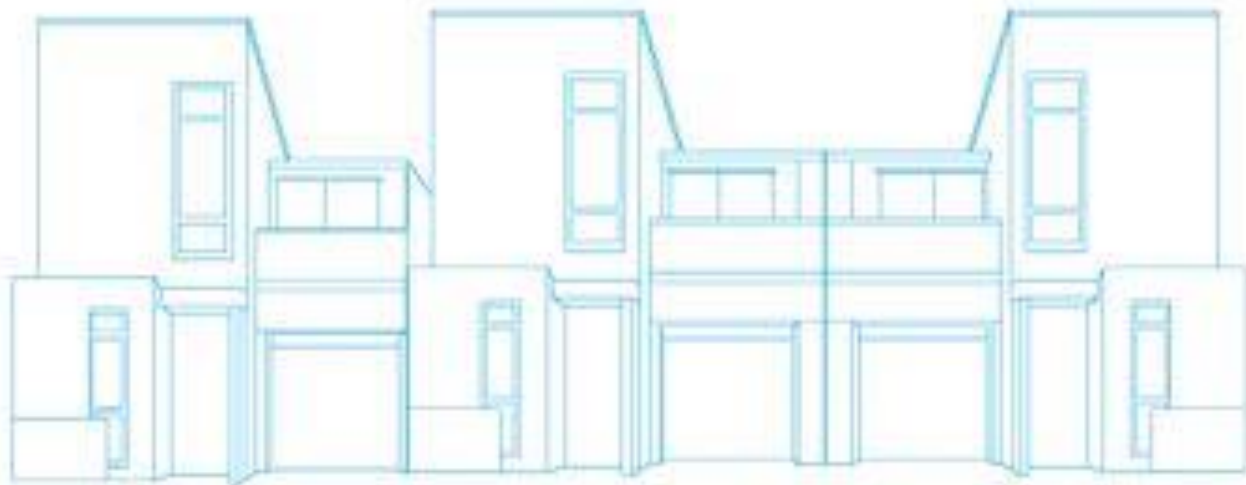


This is a standalone house on its own section with a back yard. This is the most common type of home in New Zealand.

This is a high-rise apartment building. These buildings have a common entranceway and if parking is provided it is usually a shared garage. These buildings are much taller than low-rise apartments or flats and have elevators.



MDH house typologies



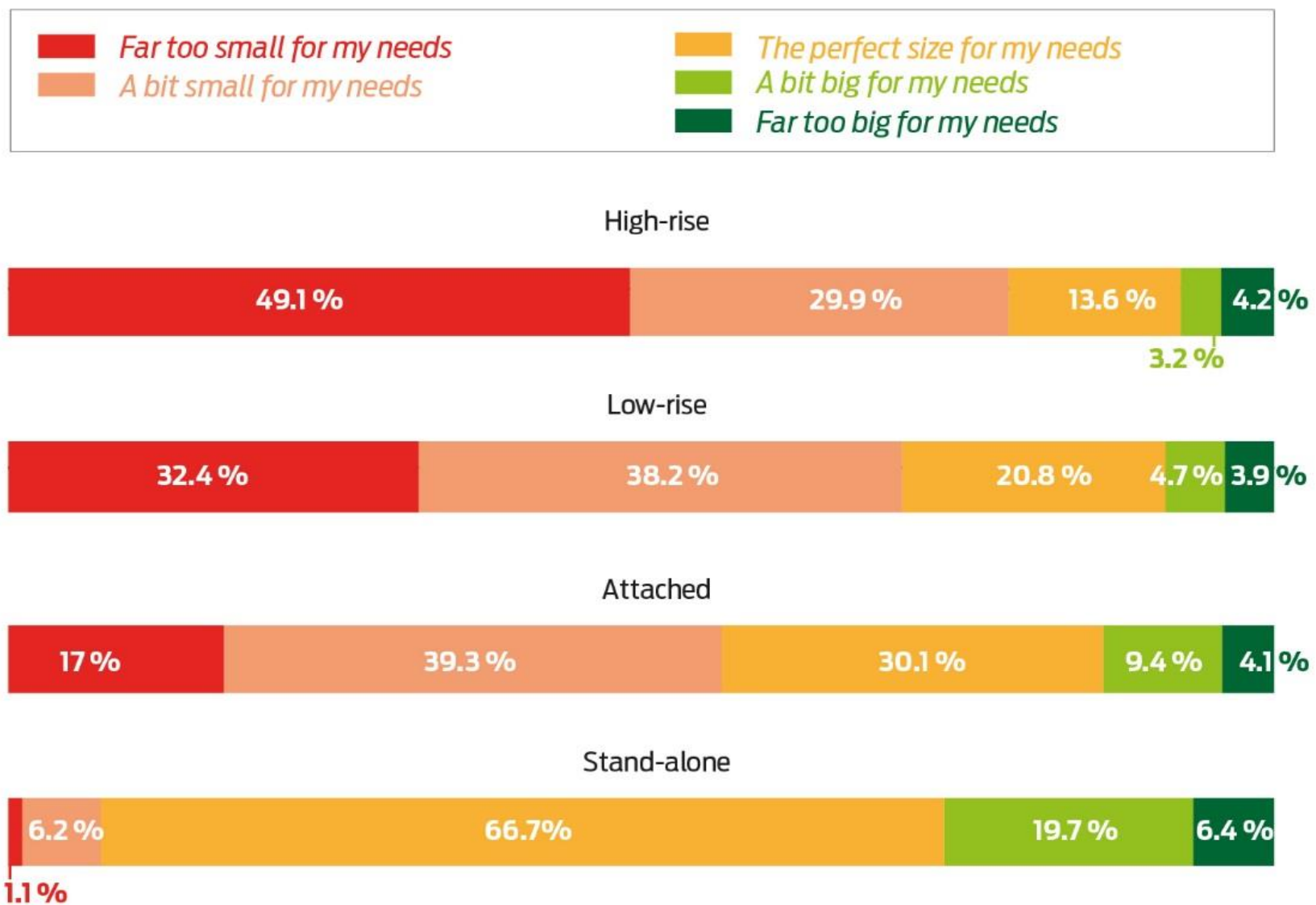
This kind of house is often called a Terraced House or Attached Townhouse. They have at least one common wall with the neighbouring home, and can be in blocks of two or three, or in longer rows.

This is a low-rise apartment building or block of flats. These are up to four storeys high and usually have a common entranceway and shared car parking.



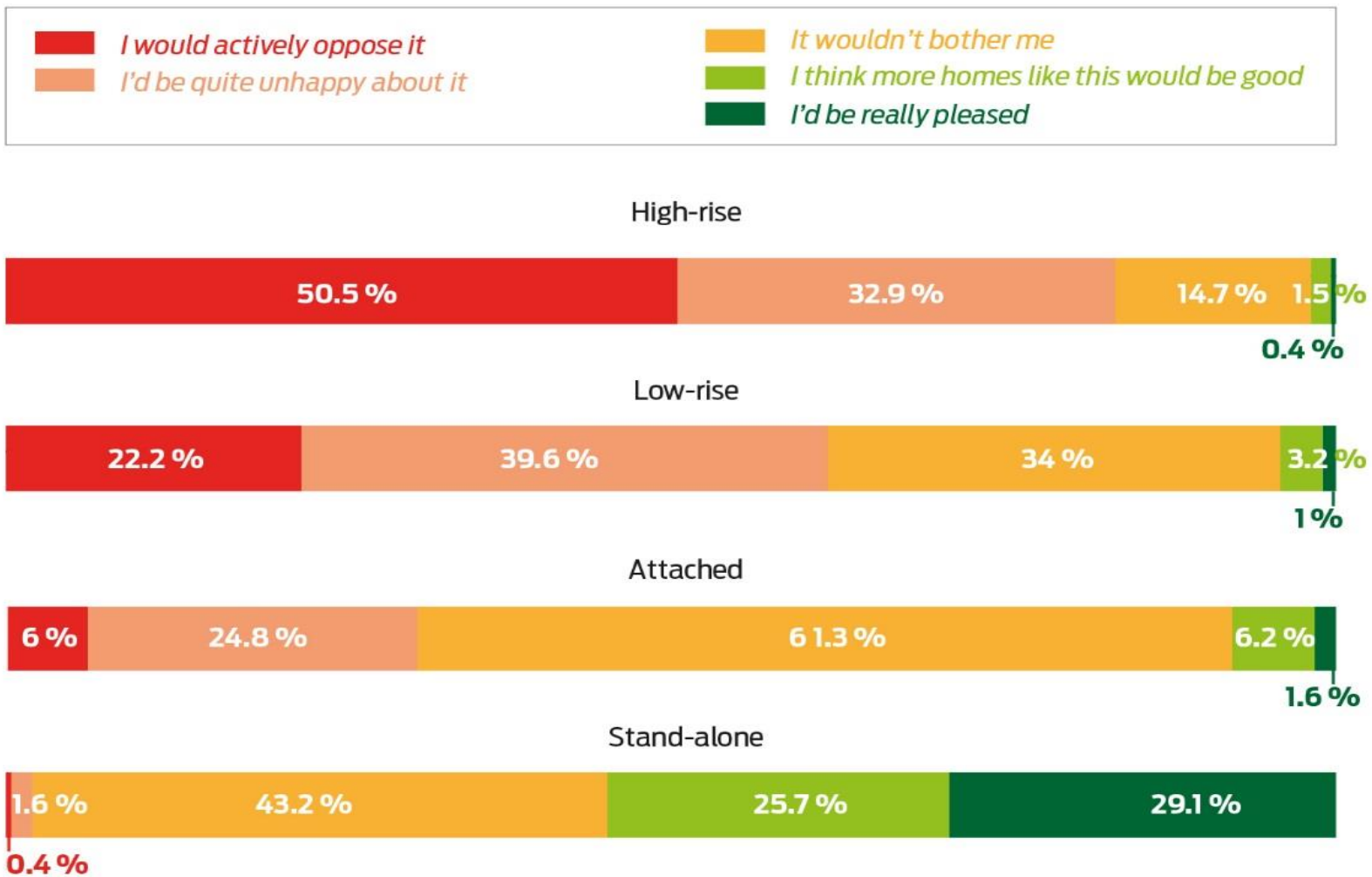
Key finding – house size

The size of this type of house would be ...



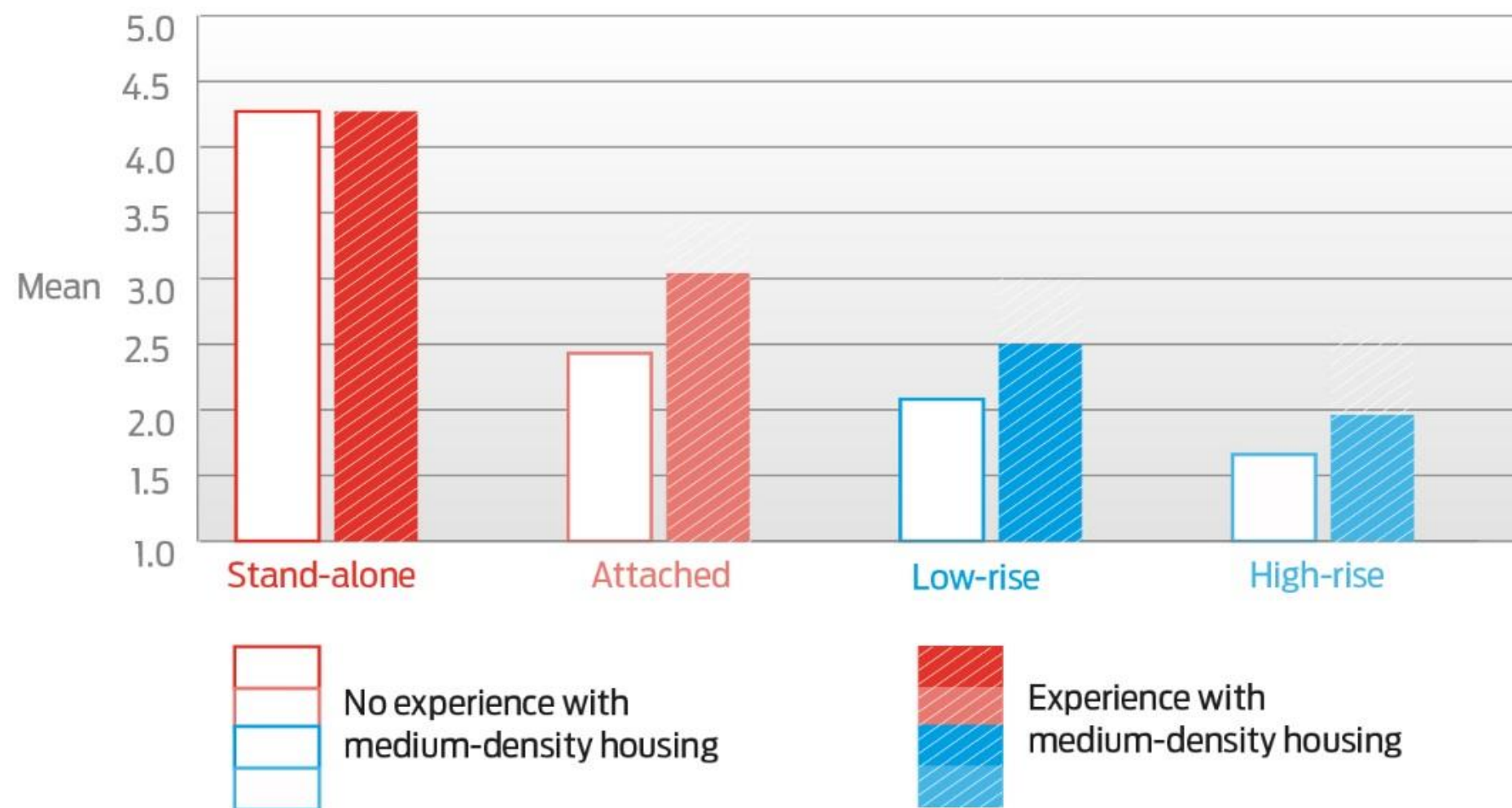
Key findings - NIMBYism

How would you feel about this type of home being built on your street?



Key findings: Willingness to live in MDH

I would definitely consider living in this type of home in the future



Where to next





Creating Improved Housing Outcomes: Liveable Medium-density Housing

What we did:

Four Research Phases (from 2017-2019):

1. MDH liveability and wellbeing literature review
2. Liveable MDH legislation and regulation review
3. Liveable MDH focus groups (local councils in Auckland, Wellington, and Christchurch)
4. Liveable MDH residents survey (500 participants from across NZ)

Key Insights – Phase 1 Literature Review

INSIGHT 1	INSIGHT 2
There is no commonly used definition of liveability in New Zealand	Liveability outcomes need to be considered across scales (dwelling, neighbourhood, and urban)
INSIGHT 3	INSIGHT 4
Liveability generally refers to place, while wellbeing refers to people	There is a need for a better method of evaluating how MDH typologies may affect liveability

Key Insights – Phase 2 Legislation + Regulation Review

INSIGHT 1	INSIGHT 2
New Zealand's current legislative and regulatory framework are not be in step with the transition towards higher density housing typologies	Specific 'liveability (or wellbeing) requirements' do not exist in one place within the legislative and regulatory framework applicable to MDH
INSIGHT 3	INSIGHT 4
Building and planning legislation and regulation appears to have the greatest influence on MDH liveability	There are differences between how territorial authorities address MDH liveability within their unitary, district and city plans

Key Insights – Phase 3 Focus Groups

INSIGHT 1	INSIGHT 2	INSIGHT 3
There is a lack of consistency between territorial authorities regarding approaches to ensuring liveable MDH	Housing delivery tends to rely on historical trends, as opposed to likely future demand	The current consenting framework does not adequately promote liveable MDH
INSIGHT 4	INSIGHT 5	INSIGHT 6
Greater integration and alignment is needed between MDH-related legislation and regulation	There is a perceived need for government leadership and intervention to achieve MDH liveability	The current nature of the development industry may promote profit over liveability

Key Insights – Phase 4 Residents Survey

INSIGHT 1	INSIGHT 2	INSIGHT 3
Those MDH residents that defined liveability considered it to mean ‘the ease of living in a place’	Dwelling liveability is important but so too is neighbourhood liveability	Satisfaction with MDH was high
INSIGHT 4	INSIGHT 5	INSIGHT 6
MDH is largely considered to be as liveable as standalone housing (by people living in it)	Factors to consider when designing liveable MDH include indoor environmental quality, privacy, and parking	Owner-occupier and renter experiences are different and not always directly comparable
INSIGHT 7		
A range of housing solutions to meet the needs and preferences of MDH residents is required		

Key Recommendations

1. That a definition of MDH liveability is developed at a national level, along with the identification of what constitutes good liveability outcomes.
2. That further research is undertaken to understand, at a greater level of detail, specifically what ability the Building Code has to influence the liveability of MDH. At the same time, other mechanisms for achieving MDH liveability (such as plans prepared under the Resource Management Act).
3. That further engagement is undertaken with industry stakeholders to clarify the leadership and promotion of a liveability agenda for MDH in New Zealand.
4. That industry stakeholders and research institutes work together to address the information gaps identified through the course of this research project.



Acclimatising to Medium Density

Viewpoints from across Auckland Neighbourhoods

Simon Opit & Karen Witten
SHORE & Whariki Research Centre



Acclimatising to Medium Density

- Case studies
 - Powell St, Avondale
 - Waimahia Inlet, Weymouth, South Auckland
 - Multi site study – 8 pre construction and 8 post construction developments



Powell St, Avondale:

Pre construction

- Development plans announced
- Residents association formed to fight development consent
- Approval granted with minor design concessions
- Resistance
 - Loss of amenity
 - Increased traffic
 - MDH - substandard housing, poor quality of life
 - Rumours of social housing
 - Impact on house prices



Powell St, Avondale:

Post construction

- 35 townhouses, mostly duplexes
- Existing residents' resistance dissipated
 - Development was better than they anticipated
 - Fears of traffic jams and ghettoization had not materialised
 - Visual amenity partially retained
- Minor concessions gained had improved the development – worth the fight
- There was a desire to include the new residents as part of the community



Waimahia Inlet: Development site

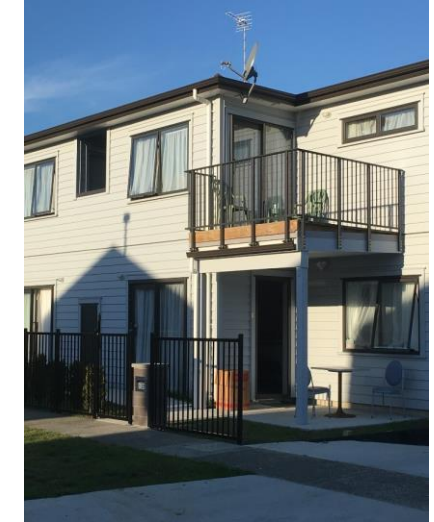
- Greenfield site in Weymouth, South Auckland
- Developed by Tamaki Makaurau Community Housing
- 295 dwellings, medium density, range of typologies, green space
- Mixed tenure
- Surrounded by a pre-existing neighbourhood – new connecting roads
- Distinctive by design and as a community entity



Waimahia Inlet:

Findings

- Recognised the need for more houses
- Generally felt the development was high-quality
- Positive for the community e.g. local businesses
- Loss of quiet cul de sac and paddock views
- Construction noise and dust and increase in through-traffic was disruptive
- Boundary effect of development traffic calming
- Crimes attributed to the 'other'
- An 'urban island' – insiders and outsiders – neighbouring residents would like to be included in Waimahia community events



Auckland MDH Multi-Site Study

Research overview

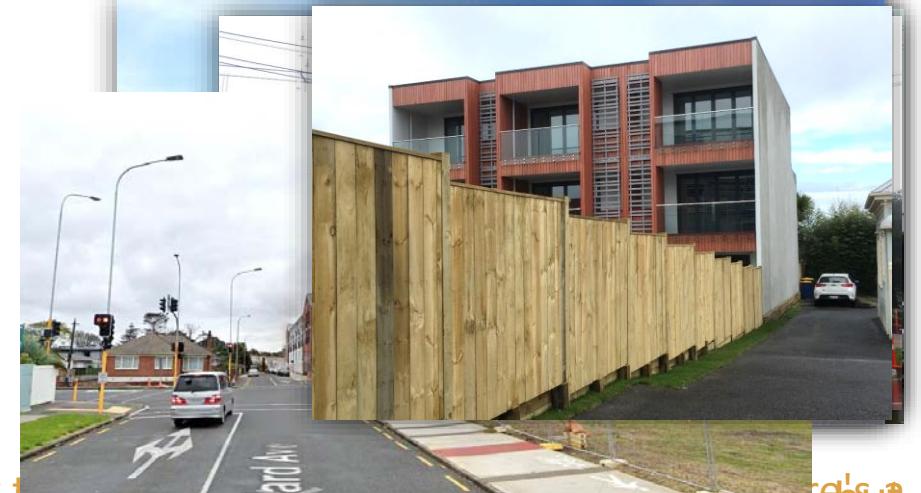
- Aim: Investigate attitudes and experiences of residents in neighbourhoods with new MDH developments
- 16 sites across Auckland (8 planned/under-construction, 8 completed and occupied)
- Sites varying in size, socio-economic area, distance from the city centre
- All dwellings proximate to the site were contacted to participate
- Interviews covered: fears/concerns, experiences, expectations, attitudes towards MDH



Auckland MDH Multi-Site Study

Positive responses

- Development makes sense
- Communication
- Behaviour
- Neighbourhood change
- Building Design



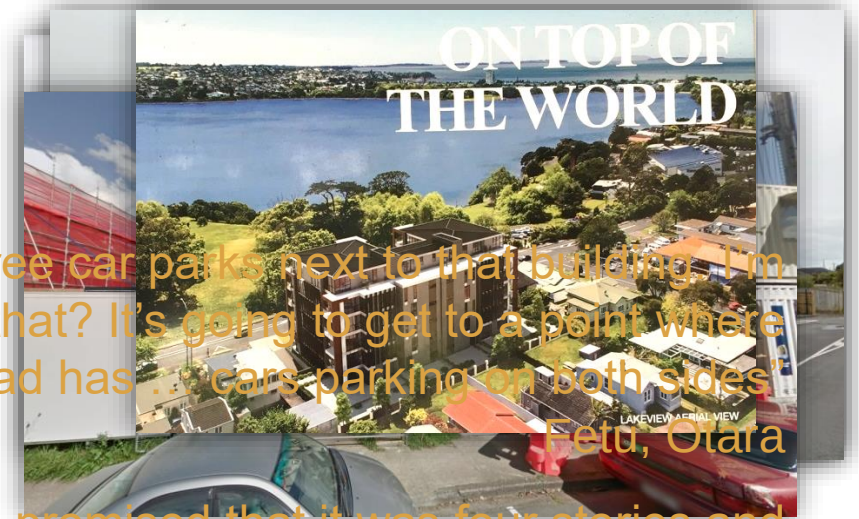
“Well I have to say I love it. It's a great development. It's a guy out there promoting stuff off the road like mean they have a needs to be here not bad. I.e. like the bus stop is like a flat we've got three options for that least trying to be a consideration around the environment. It's they're not any pressure and we have to live with it and move. David, Mark, Albert contact [them], they are quite good. Maddy, Devon, Port us know what's happening in the street. Terry, West, we are actually really quite good. It was an idea to see what's getting into our car designed it as a bus stop, but the bus stop have a really they'll stop the traffic and let us out. I think they've done a really looks like a bus stop. That's why people like it here. way we had to keep us happy. They've been really good.”
kept the same design.... [but] just be slightly better.
Catherine, Glen Eden

Auckland MDH Multi-Site Study

Negative responses

- Development out of character
- Communication
- Behaviour
- Lack of trust
- Neighbourhood change

“[There are] only three car parks next to that building. I’m just like, oh, how’s that? It’s going to get to a point where our road has ... cars parking on both sides”



“They promised and promised that it was four stories and then it became six stories and the developers said there just a huge block of flats ... I know that were probably the ... were green spaces on either side have sold those ... [but] this is where we live, would you dump your ...”

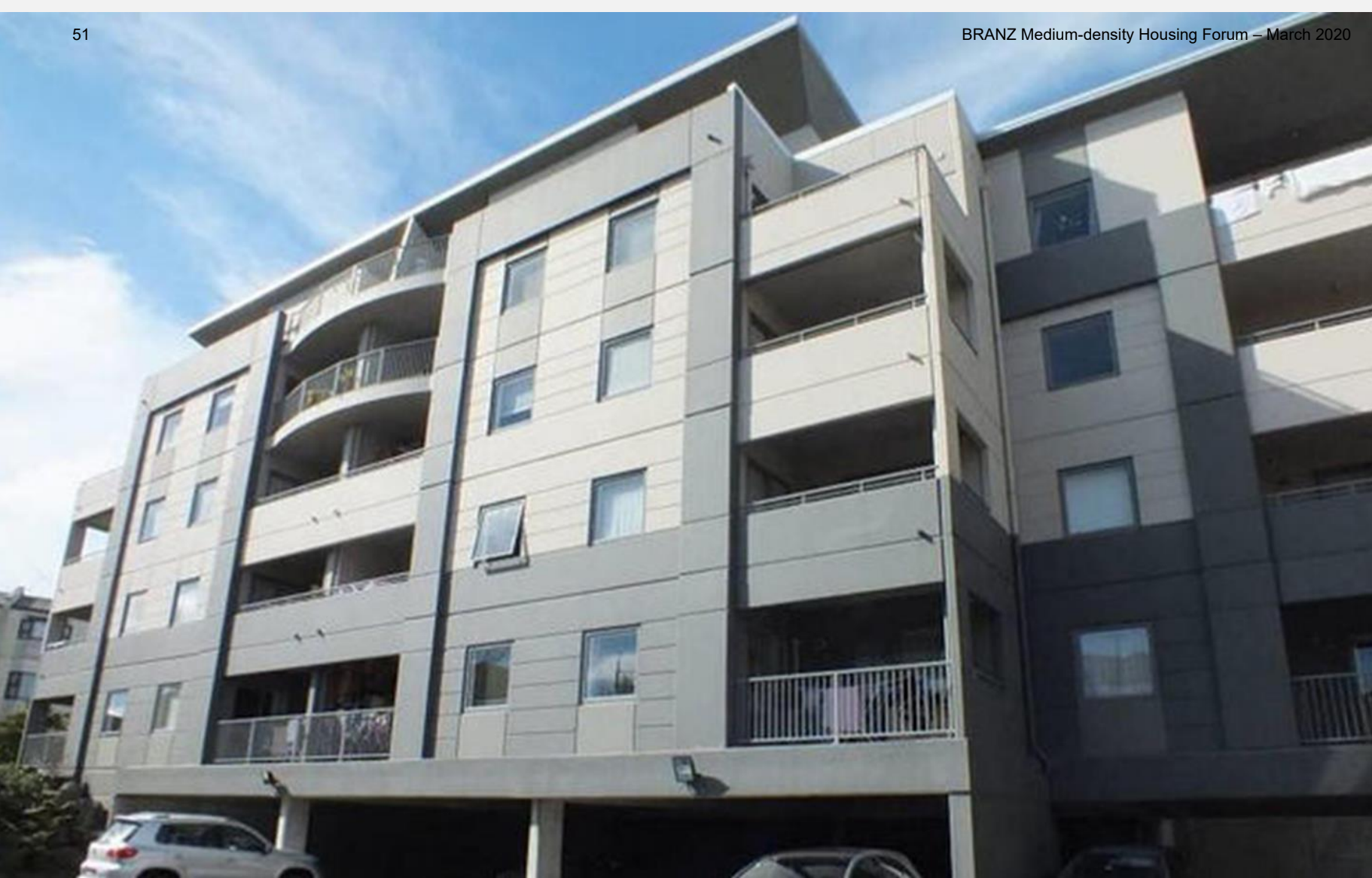
“[It’s] the precedent it sets. I mean a one off is not a problem but if they’ve done it for an area ...”

“While ... there’s ... doesn’t look like the community think the ... packaging, gloves, lots of socks and all sorts of things ... around it ...”

Conclusions

- Most people have initial concerns about MDH
 - Some retained, but many diminish over time
 - Fear of loss of character and community
 - Younger people more likely to welcome intensification
- There remains a need to Improve perceptions of fairness in public engagement and decision-making (e.g. consenting, communication)
- Actions of being a ‘good neighbour’ were well received and could improve attitudes to MDH developments
- Parking and traffic issues around MDH sites remain a key concern





Industry experiences of technical issues affecting medium density housing

St Lukes Garden Apartments, Mt Albert, Auckland

Presentation Overview

Grenfell Tower, London



This presentation covers:

- What we did and how we did it
- An overview of the technical issues identified by industry reps in our study as being most common and most problematic in MDH.
- Industry views about the origin of these issues.
- Implications of this research.

What we did and how we did it

Apartment complex, Mt Victoria, Wellington



- Online survey of 300 building professionals with MDH experience
- Six workshops with 80 building professionals in Q-Town, Chch, Wellington, Tauranga and Auckland to explore issues in more detail
- 10 interviews with key industry stakeholders

What did we discover? - survey

In total, 661 technical issues were identified. Five dominant themes emerged during analysis of survey data.

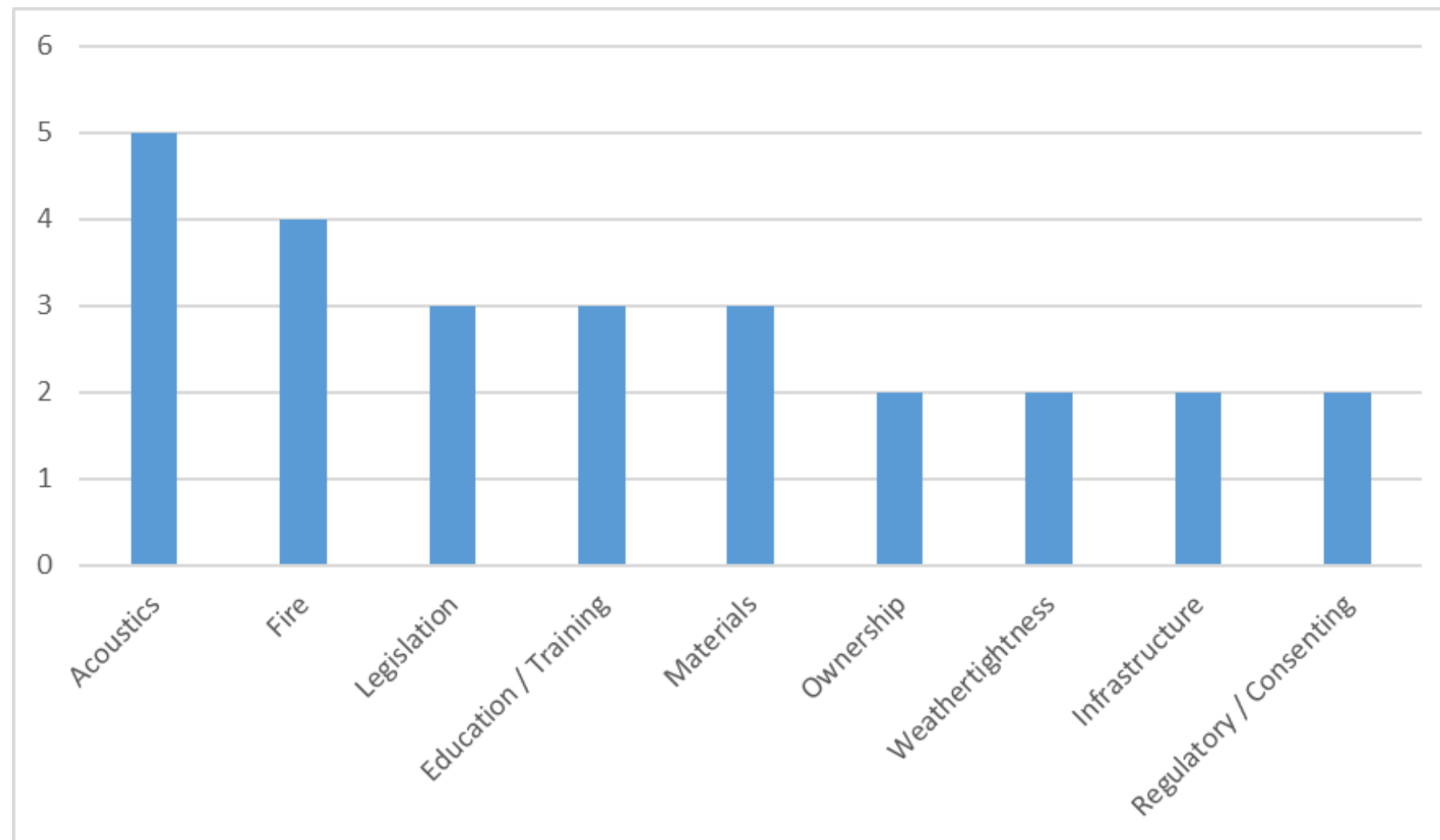
Table 1. Frequency of identified themes.

Theme	Mentions
Fire safety	152
Prebuild/design	125
Structure	114
Weathertightness	86
Acoustics/noise	76

What did we discover? – prioritizing technical issues

Concerns about fire and acoustics again stood out in workshops

(6 = very concerning; 0 = of no concern).

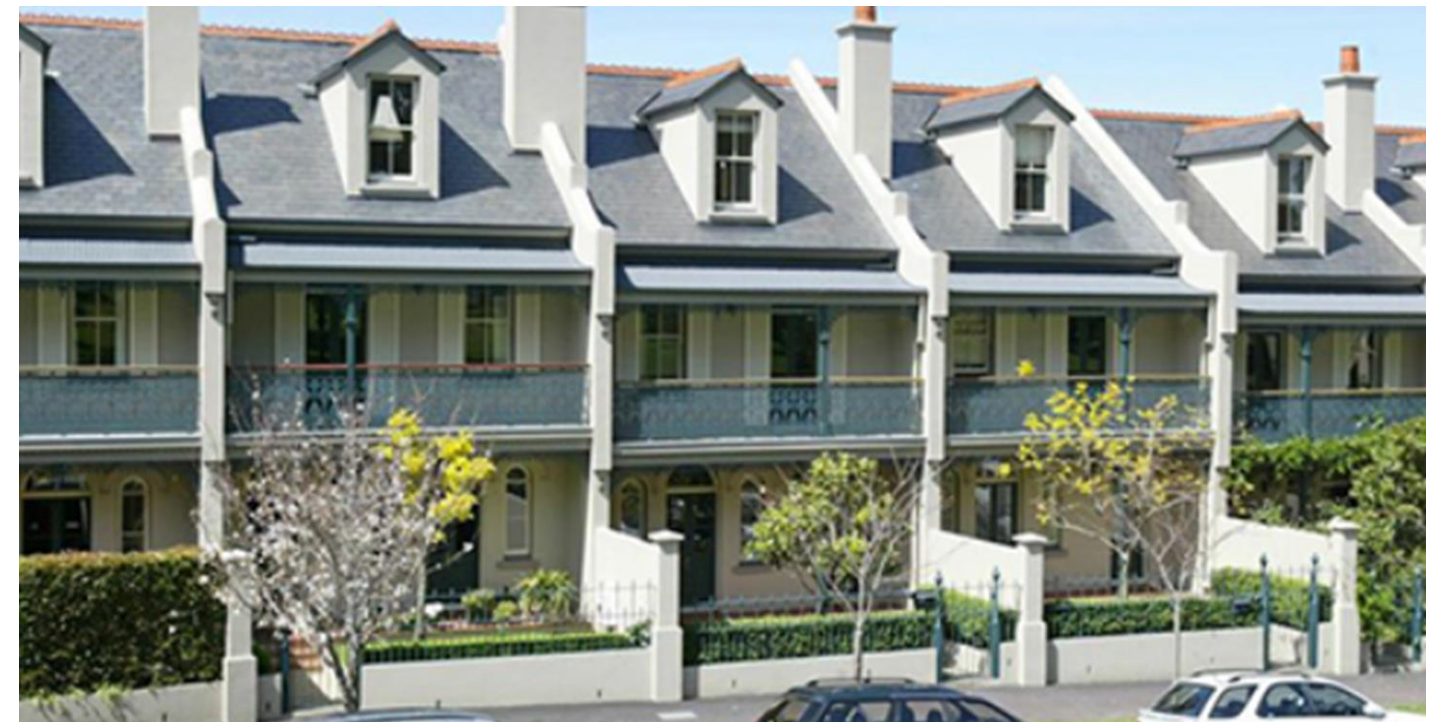


Industry feedback on why technical issues persist

There was a general view that technical issues persist for non-technical reasons, e.g:

- Architects and contractors frequently pointed to each other for providing insufficient detail in the design and specifications or for lacking the skills necessary to understand design and to build to its blueprint.
- Designers and builders both expressing a lack of faith in Building Consent Authorities to properly assess complex design against compliance criteria.

Domain Terraces, Parnell, Auckland



Implications

- Industry feedback: some technical issues are part of a broader industry problem associated with a lack of collaboration and coordination between building professions.
- Building professionals depend on effective relationships with other parties to deliver quality outcomes.
- This feedback connects to the Construction Sector Accord and to BRANZ's refreshed strategy where achieving closer collaboration and cooperation across the industry is seen as key to resolving commonly experienced issues.

Opportunities: tackling systemic issues



Key messages

- Public perceptions of MDH is consistent with the experiences of some building professionals.
- Industry feedback is that to help resolve these problems we need to look at how to address industry fragmentation e.g. the challenging relationships between stakeholders that underlie technical issues.
- This presents an opportunity for BRANZ to look at technical issues in MDH in a different way.
- We are beginning to do this: study on the persistence of weathertightness failure. (To be discussed further in the workshop)



MDH and Fire – what are the issues?

External fire spread



Internal fire spread



MDH and fire – external fire exposures



Dunedin, 2005 (Photo credit: 111emergency.co.nz)



Christchurch, July 2016 (Photo credit: Brian Dimbleby)

MDH and fire – external fire exposures

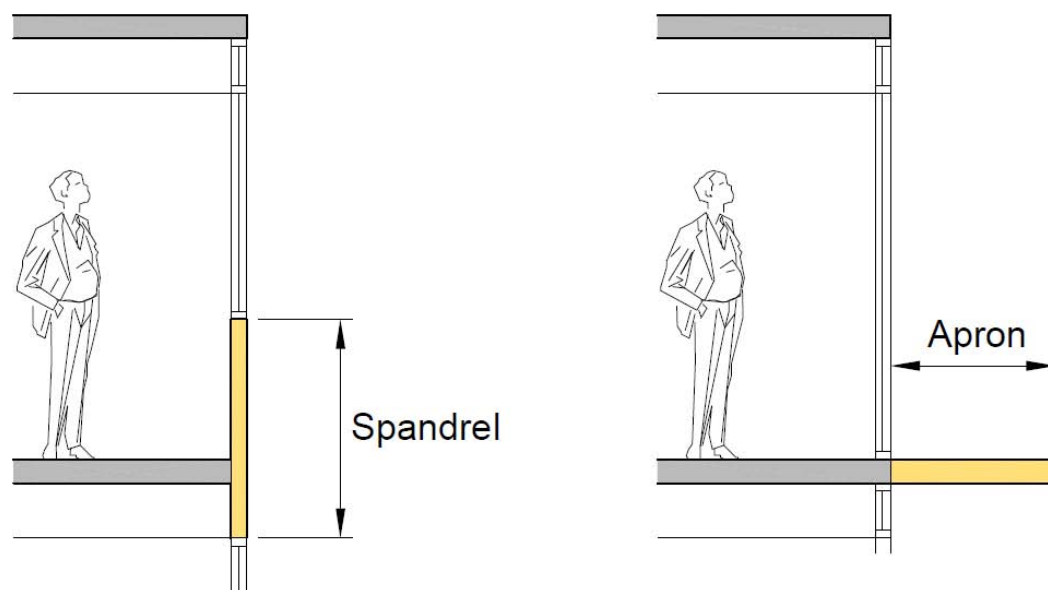
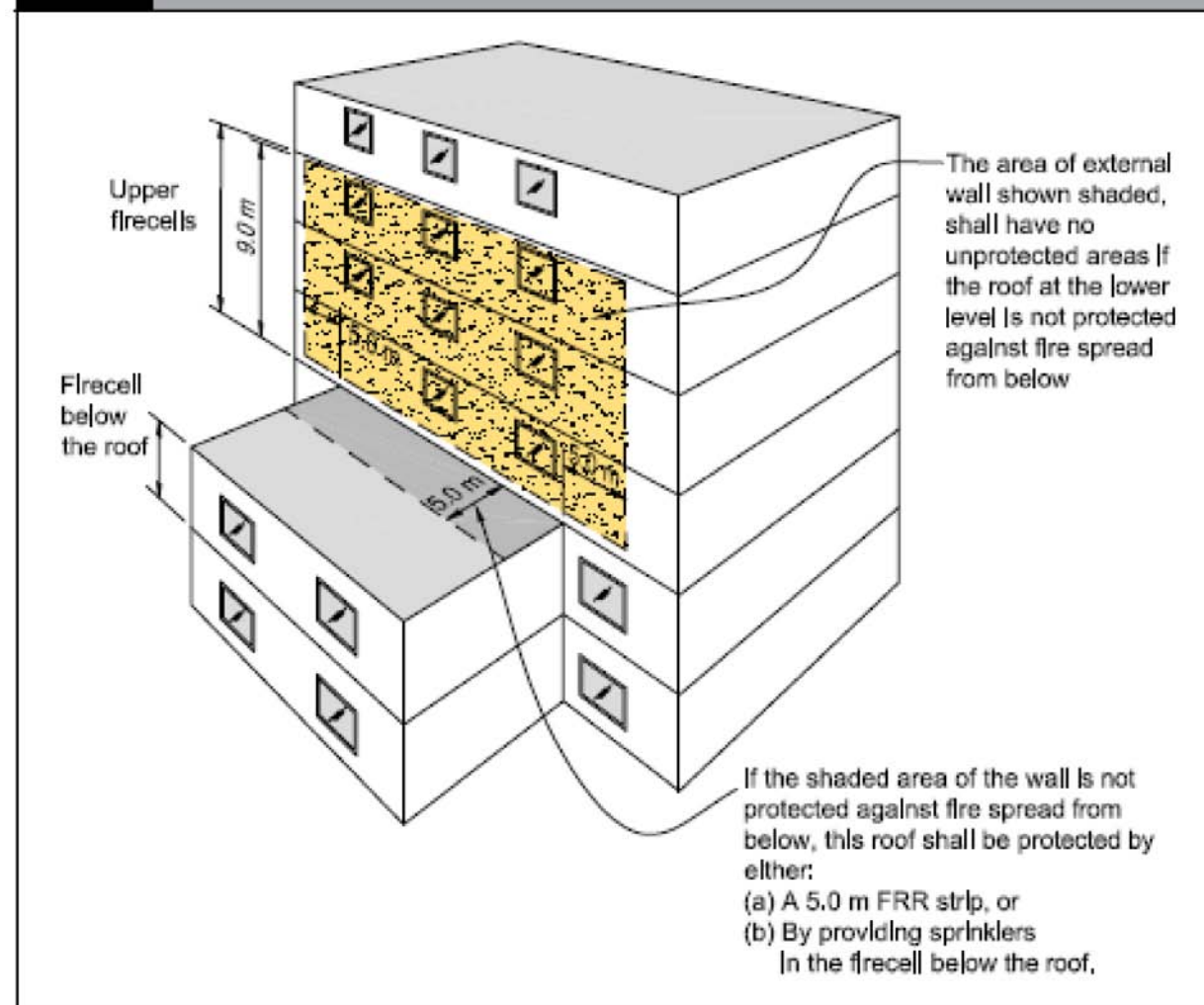


Table 5.4 Combination of aprons and spandrels	
Apron projection (mm)	Spandrel height (mm)
0	1500
300	1000
450	500
600	0

Figure 5.6 External walls and roof, vertical fire spread
Paragraphs 5.7.7 and 5.7.9



MDH and fire – external fire exposures



Study Report

SR360 [2018]

Vertical external fire spread from flames extending out of an opening

Kevin Frank, Haejun Park, Greg Baker and Colleen Wade



Study Report

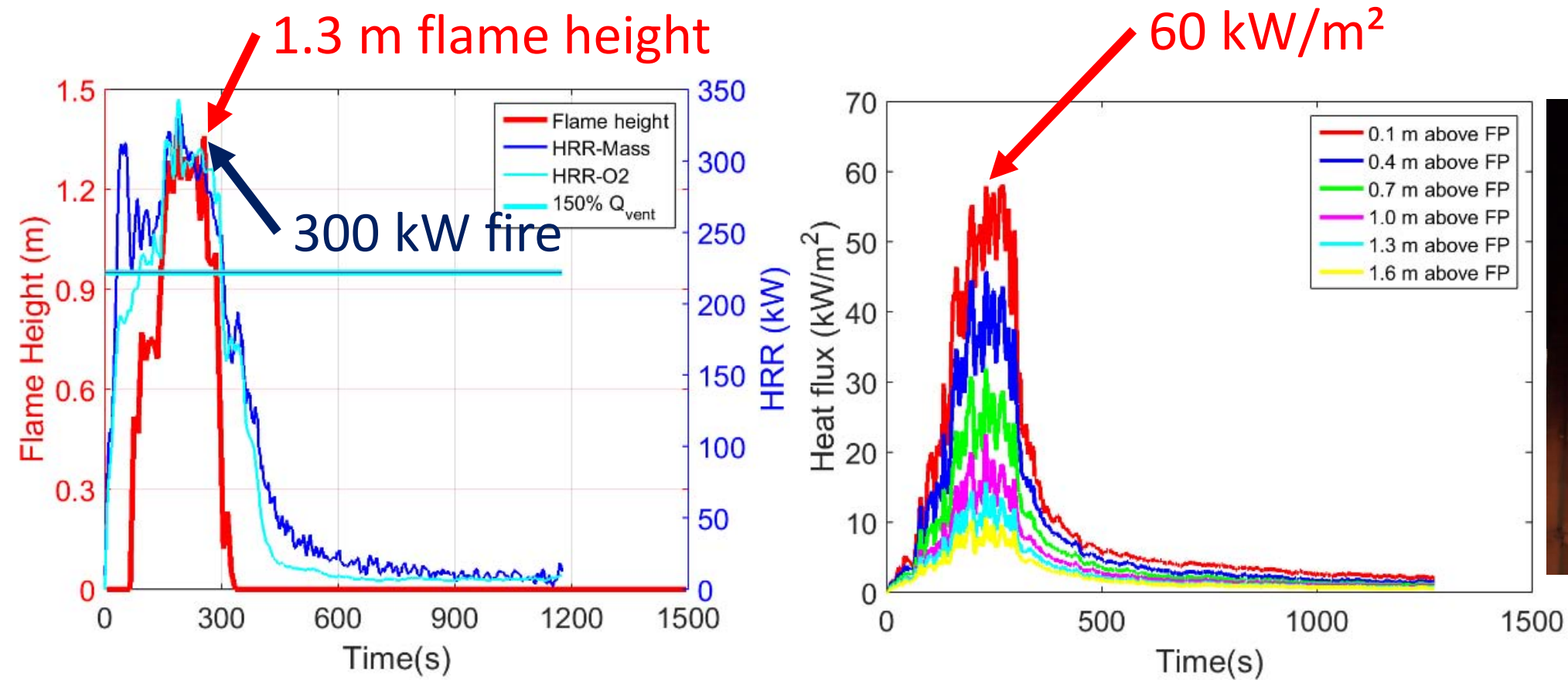
SR409 [2019]

Fire spread from lower roofs project: Final report

Kevin Frank, Greg Baker and Colleen Wade

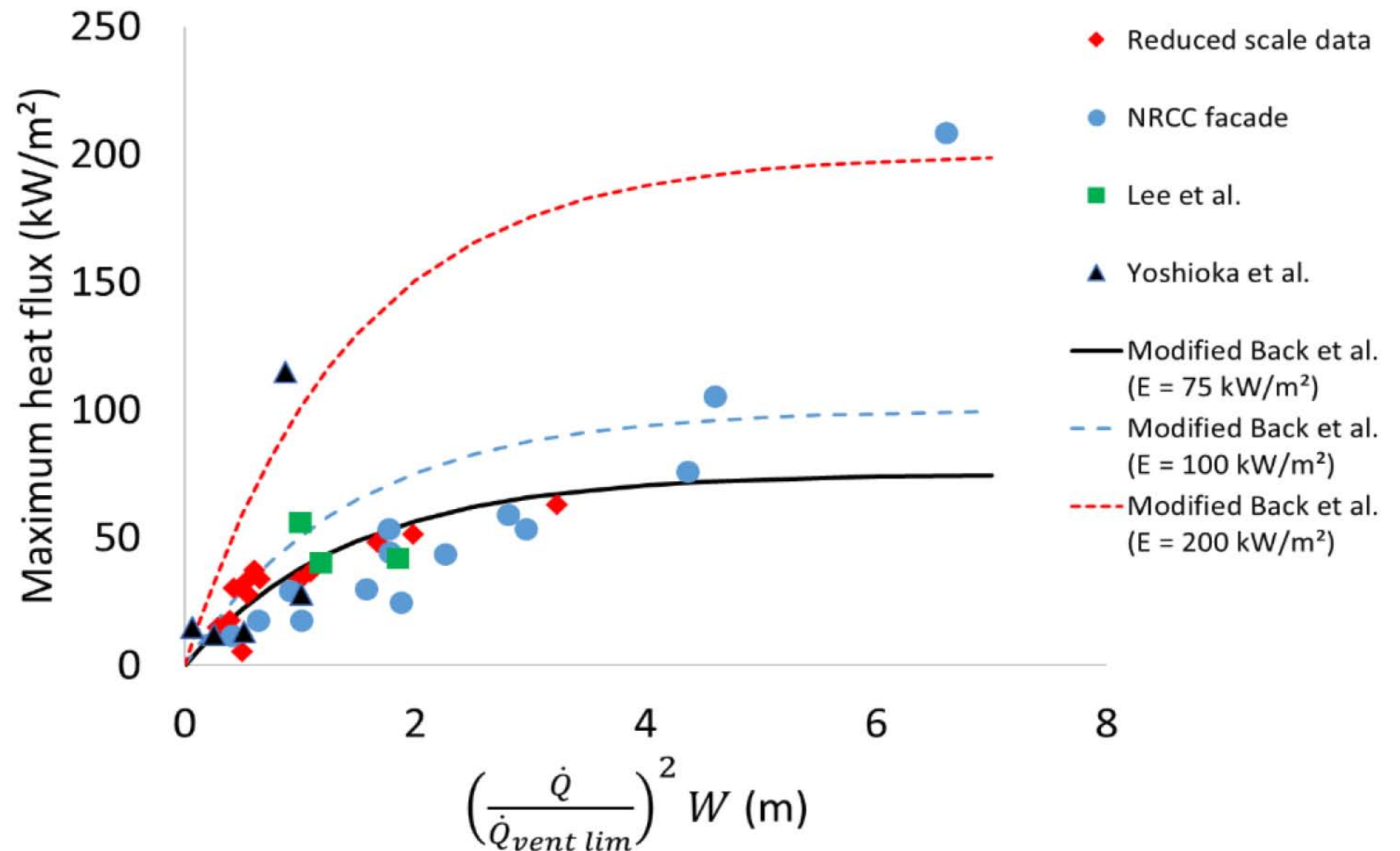


Exposures from windows



Exposures from windows – key findings

- Peak heat fluxes can reach up to 75 kW/m², even in relatively small fires
- Spandrel and apron requirements not conservative
- Flame spread can be expected to openings on the floor above



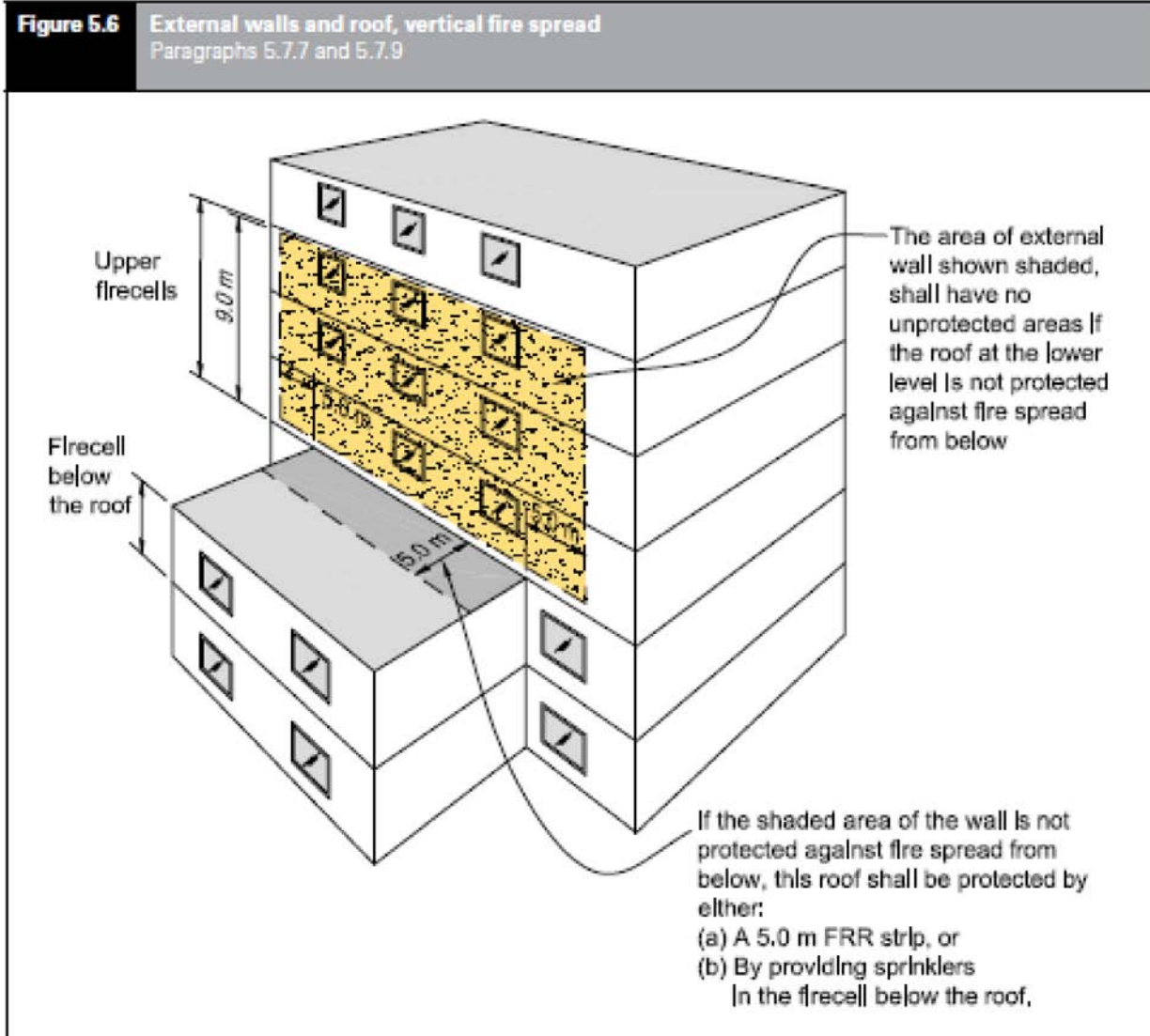
Exposures from windows – key findings

- Peak heat fluxes can reach up to 75 kW/m², even in relatively small fires
- Spandrel and apron requirements not conservative
- Flame spread can be expected to openings on the floor above

Table 11. Evaluation of New Zealand Acceptable Solution spandrel criteria using the 150% ventilation-limited heat release rate criteria and recommended flame height and heat flux correlations.

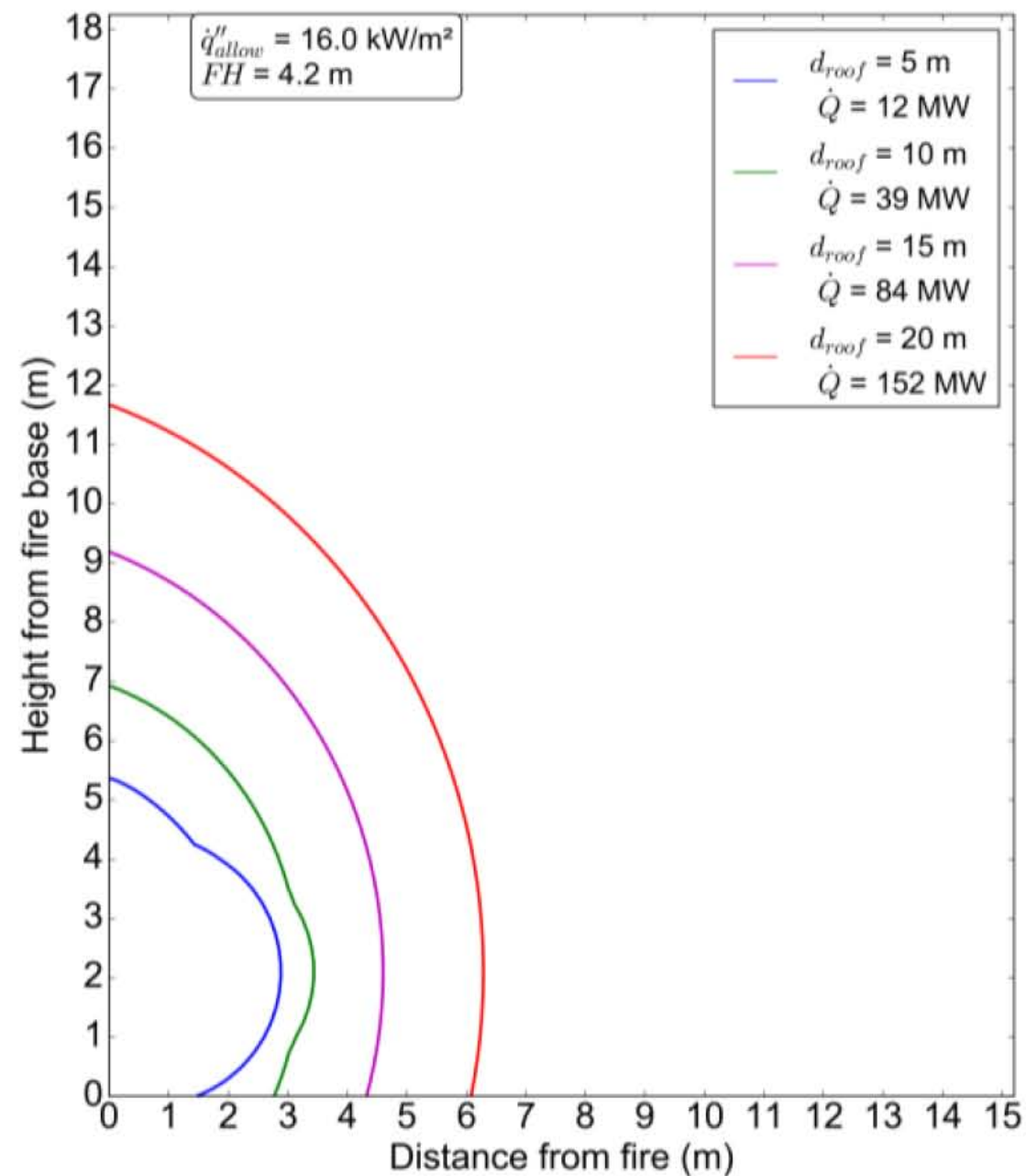
				Flame height for		
Opening Type	Width (m)	Height (m)	$\dot{Q}_{vent\ lim}$ (MW)	$\dot{Q} = 150\% \dot{Q}_{vent\ lim}$ (m)	$\dot{q}''_{max}$ (kW/m²)	$Z@ \dot{q}''_{max}$ (m)
Door	0.8	2	3.4	2.7	20.0	2.7
					16.0	3.1
					12.5	3.6
Small window	1	1	1.5	2.2	20.0	2.2
					16.0	2.5
					12.5	2.9
Medium window	2	1.5	5.5	3.8	20.0	3.8
					16.0	4.3
					12.5	5.0
Ranchslider or large window	2.5	2	10.6	4.9	20.0	4.9
					16.0	5.6
					12.5	6.5

Exposures from lower roofs

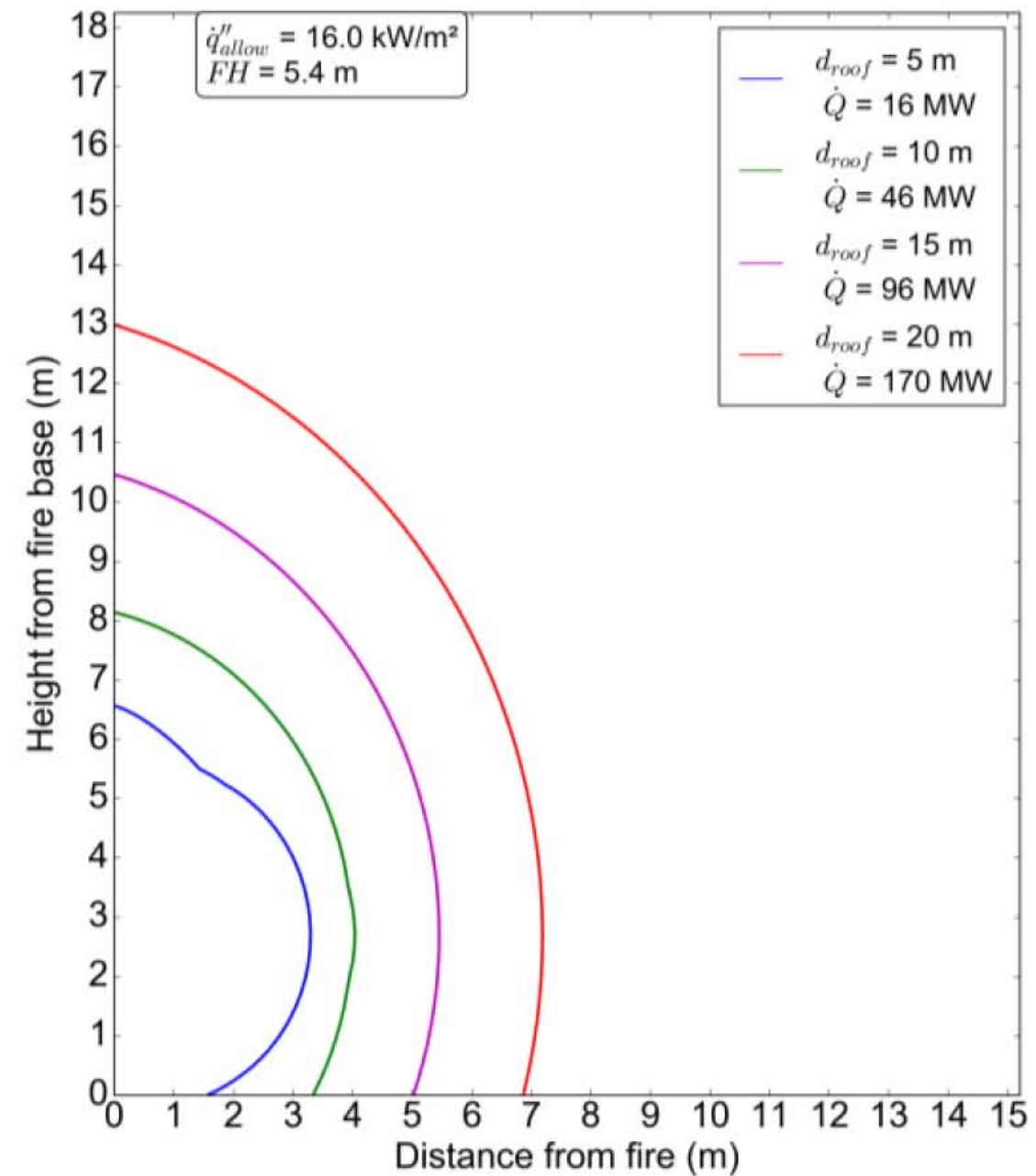


Country	Document	External Wall	Lower Roof	Requirement
New Zealand	C/AS1,2,4,5	9.0 m	5.0 m	FRR which varies depending on acceptable solution
Australia	National Construction Code	6.0 m	3.0 m	Same FRR as lower firewall
Sweden	Boverket's Building Regulations (English Translation)	5.0 m	8.0 m	Exterior wall: FRR equal to requirement of separating structure (up to 20% of area can be windows with 30 min integrity and radiation FRR) Roof: 60 min FRR
USA	IBC 2015	4.6 m*	3.0 m	1 hour FRR with 45 min protective assemblies on openings
Canada	National Building Code	-	5 m	No skylights in roof if windows are within 3 storeys vertically and 5 m horizontal to roof
UK	Approved Document B	10 m		Reaction to fire for assembly buildings (no FRR)

Exposures from lower roofs – effect of compartment size

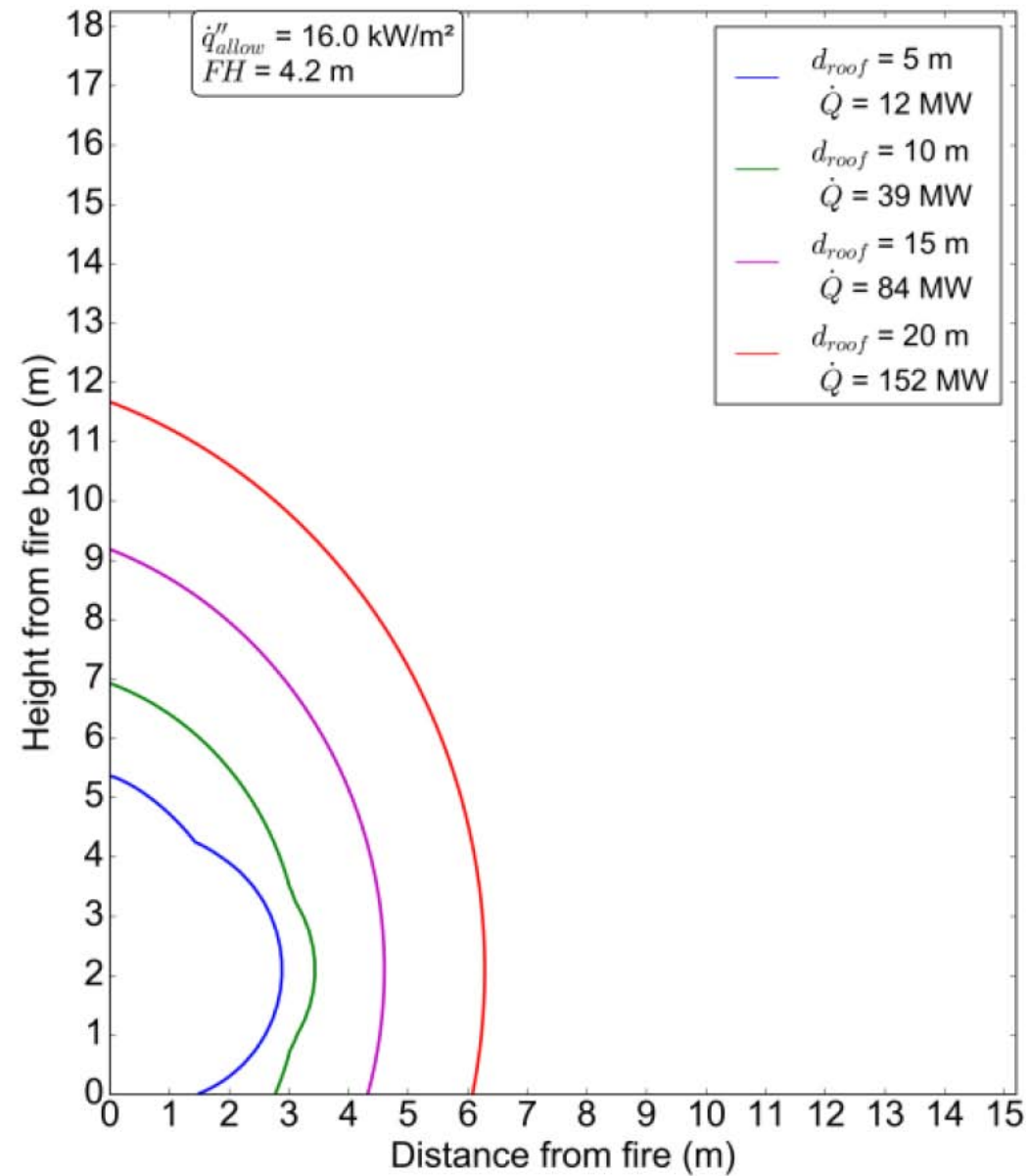


(a) 1 storey contributing

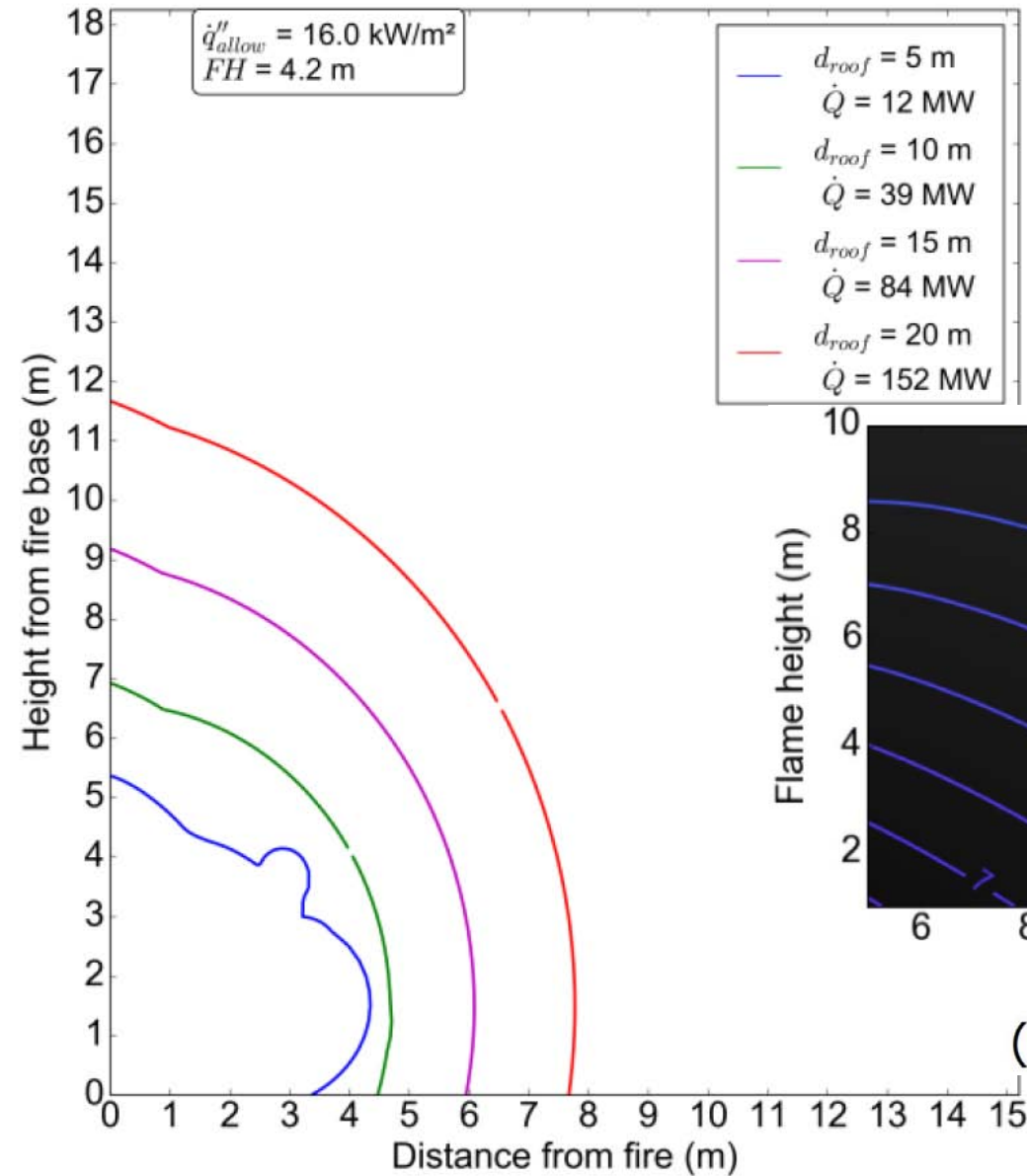


(b) 2 storeys contributing

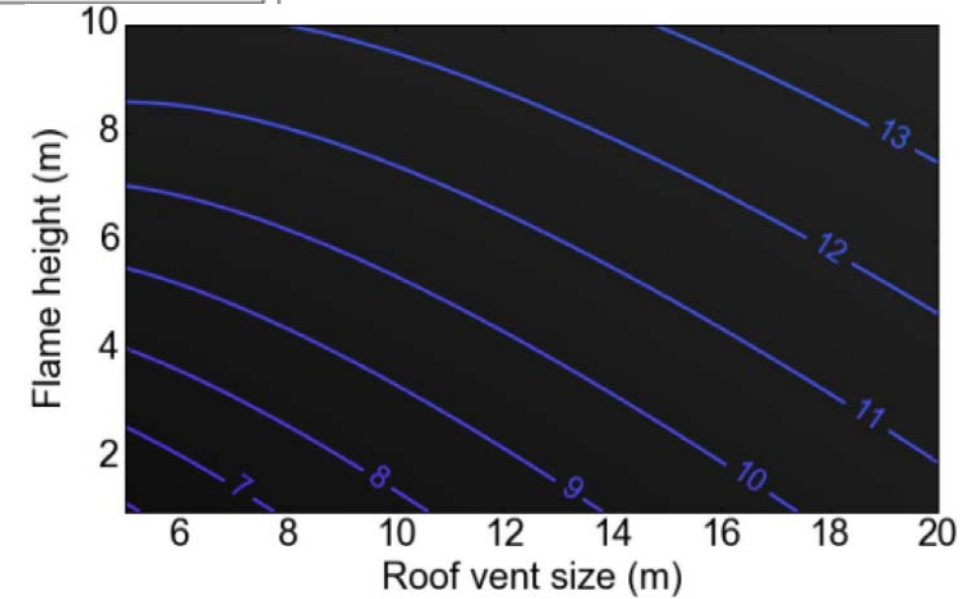
Exposures from lower roofs – effect of wind



(a) 0°



(c) 45°



(b) Flame tilt = 45°

Exposures – key findings

- Lower roof requirements conservative compared to spandrel and apron requirements
- Should also include reaction-to-fire requirements
- Guidance for estimating window and roof exposures provided
- Knowledge of exposures useful for combustible façade fire safety research project



Internal fire spread

- Widespread concerns with fire separation compliance
- For example:
 - Mt Wellington unit owners face \$32.8m repair: leaks, fire, roof, structural, even P
 - May 2017, NZ Herald



Internal fire spread: case study

- Terraced housing complex (56 three-storey units in four blocks)
- 30/30/30 FRR required for inter-tenancy walls (with reference to C/AS1)
- PFP concerns:
 - Cable penetrations through inter-storey boundary joists
 - Gaps in timber framing
 - Plastic flush boxes
 - Plasterboard fixings
 - Fire protection of structural steel members



Frank, K. M., Baker, G. B. & MacIntyre, J. D. (2018). *Assessing the risk of non-compliant firestopping and smokestopping in New Zealand residential buildings undergoing alterations*. BRANZ Study Report SR410, Judgeford, New Zealand: BRANZ Ltd.



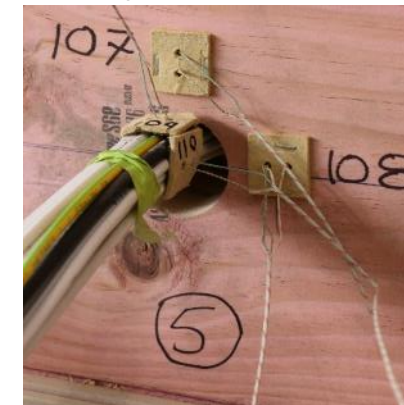
Determination 2016/048

Internal fire spread

- Research focused on problems in existing buildings (ANARP compliance)
- Most issues with new construction are more to do with process, attitude, and education



Unexposed
(pre-test)



Unexposed
(post-test)



Exposed
(post-test)



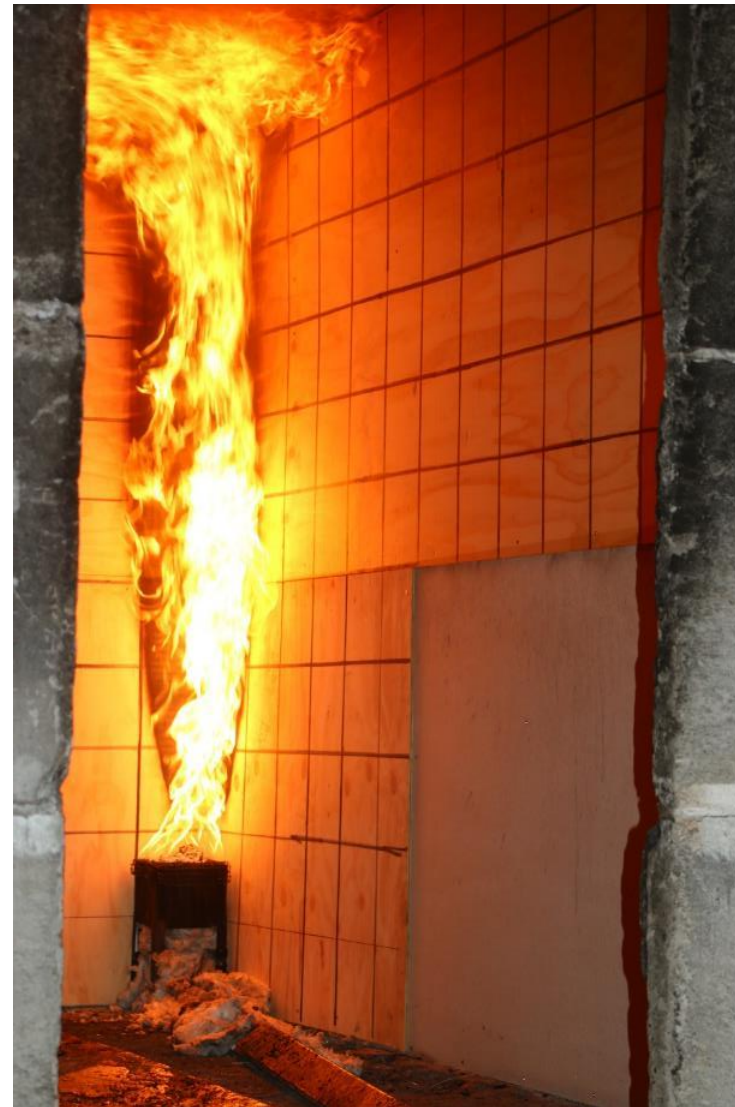
What has happened since?

- Manufacturer solutions
- Other industry initiatives:
 - FPANZ passive fire register and position statements
 - Auckland Council position statement
 - SFPE NZ guide to construction monitoring
 - Canterbury District Health Board contractor accreditation
 - New Zealand Diploma in Fire Engineering



Next steps

- Combustible façade research
- Industry education



Multi-Storey Light Timber-Framed Buildings in New Zealand – Engineering Design

David Carradine

Recently Published Guidance (October 2019)



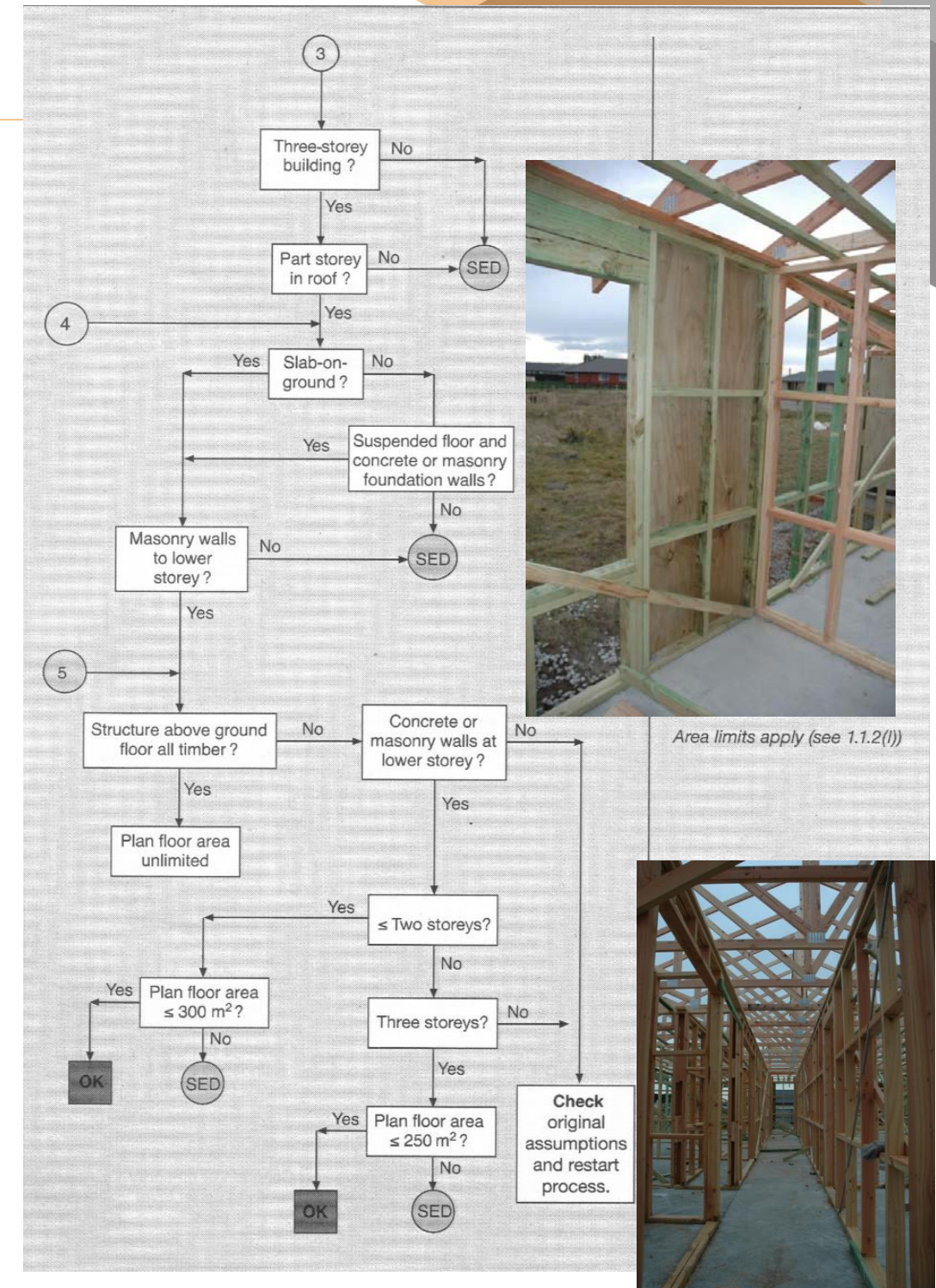
Rationale for Design Guide Development

- Housing Requirements in New Zealand
 - Increased Density Initiatives
- Continued Rebuild of Christchurch
- Large Timber Resource in New Zealand
 - Solid Sawn Timber
 - Engineered Wood Products
- “Compartmentalised” Construction
 - Lots of Walls
 - Lots of Rooms



Current Provisions around LTF

- Performance Based Building Code
- NZS 3604 Timber-Framed Buildings
 - Prescriptive Code
 - Up to 2-1/2 Storeys (10 m)
 - Includes Residential, Educational, Healthcare Facilities, Commercial, etc.
- NZS 3603 Timber Structures Standard
 - Connections and Components Design
 - Currently Undergoing Significant Revision (NZS AS 1720.1)



Specific Design of Light Timber Frame Buildings

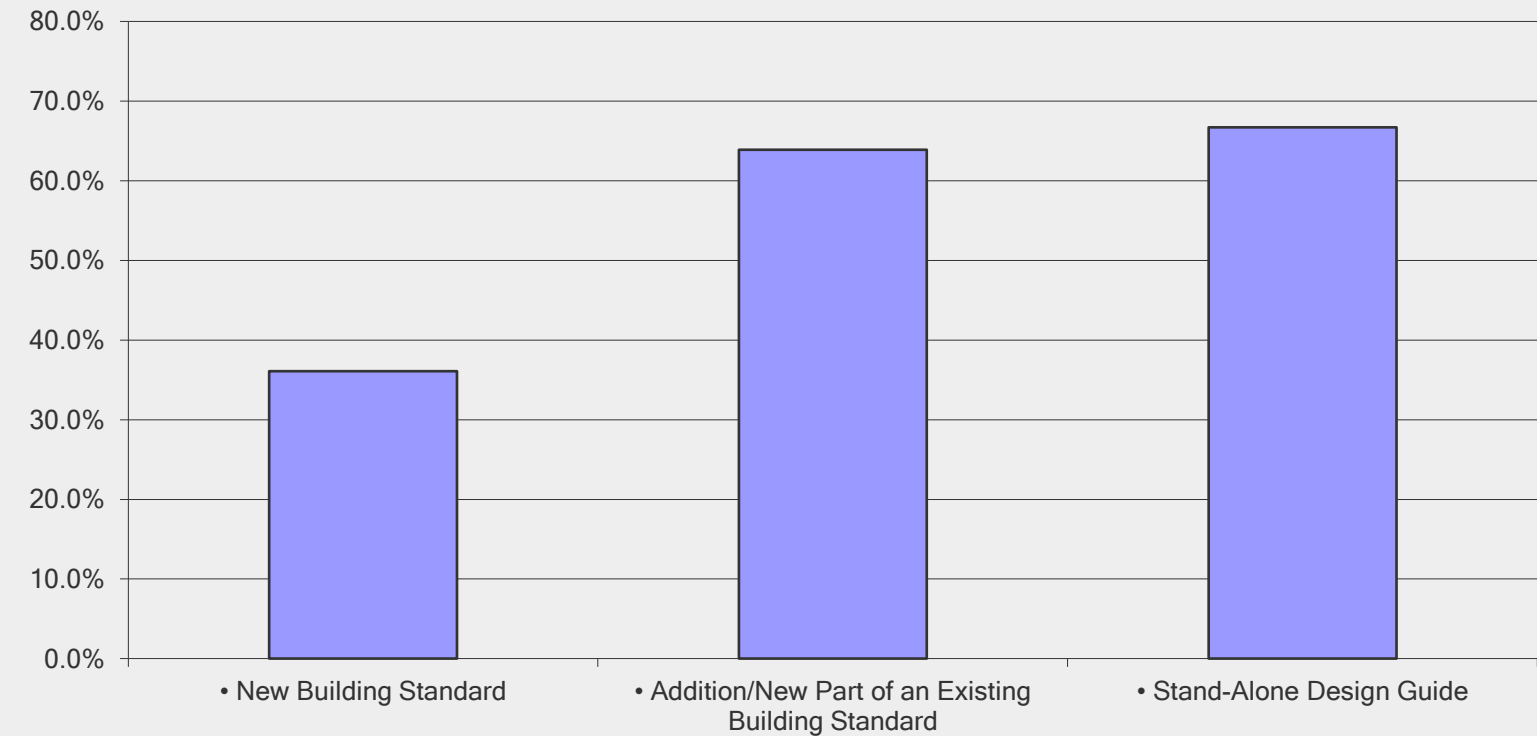
- Providing technical design guidance for 3-6 storey light timber frame (LTF) buildings
- Non-prescriptive
- Accommodation, retirement and multi-unit residential
- Incorporates existing and anticipated changes to timber standards



Do you think that any of the following would provide an incentive to engineers or architects to design more of these types of buildings? Please tick to indicate your agreement.

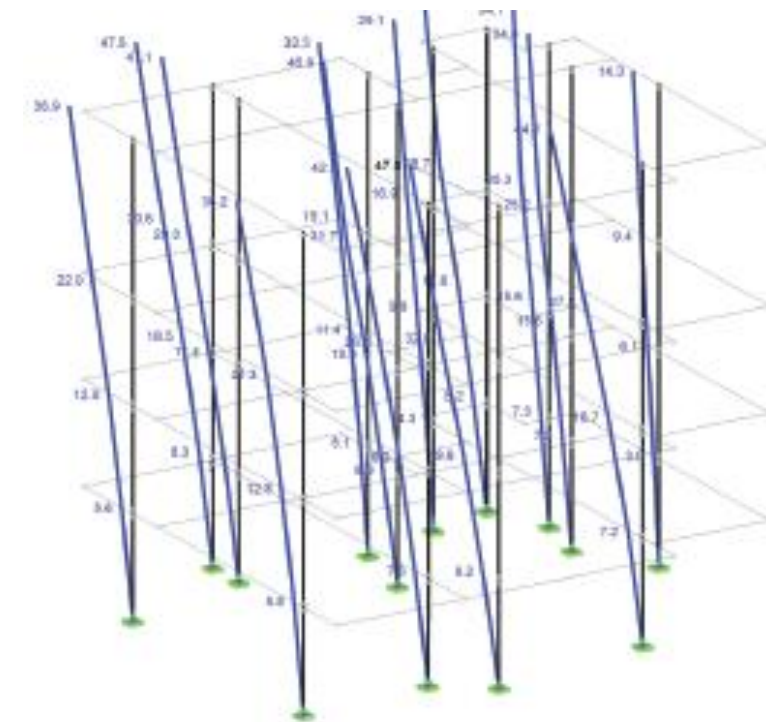
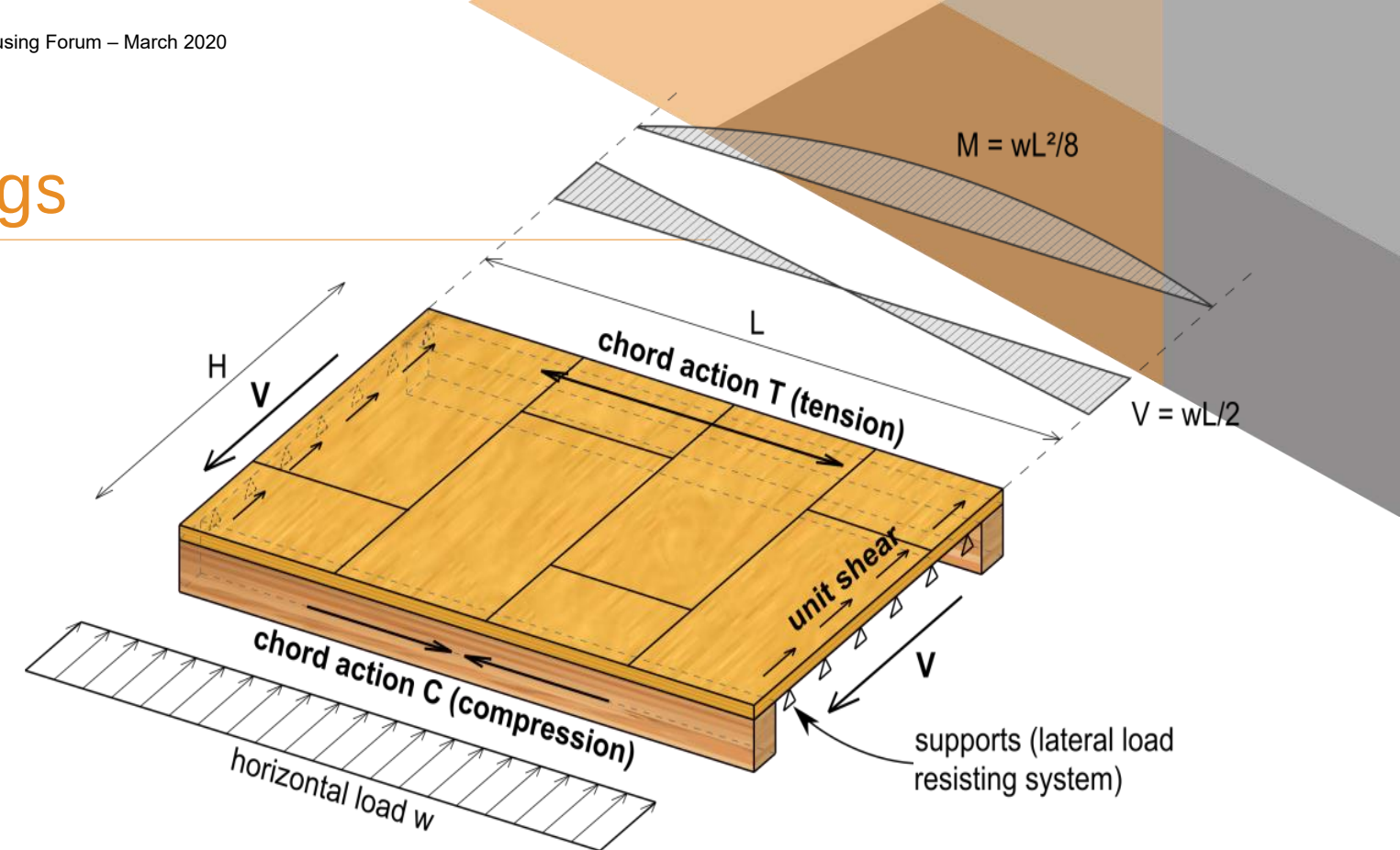
LTF Investigation

- Global Methods?
- Existing Techniques in NZ
- Practitioner Survey
 - Input Requested
 - Reality Check
 - Desirable Output Methods



Guidance on Multi-Storey LTF Buildings

- Specific Engineering Design Methods
 - Diaphragms
 - Shear Walls
 - Vertical Movement
 - Floor Vibrations
 - Seismic Resistance
- Full Structural Analysis
- Calculations and Model Recommendations



Design Guidance Outline

1. Introduction

- How Is It Being Done?
- Practical for New Zealand?
- Global Methods
- Existing Documents
- Identifying Gaps
- Outline of Document



Design Guidance Outline

2. Loading Demands

- Gravity
- Wind
- Seismic
 - Ductility
 - Global
 - Local
 - Deformation Limits
 - Capacity Design



Design Guidance Outline

3. Structural Analysis of LTF Buildings

- Floors
- Walls
- Lintels
- Lateral Load Resistance
 - Analytical Modeling
 - Torsion
 - Shear Walls
 - Components and Fasteners
 - Numerical Modeling

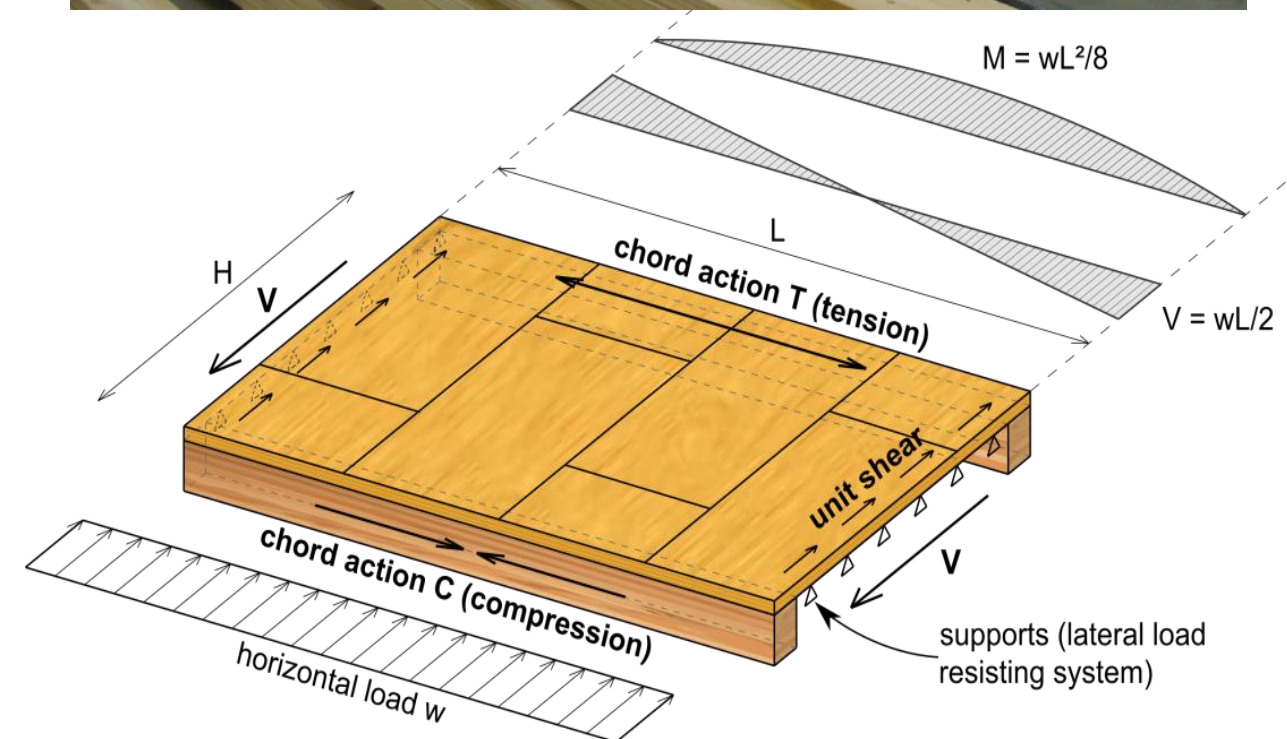


Photo by Daniel Scheibmair

Design Guidance Outline

4. Diaphragm Design in LTF Buildings

- Role of Diaphragms
- Components and Materials
- Higher Mode Forces
- Capacity Design
- Load Transfer
- Displacement Compatibility
- Load Distribution



Design Guidance Outline

5. Controlling Floor Vibrations in LTF Buildings

- Vibrations and Occupants
- Design Parameters
- Adjusted Span Tables
- Support Effects

6. Cladding, Weathertightness and Durability in LTF Buildings

- Building Code Requirements
- Timber Durability
- Keeping It Dry



Design Guidance Outline

7. Fire Resistance in LTF Buildings

- Building Code Requirements
- Encapsulation and LTF
 - Proprietary Systems
- Fire During Construction



Design Guidance Outline

8. Acoustic Performance in LTF Buildings

- Noise Transmission
- Building Code Requirements
- Proprietary Systems

9. Vertical Movement in LTF Buildings

- Contributions
- Estimation of Deformation

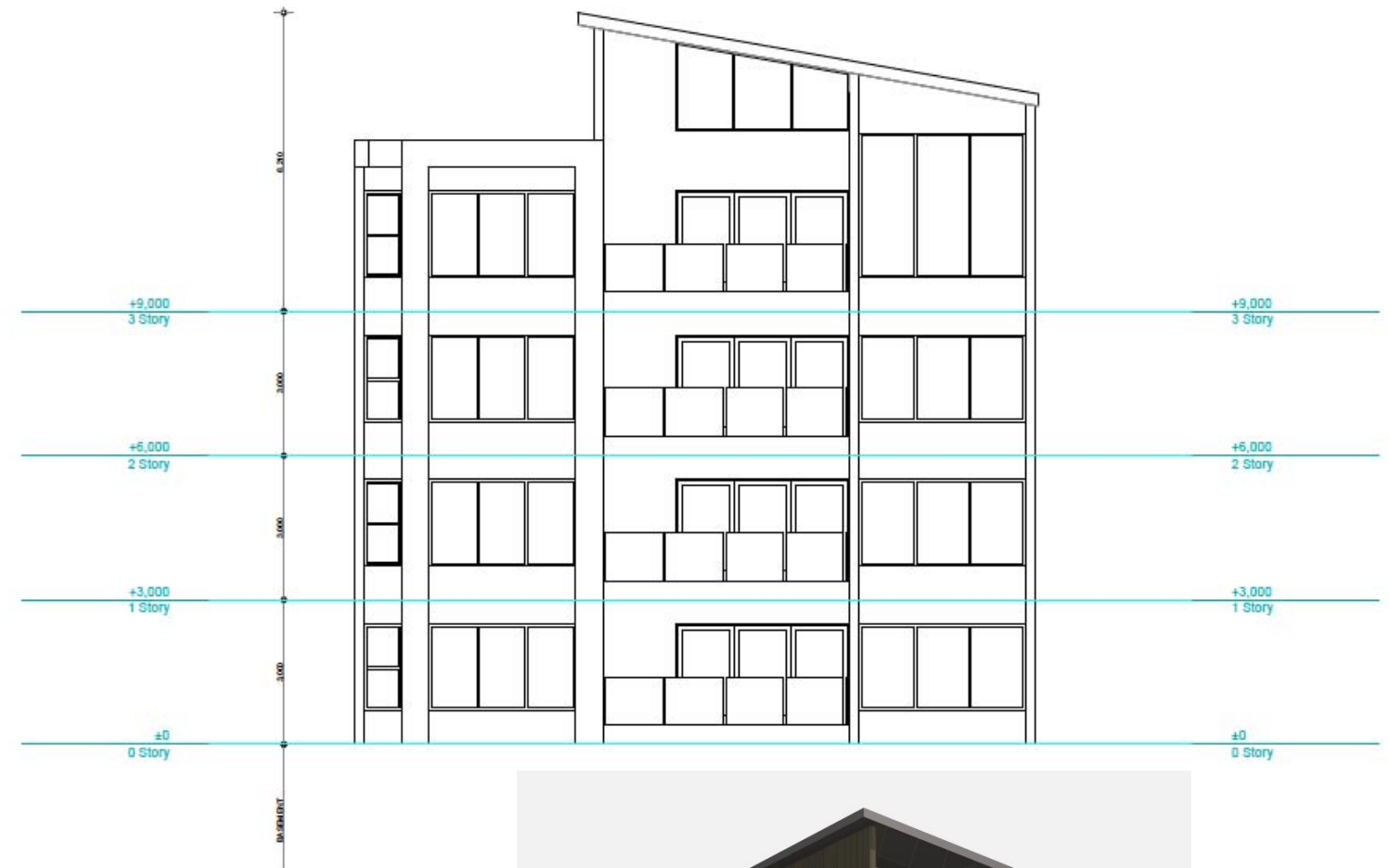


Photo by Daniel Scheibmair

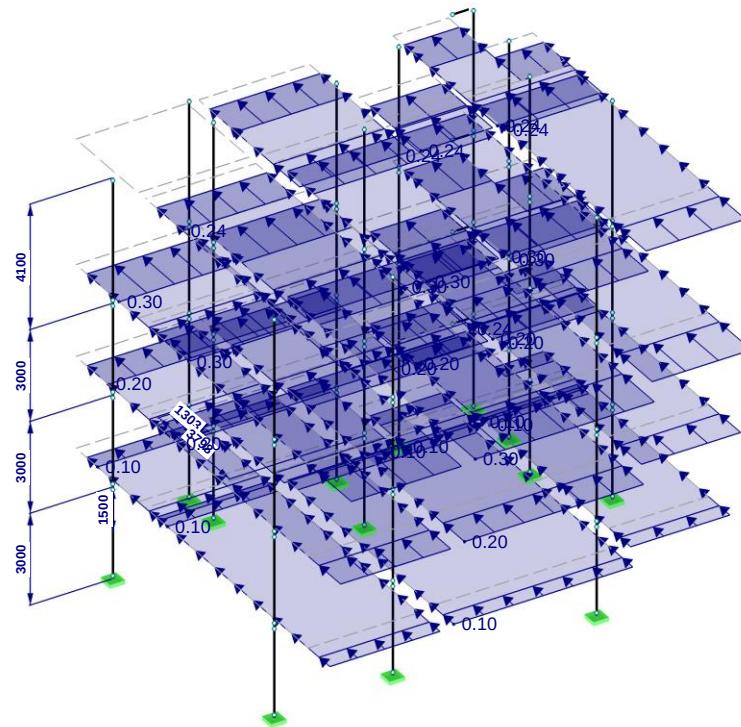
Design Guidance Outline

10. Design Example

- Residential Building
- 4 Storey
- Realistic Complexity



LC 2: Ey
Loads [kN/m²]



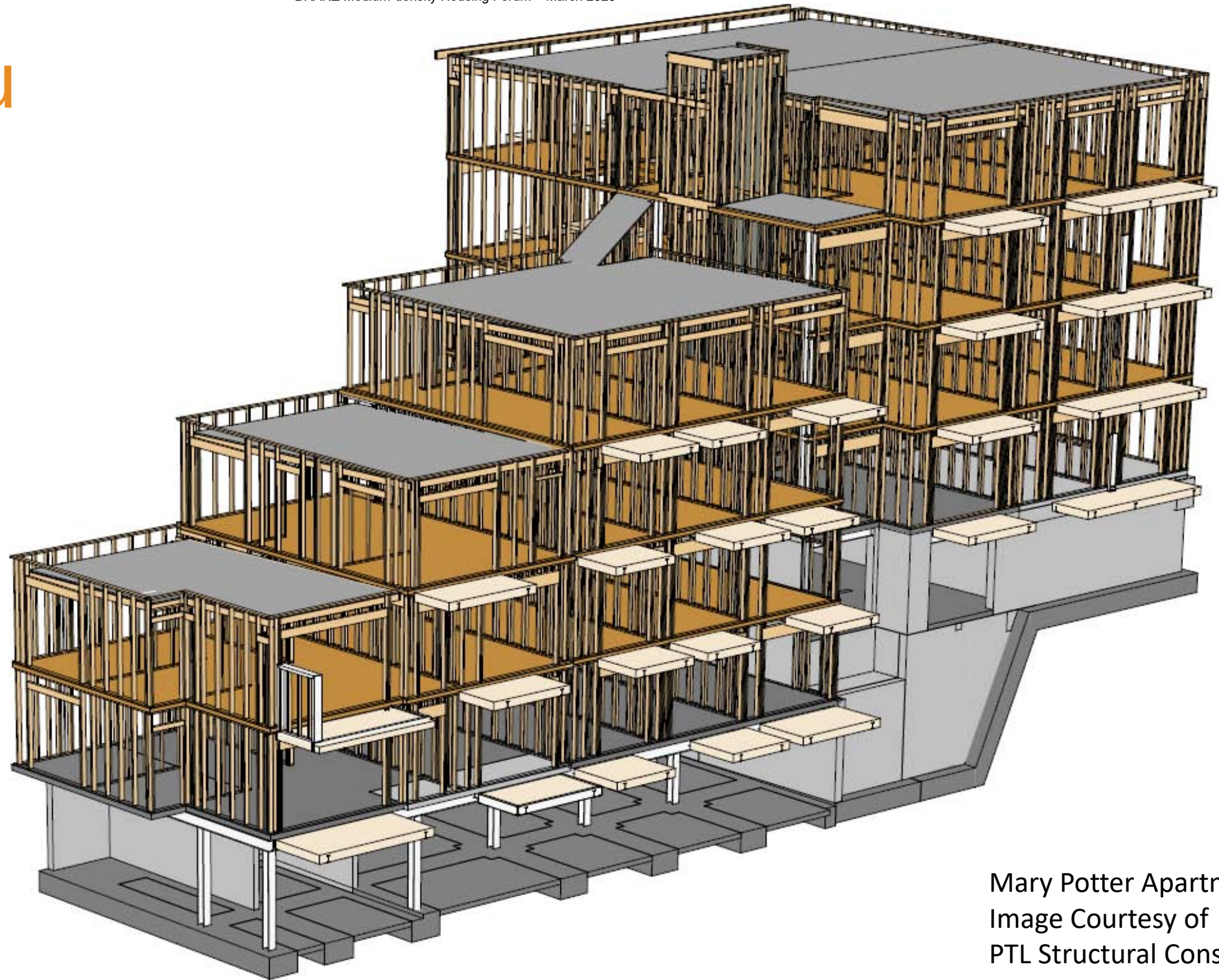
Guidance on Multi-Storey LTF Buildings

- Synthesis of Existing Methods
 - New Zealand
 - North America
 - UK
- Integrate Systems and Methods for New Zealand Compliance
- Provide Guidance and Methods for Design of LTF Buildings Up to 6 Storeys



Thank You

- Questions?



Medium Density Housing

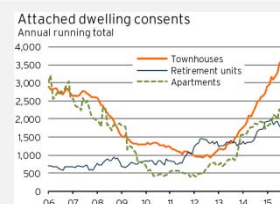
A supply side perspective



Kevin Golding
Sustainability Manager
Winstone Wallboards Ltd

Situation: The Pressure Has Come on for Medium Density Housing

Market Growth



Affordability

Major Centre	Median Household Income	Affordable at a Median Multiple of 3.0	Affordable at a Median Multiple of 4.5
Auckland	\$ 75,200	\$225,600	\$338,000
Wellington	\$ 70,600	\$211,800	\$318,000
Christchurch	\$ 66,200	\$198,600	\$298,000

Urban Planning



There is a compelling and urgent need for **high quality** multi-unit medium density housing in New Zealand

Desired MDH



Terraced/Townhomes



Retirement Resorts



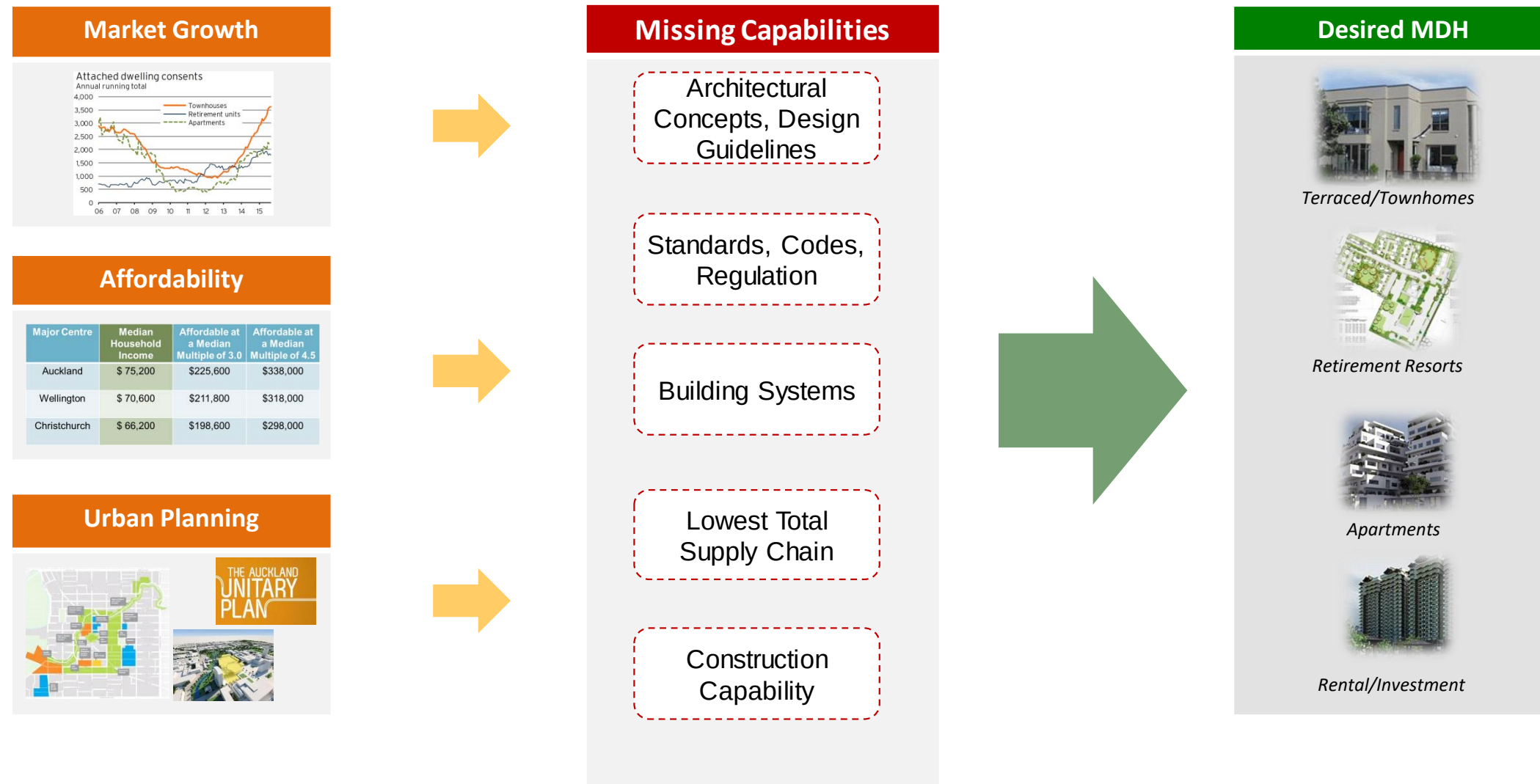
Apartments



Rental/Investment

Complication:

To Achieve High Quality MDH at Scale, We Need to Develop New Core Capabilities



Starting Points: A Scorecard to Define Performance Goals for Multi-unit MDH

"Medium-density housing means comprehensive developments including four or more dwellings with an average density of less than 350 m² per unit. It can include semi-detached (or duplex) dwellings, terraced housing or apartments.*



*Source: Ministry for the Environment

Quality of Living	Today	2020
Satisfaction		
Security		
Space		
Lighting		

Building Performance	Today	2020
Fire		
Noise		
Weather		
Thermal		

Economics	Today	2020
Cost m ²		
Margin m ²		
Cost Unit		

Regulatory	Today	2020
Cost Unit		
Time to Approval		
Impact		

Regulatory	Today	2020
Time to Construct		
Cost to Construct		
Defects		

Which Build Options Work Best For Achieving 2020 Goals?

Light Weight Steel Structures



Timber Structures



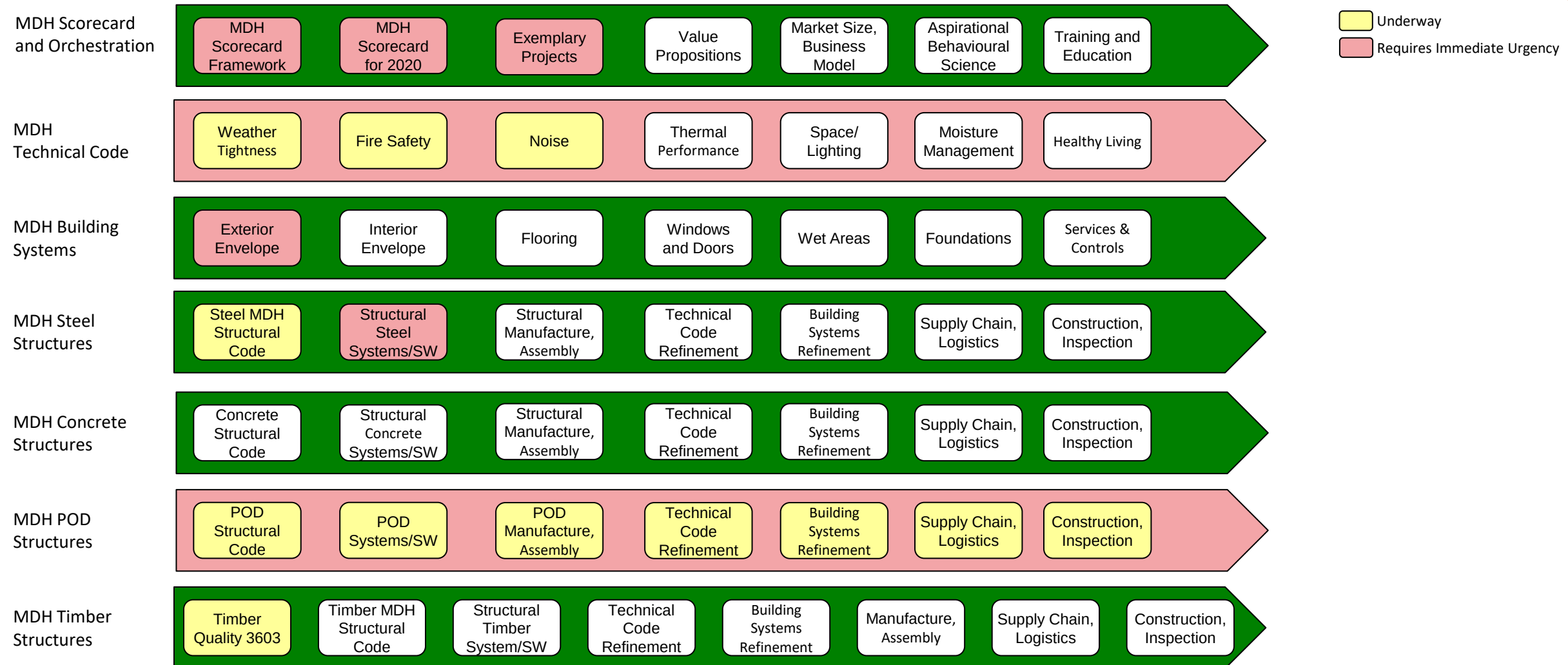
Concrete Structures



Pod/Modular Construction



MDH Work Streams Should be Organised



We Also Need to Start with Exploration of Critical Problems Across the Chain

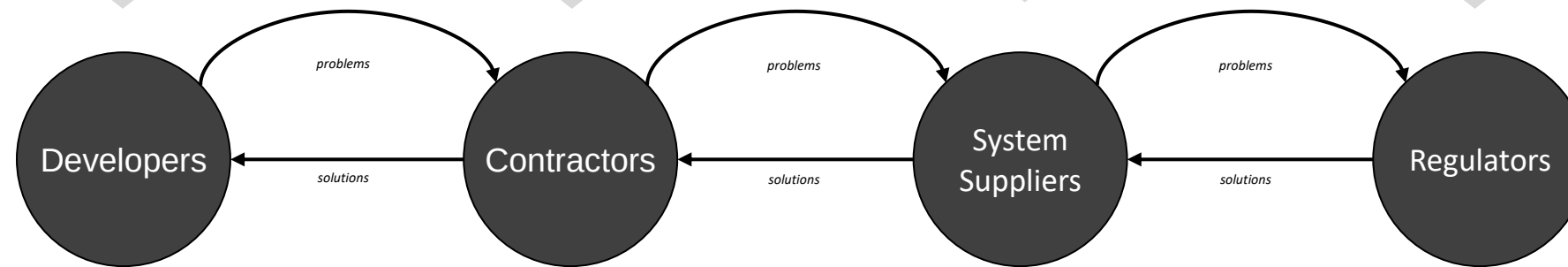
Exploration questions ...

- What MDH buildings are you seeking to offer to match market needs affordably?
- What is preventing you from providing these now?
- Do you require new types of buildings and construction?
- What would you like to see emerge from industry and regulators to allow you to offer these dwellings at a profit?

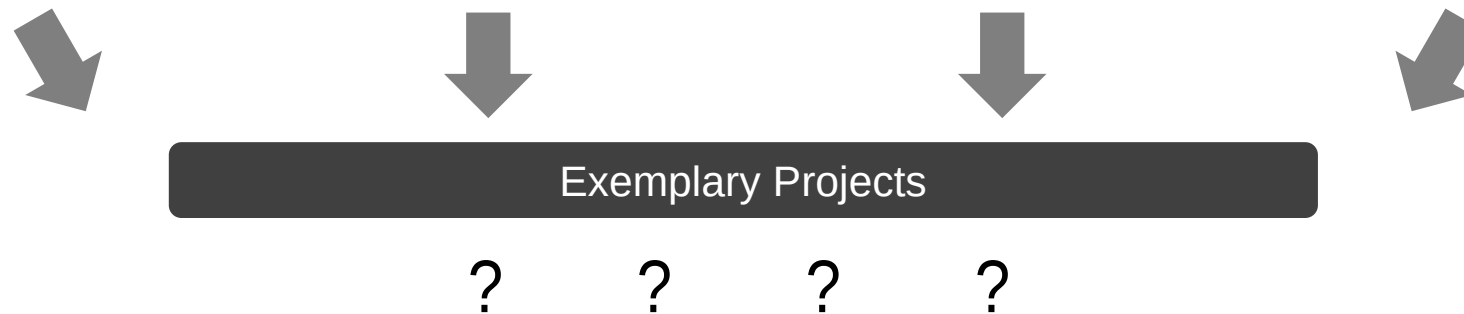
- What are the problems with constructing for MDH?
- If new types of buildings are required, what are the industry gaps or problems with constructing these?
- Are you aware of different approaches - perhaps found overseas?
- What would it take for you to invest in new capability?

- How do MDH dwellings need to perform? What are occupiers main aspirations and core needs?
- How should building systems be designed, manufactured and installed to achieve these needs?
- What change or complexity does this create for constructors?
- What is needed from codes or standards that would help?

- What are the likely dwellings that industry will see to offer? How do MDH dwellings need to perform?
- What are the most likely designs and materials that industry will use to provide MDH?
- What are the building failure risks that need to be mitigated with codes/standards?
- How do we resource to fast track the creation of codes/standards?



What specific projects do you have in concept that we can begin learning from right now ?



Summary

- Understood?
- Easy?
- Desirable?
- Rewarding?
- Mainstream?



Medium Density Consenting

Verney Ryan, Beacon Pathway

Research Context

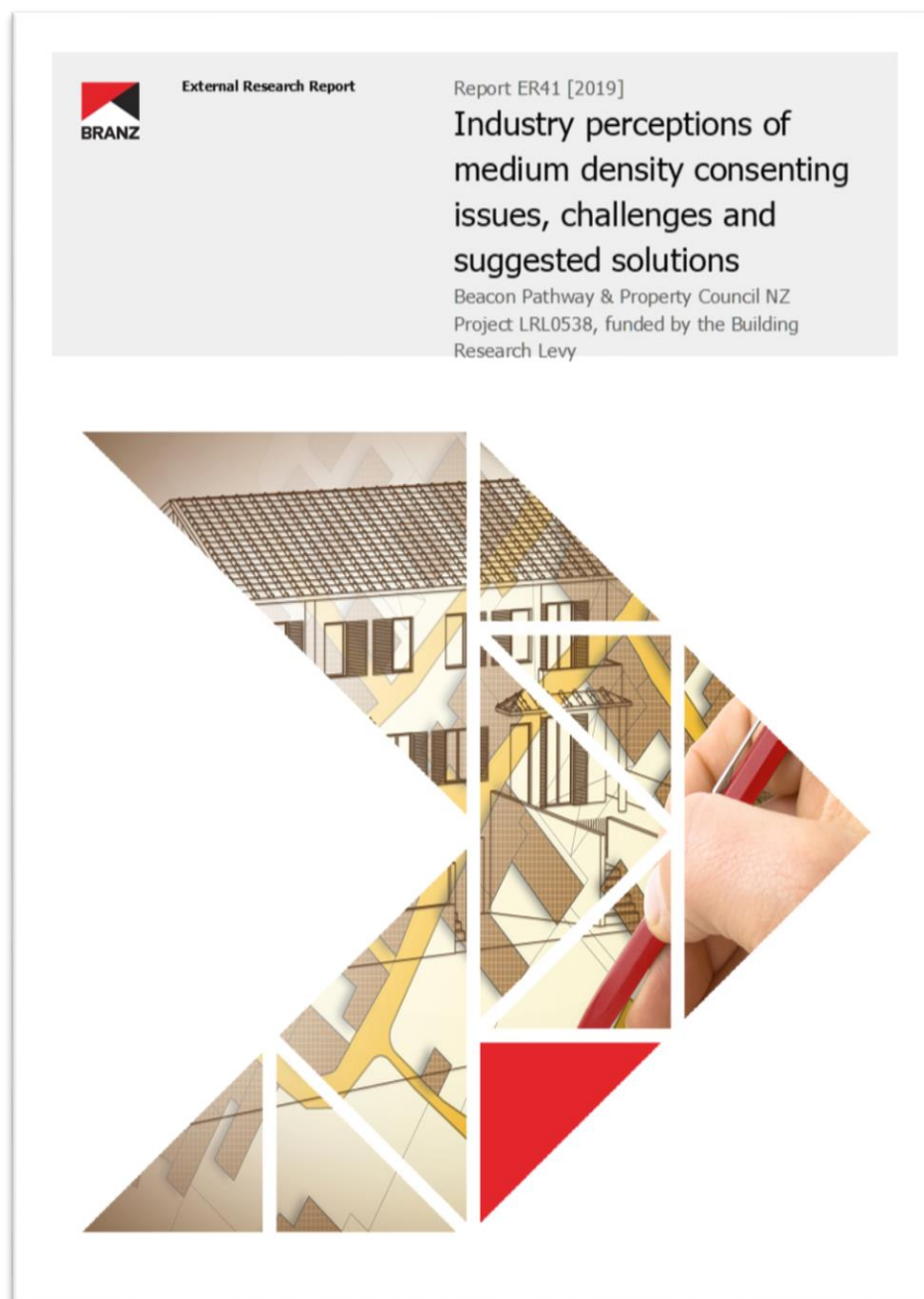
- Focus in media
- BRANZ Levy question:

"What are the specific challenges with the resource and building consent process for medium-density?"

What process issues are emerging, and what behavioural problems are occurring?"



Who



Methodology

1. Desktop media review
2. Foundation phase - Targeted stakeholder interviews (6)
3. Qualitative in-depth interview phase (15)
4. Wider online industry survey ($n = 279$)
5. Analysis and results



Accentuate the Positive

- Mid point shift from negative 'problems' focus to more positive 'solutions' focus
- Interviews and stakeholder discussions raised many innovative and creative solutions
- Social dynamic at play - empathy for the 'other' side
- Recognition that the task at hand was far from easy



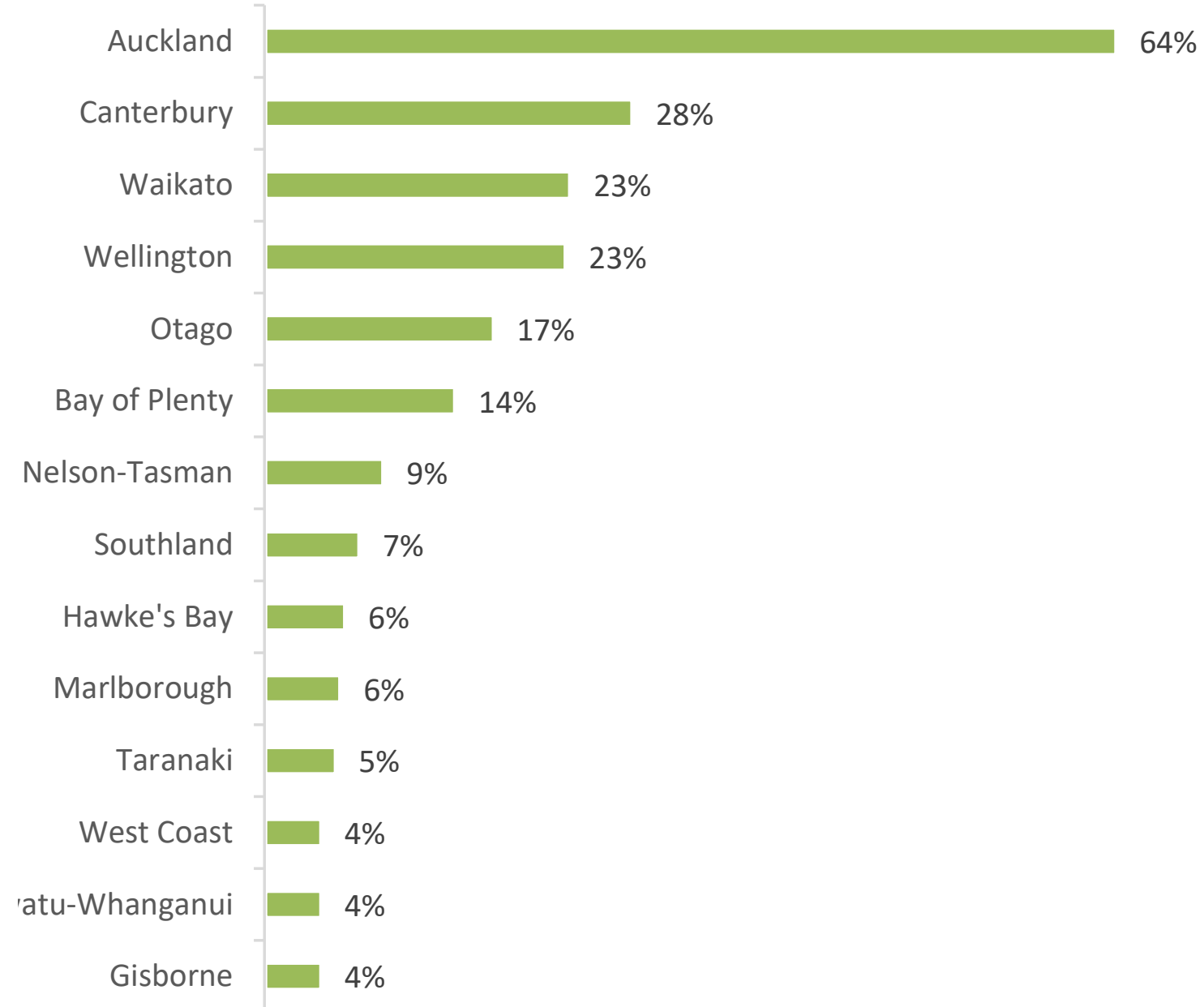
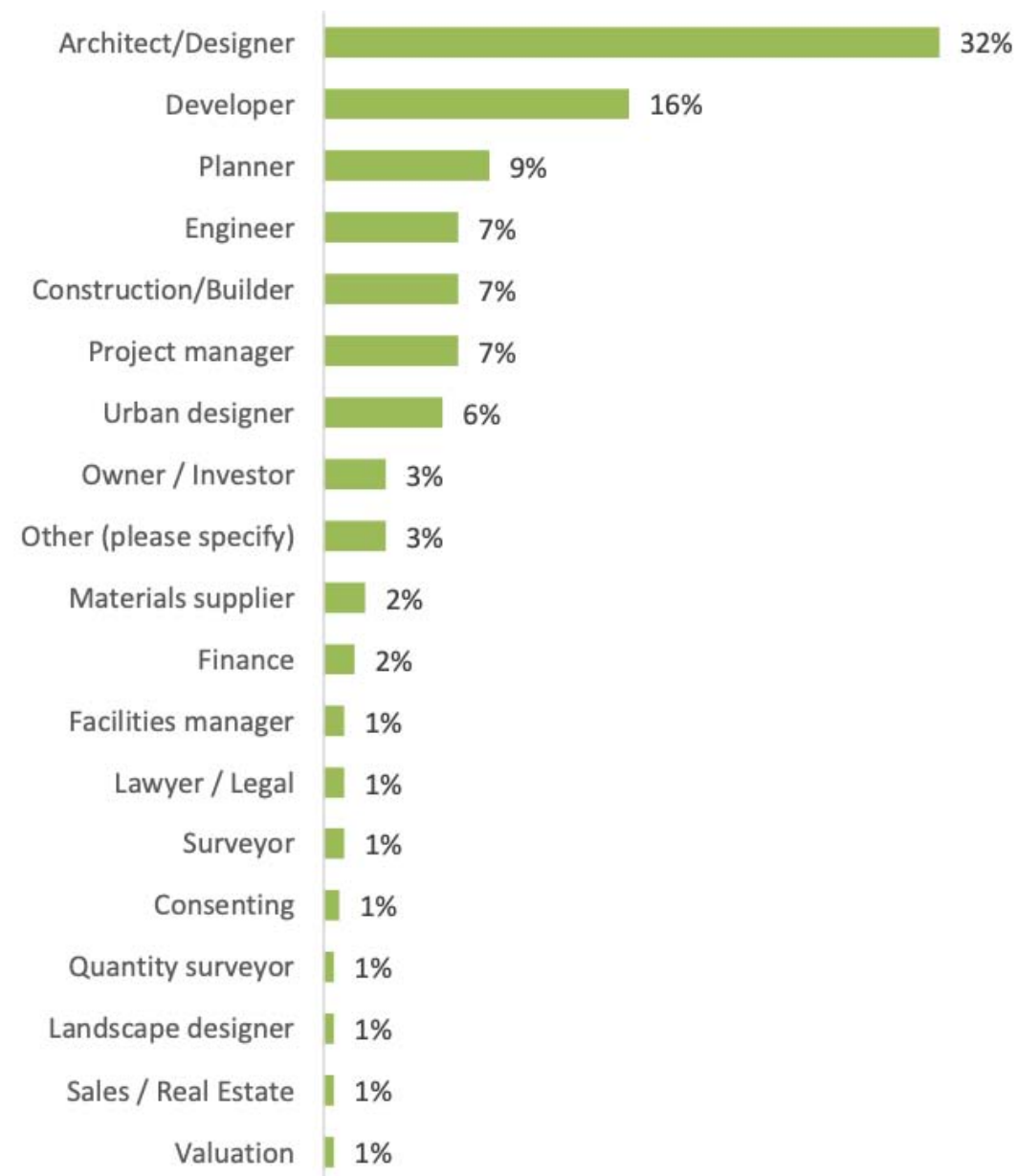
Thematic Issues

- Process issues
- Technical issues
- Information issues
- People and relationships
- Capability, skills and knowledge



Online Survey Results - overview

- 279 participants from 181 organisations



Online Survey Results - overview

- Good levels of experience represented – close to half had involvement in 10 or more projects

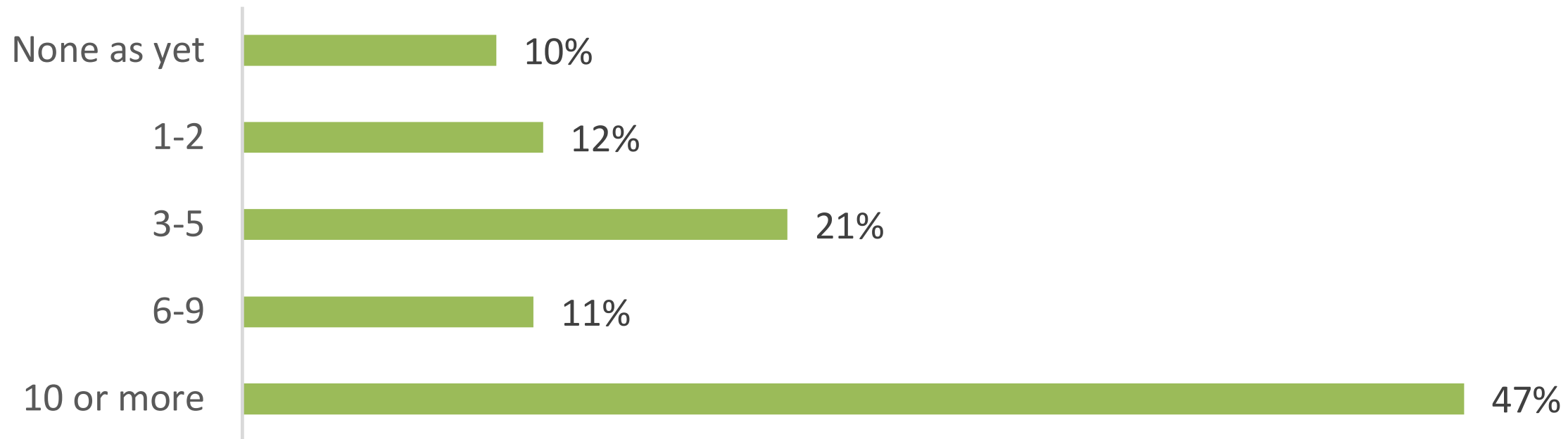


Figure 3: Number of MDH projects respondents were involved in

Online Survey Results – issues of complexity

Aspects causing significant issues during design or consenting

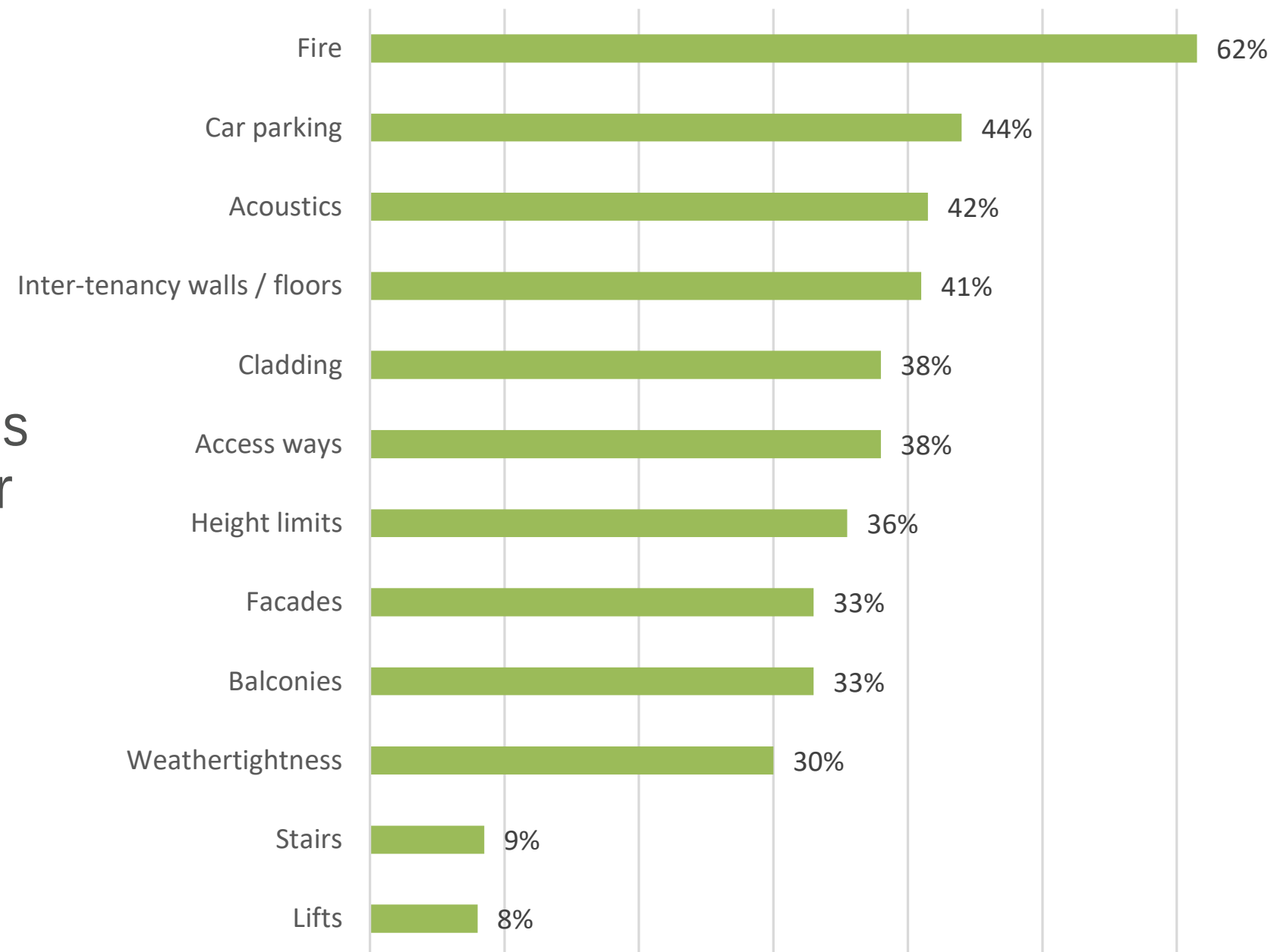
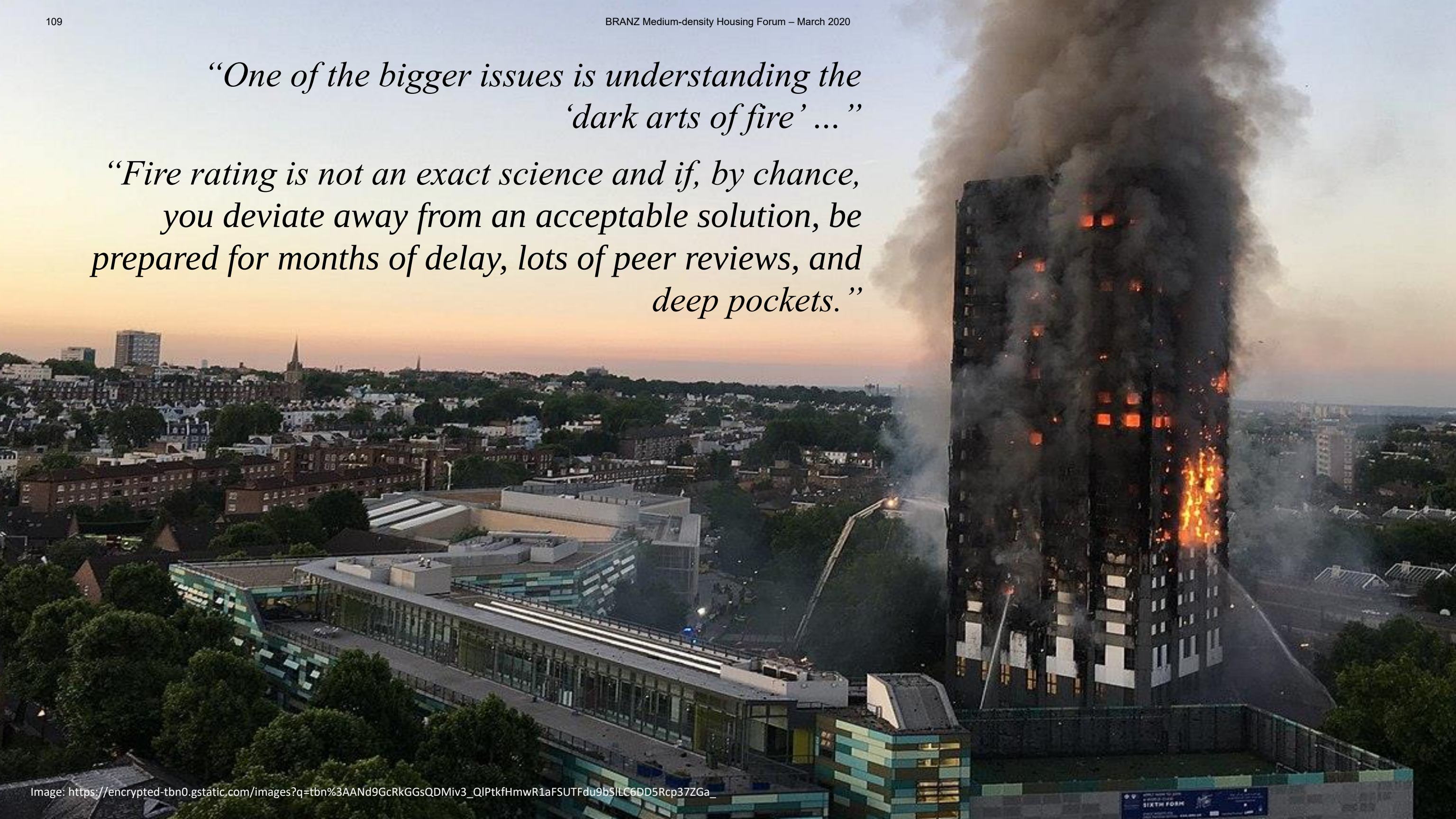


Figure 10: Building Code and design features presenting complex issues for MDH

*“One of the bigger issues is understanding the
‘dark arts of fire’ ...”*

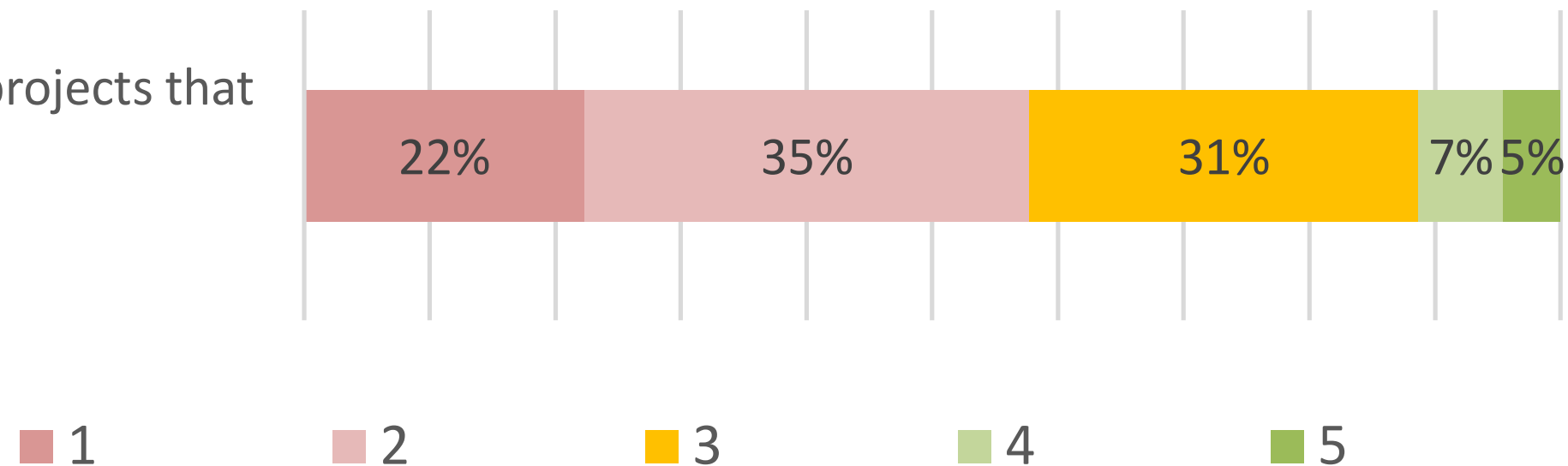
*“Fire rating is not an exact science and if, by chance,
you deviate away from an acceptable solution, be
prepared for months of delay, lots of peer reviews, and
deep pockets.”*



Results – Requests for Further Information (RFIs)

- Big issue amongst respondents...
- Time and cost... as well as psychological barriers

How have RFIs impacted the delivery of MDH projects that you have worked on?
N=220 / Av 2.36



1 is 'Very negative impact' and 5 is 'Very positive impact'

Solutions – guidance and support

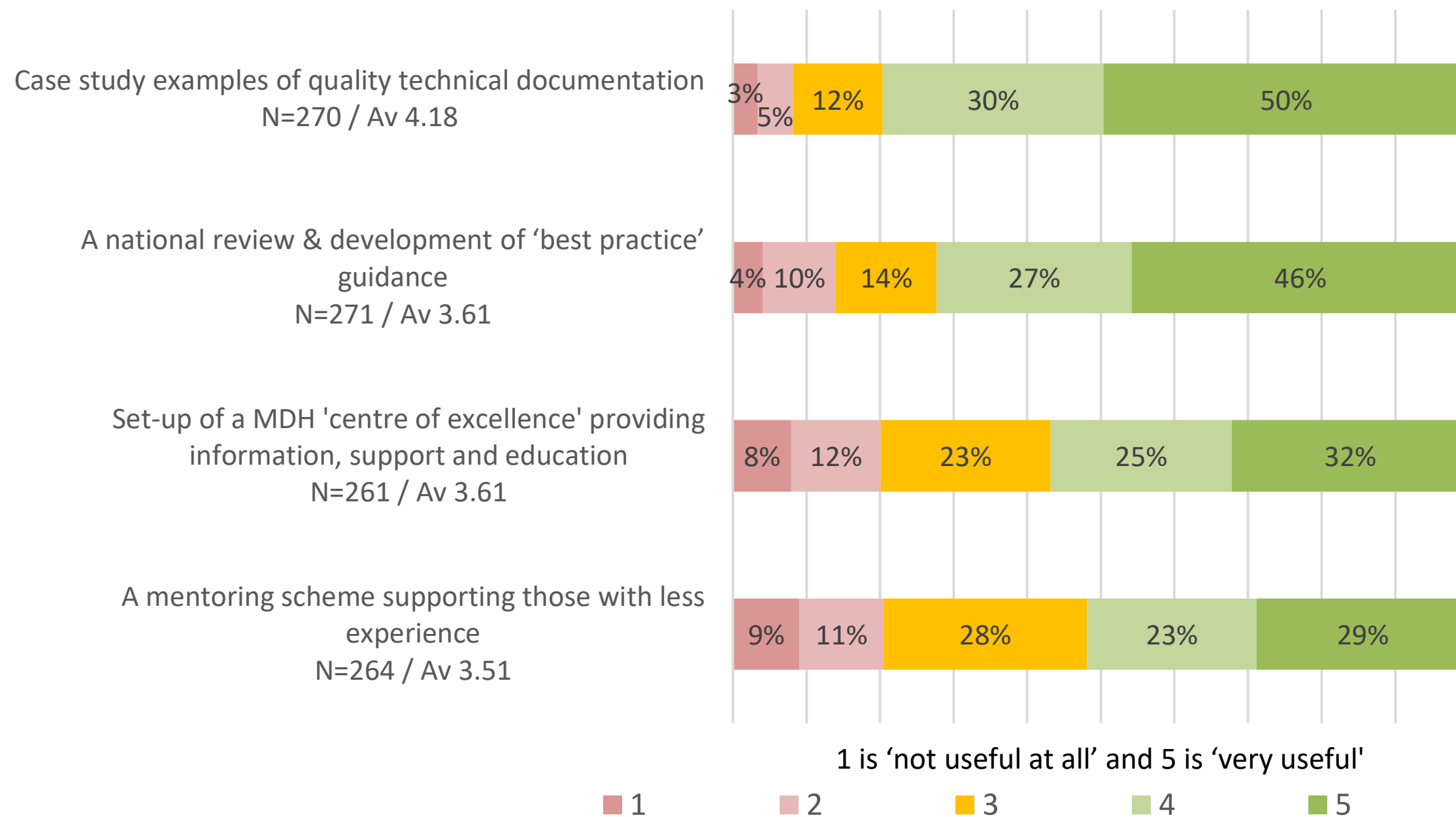


Figure 5: Usefulness of ideas to improve guidance and support

Impacts of attempting alternative solutions

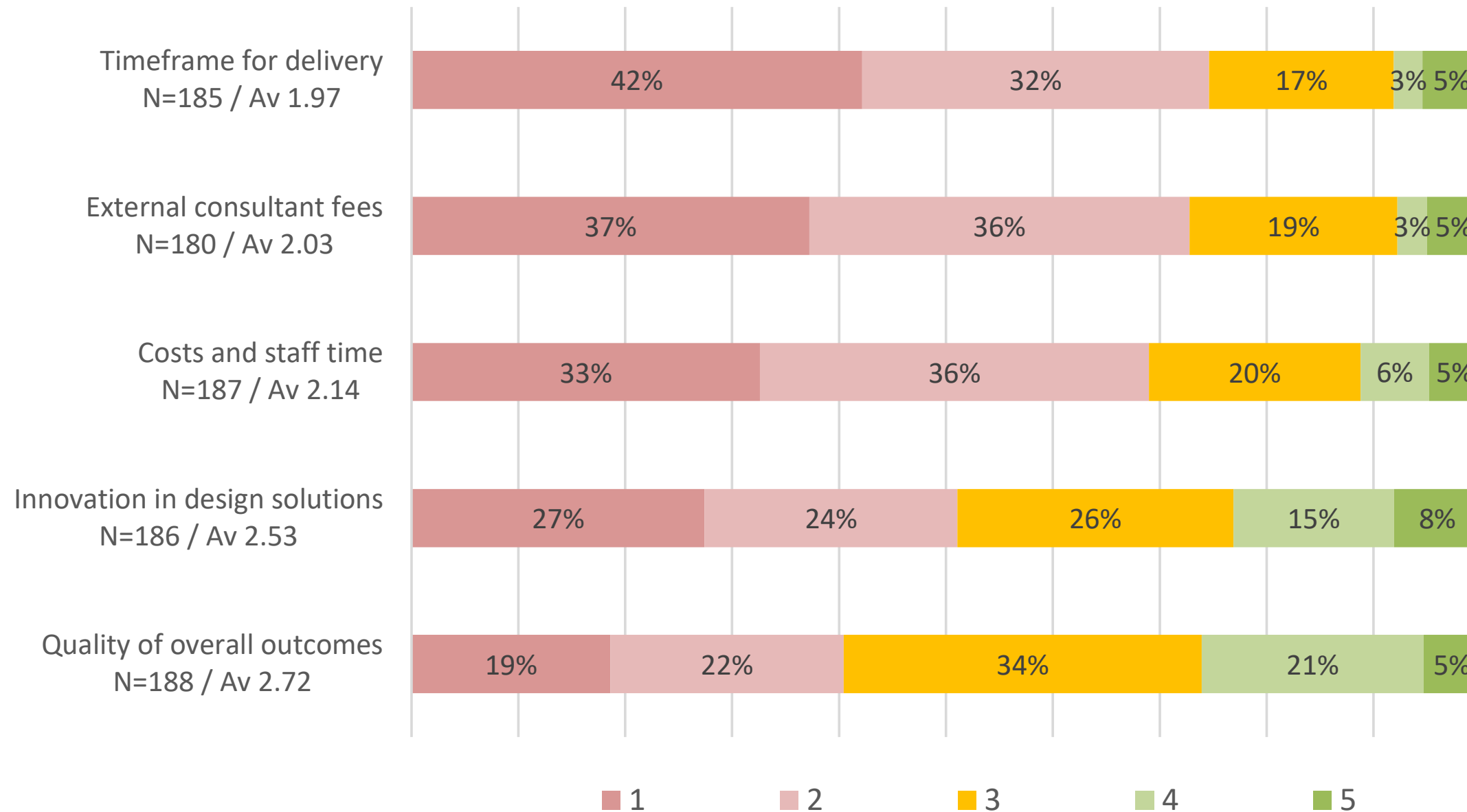


Figure 8: Impacts of process of gaining compliance for alternative solutions

Improving alternative solution compliance

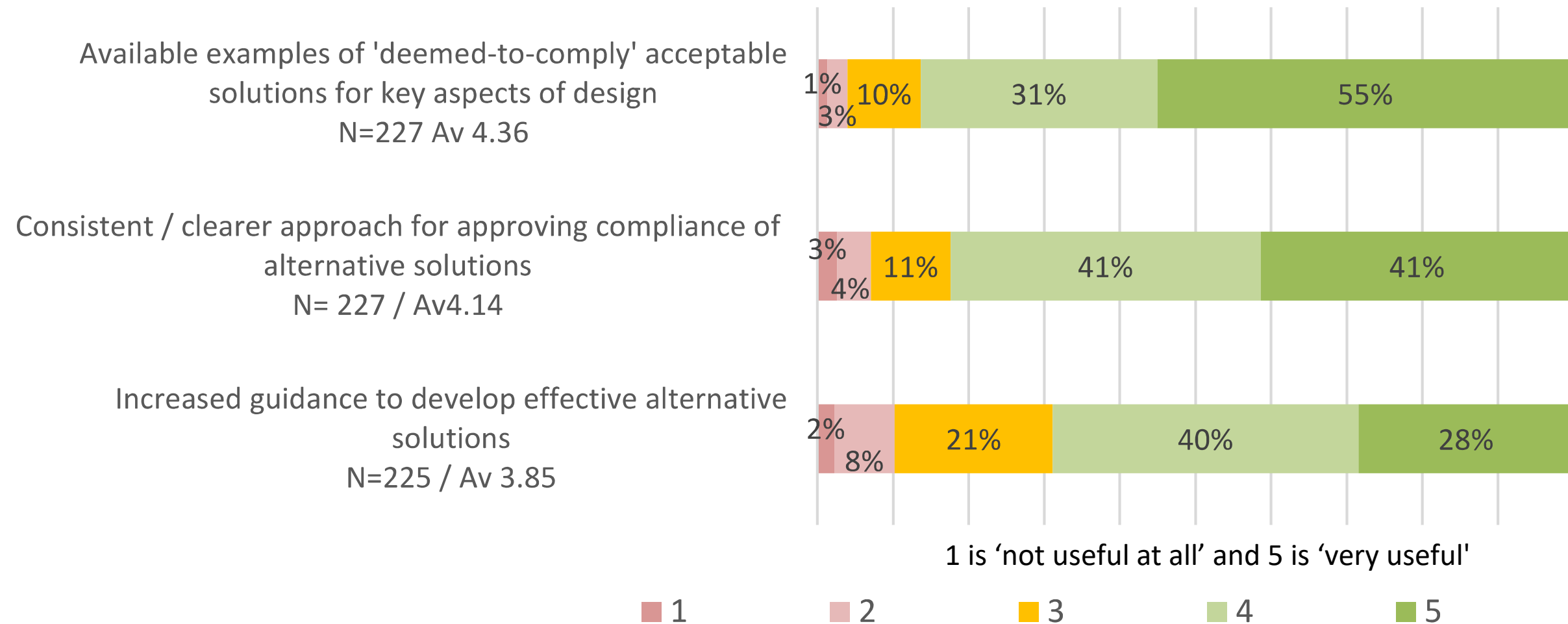


Figure 9: Effectiveness of measures to improve compliance for alternative solutions

Online Survey Results – products and systems

How easy has it been for new products or materials to gain approval?
N=140 / Av 1.98

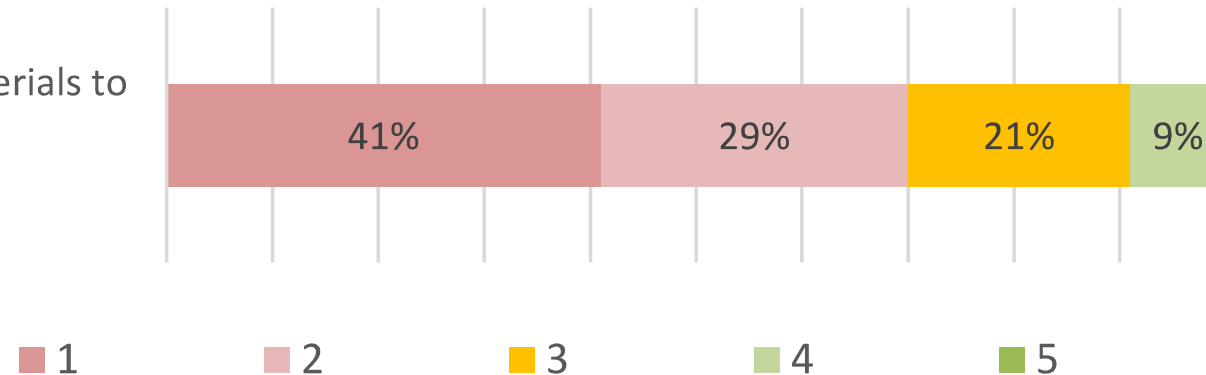


Figure 12: Issues with newly developed or new to New Zealand products

- Many avoid new & potentially better products, unless they feel the developers of medium density are not concerned with time delays
- New products often result in increased paper work, time delays and frustrations
- There is a lack of choice amongst existing product suppliers - there is a need to allow other /overseas products to access a fairly priced testing and approval process
- There are problems with low quality or marginal products expecting to be approved
- There are specific buildability issues arising – e.g. recessed windows

Product and system solutions

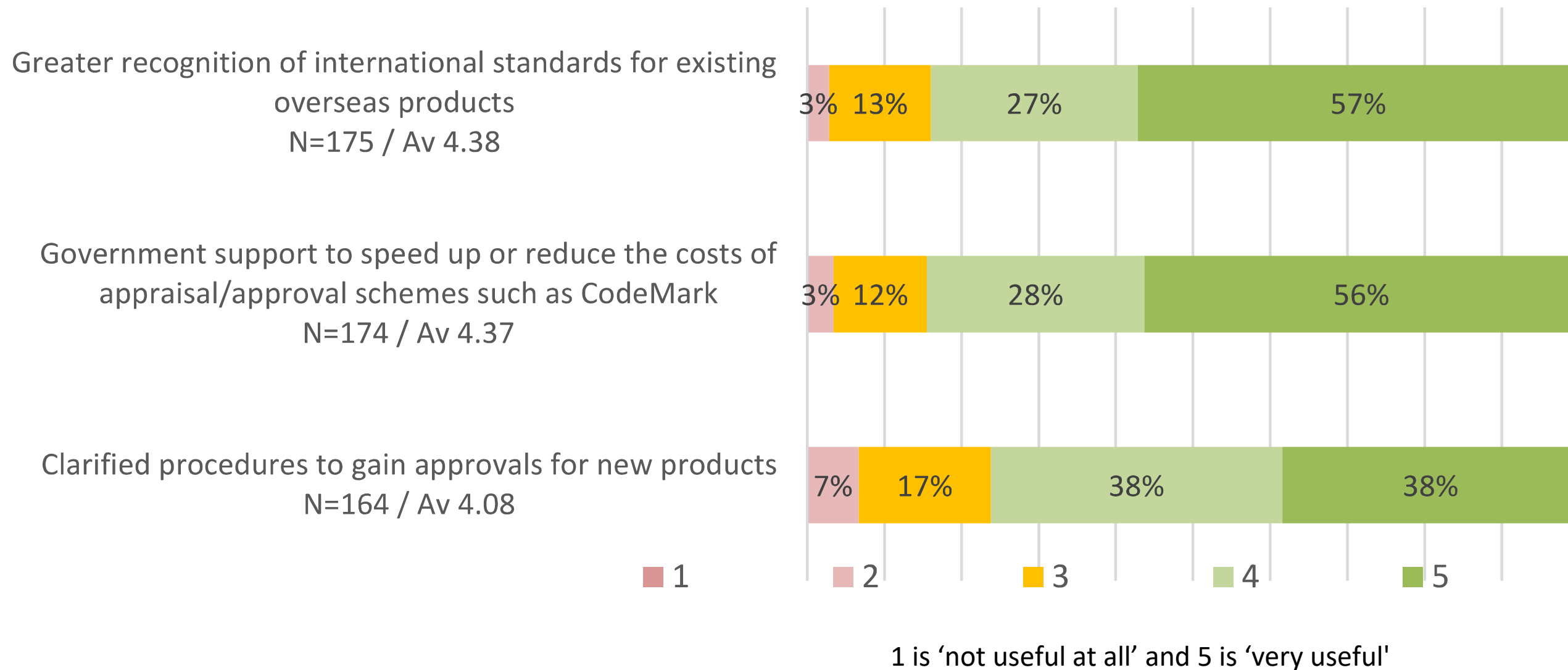


Figure 13: Usefulness of solutions to new product issues

Relationships and the social dynamic

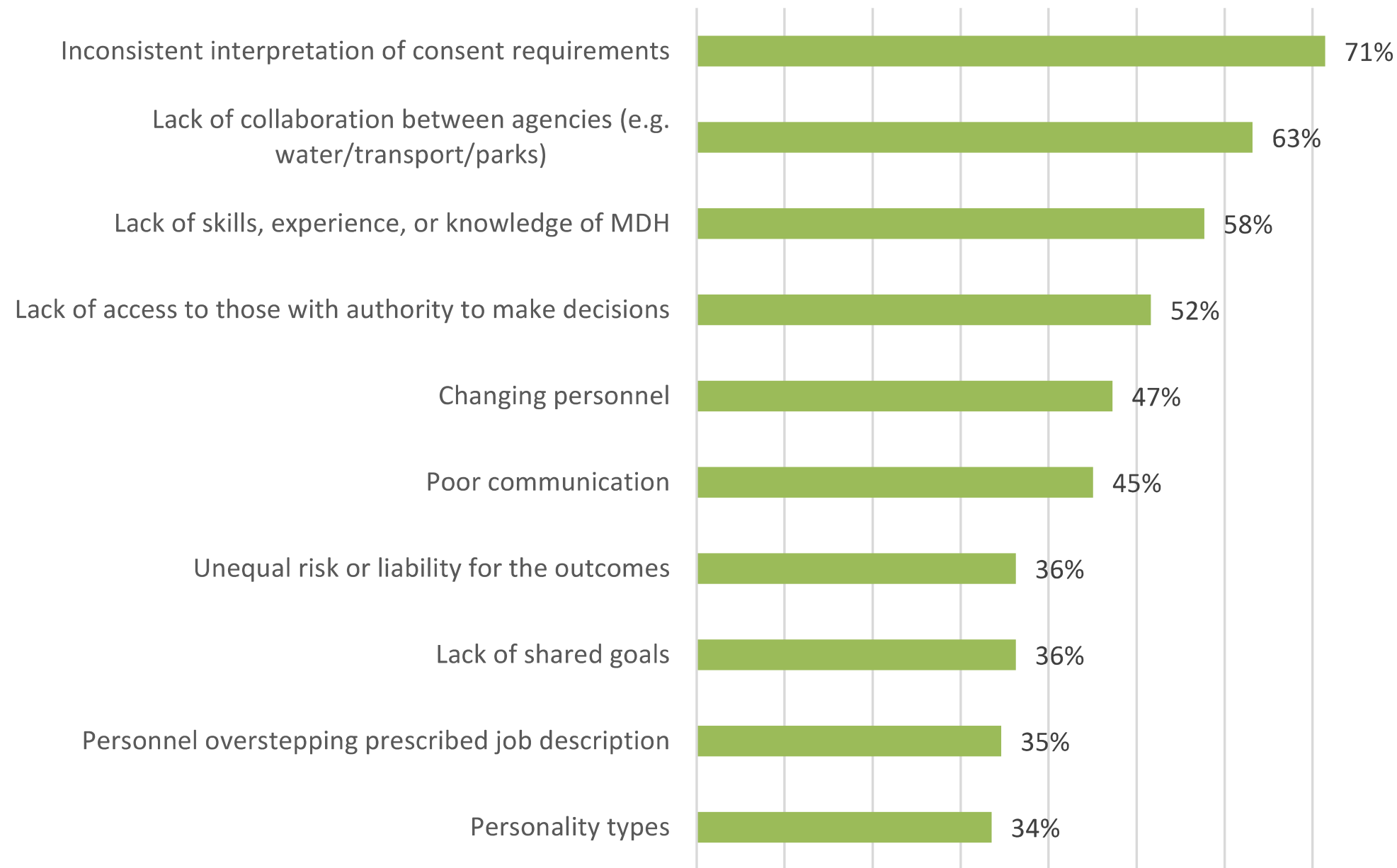


Figure 15: Causes of relationship impacts on MDH consenting

Relationships – potential solutions

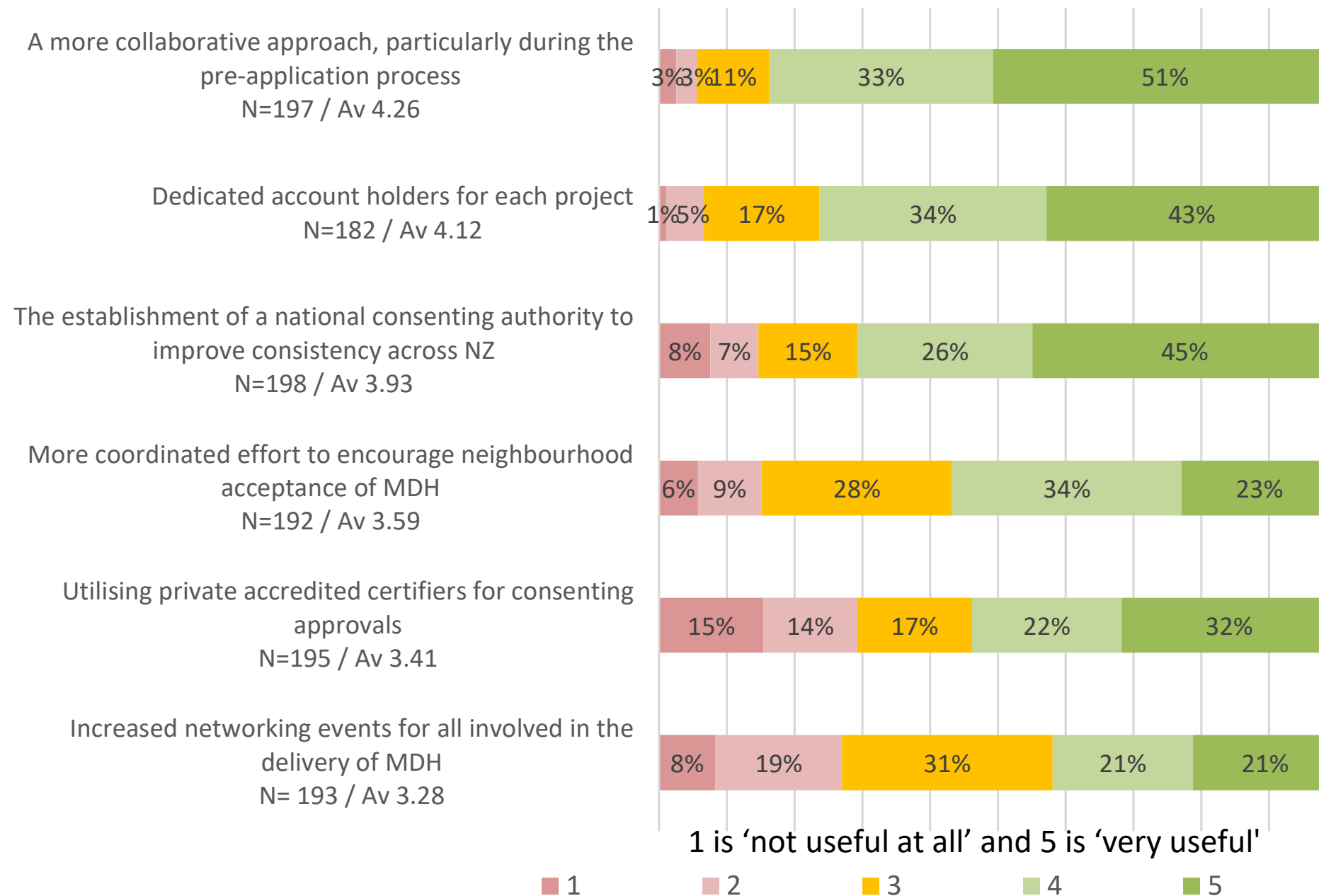


Figure 16: Effectiveness of possible solutions to relationship impacts on MDH consenting

Costs of consenting

- Q. Based on your experience, please estimate the average cost of the consenting processes as a proportion of the total cost of a MDH development.
- N=204

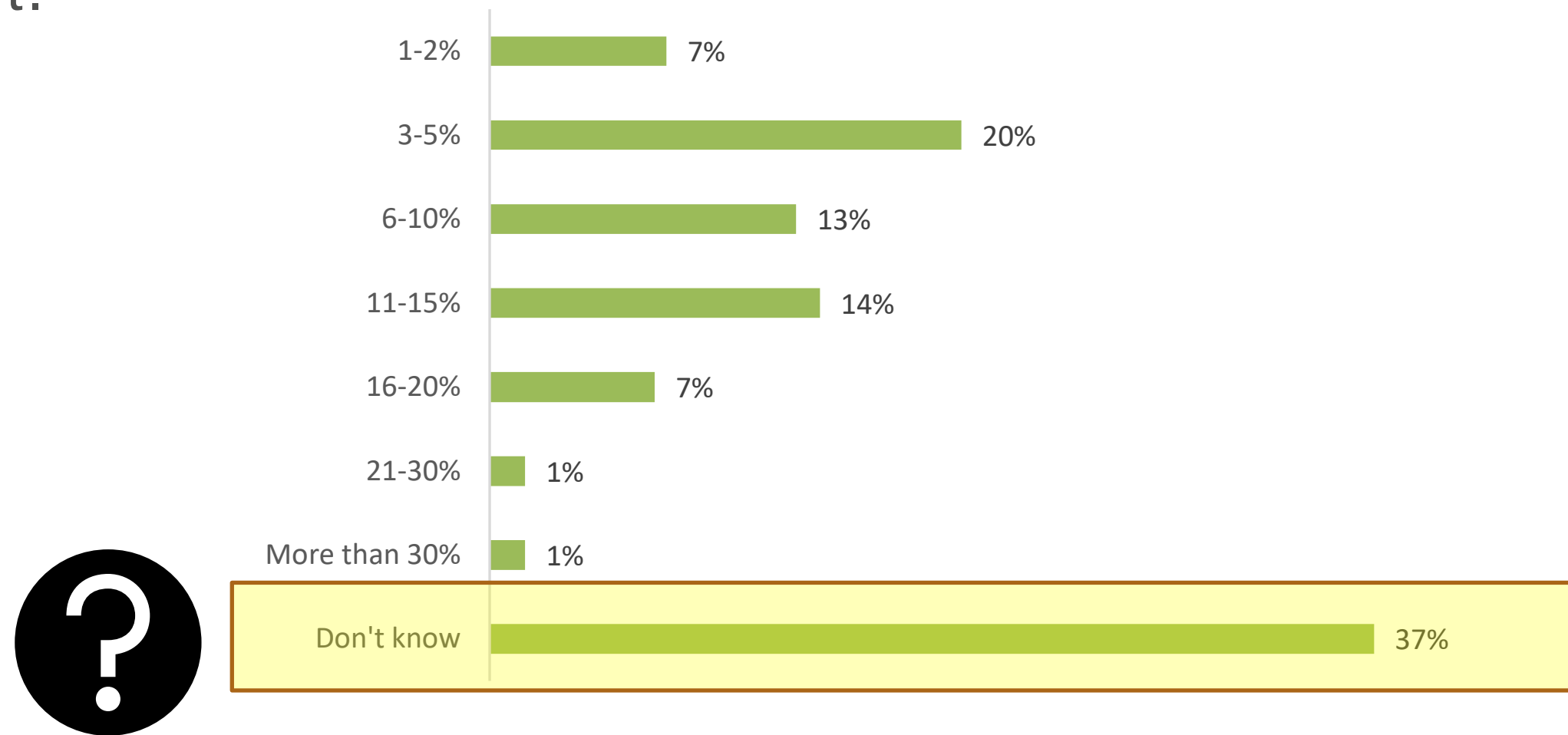


Figure 17: Consenting costs as an estimated proportion of total development cost

Online Survey Results - overview

Table 2: Heat map table showing significance of various issues

	Extent of support or guidance N=246	Technical quality of submitted documentation N=226	Time taken at this stage N=403	The costs associated at this stage N=312	The skills / knowledge required to complete this stage N=371
Pre-application planning N=169	60%	22%	34%	22%	43%
Consent preparation N=162	25%	44%	33%	40%	43%
Consent submission N=157	22%	31%	43%	43%	41%
Requests for further information N=181	26%	26%	67%	51%	51%
Consent signoff N=160	14%	14%	64%	32%	44%

Conclusions – emerging themes

- Significant issues = extended time frames and increased costs
- Desire for solutions
- 4 Key Themes
 - Need for consistency – interpreting rules, nationally, across council staff, within application process
 - Clearer guidance and support specific to medium density – best practice exemplars, acceptable solutions
 - Upskilling required – industry and council (design, compliance, construction, documentation, innovation, technical areas)
 - Collaborative approaches and need for good relationships – built on trust and consistency



Solutions



<https://www.christies.com/lotfinder/Lot/a-north-european-vampire-slaying-kit-20th-6070113-details.aspx>

Conclusions – solutions

- Guidance: expand and improve online consenting, MDH design guides, case study exemplars, MDH centre of excellence / mentoring
- **RFI's**: Increased resourcing, better electronic communication, single point of contact in council, collaborative approach
- Acceptable and alternative solutions: Examples of deemed to comply acceptable solutions for MDH, clear and consistent guidance



Conclusions – solutions

- Building Code: Engage industry in code revisions (more), regular timeline for code review, explore risk and liability issues
- New products: Recognise international standards, clarified procedures for gaining approval, central government support
- People and relationships: more collaborative approach at pre-application stage, acknowledge social dimension - invest in trust and build relationships



Next Steps

- Maintain engagement – national workshops
- Inter-agency cross industry review panel focussing on MDH delivery
- Develop key working groups
 - Pre-application support and guidance
 - Building Code review (MDH focus)
 - Build library of case studies
 - Review new products and systems
 - Provide exemplars of technical documentation



Next Steps

- Consider feasibility of:
 - Using private accredited certifiers for consenting approvals
 - Establishing a national consenting authority
 - Creating a centre of excellence for MDH
 - Reviewing risk and liability across the sector
 - Developing a mentoring scheme for medium density housing (design, consenting and construction)
- **Join us for the workshop session...**
Identify who should be doing what





How do regulatory planning processes influence the production of housing in New Zealand?



Morten Gjerde

Victoria University of Wellington, New Zealand

New Zealand's housing crisis

- Shortfall in housing to meet current and projected needs
 - Affordability and design to meet contemporary needs as key issues
 - Simply put, insufficient production in the right areas
- Strong interest in medium density housing to address future needs
 - In conjunction with other smart growth initiatives
- Intensification around existing centres
 - Leverage existing infrastructures
 - Higher densities needed to address cost of land
- However, development defaults significantly to low density, suburban typologies
 - Land availability
 - Known quantity

Research question and methods

What are the specific challenges with resource consent processes for medium density housing?

1. Review district plan objectives, policies and rules
 - Understand the local framework for developing and consenting medium density housing
2. Analyse resource consent processing
 - Project size and typology, timeframes, cost, days on hold
3. Interview project participants
 - Identify projects of interest
 - Meet with designer, developer and processing planner

Case study approach

	Auckland	Wellington	Christch	Palmersn North	Hastings
Developer	2	3	2	-	1
Architect /designer	3	1	2	-	1
Council planner	2	2	2	2	1
Total interviews	7	6	6	2	3

Working with five territorial authorities or councils

- Auckland
- Christchurch
- Wellington
- Palmerston North
- Hastings

Information sourced from councils and from Ministry for the Environment

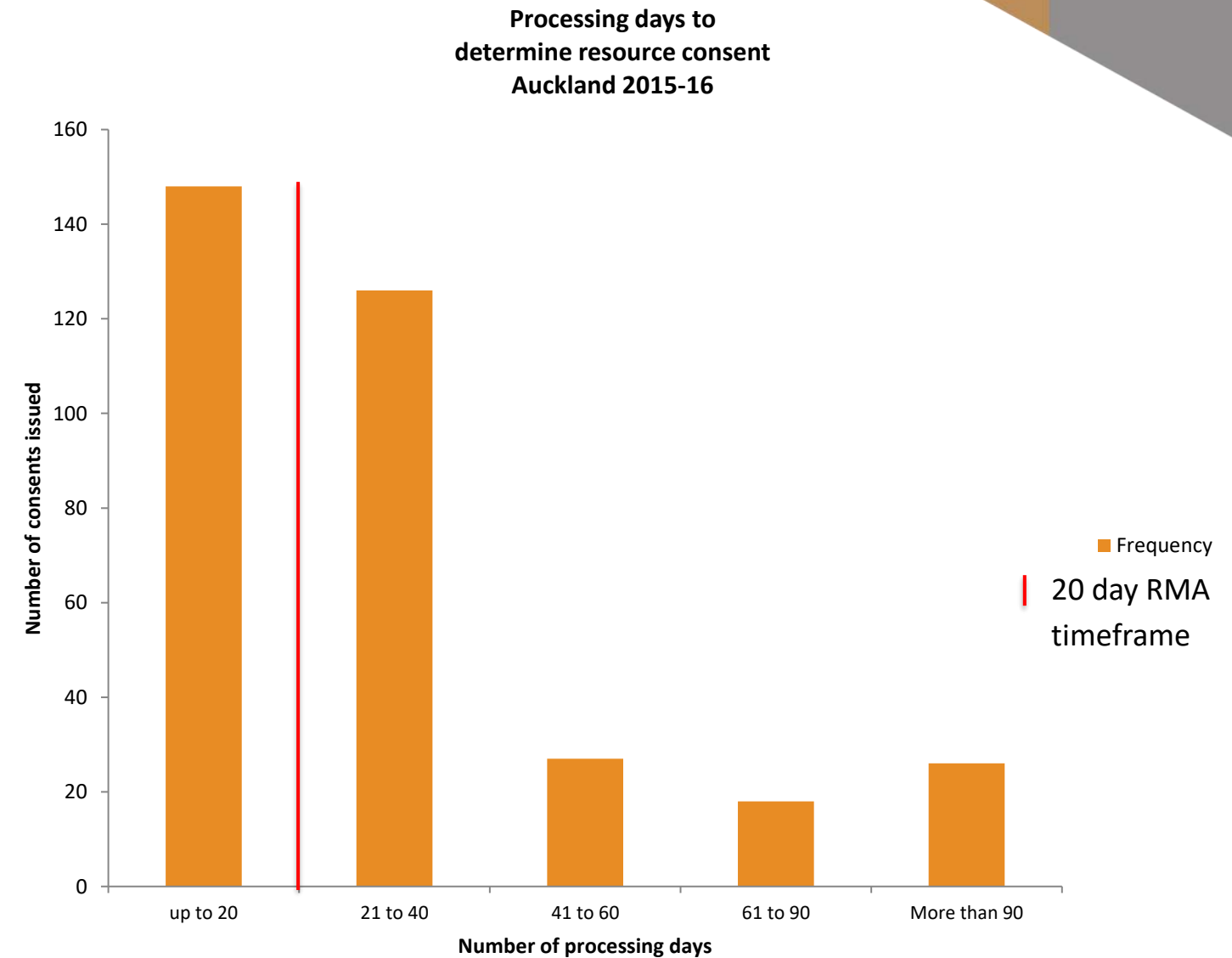
Some things are working well



- Focus on improving quality of outcomes
- Process brings experts together
- Potential to be flexible written into the legislation and process
- Direct cost of planning approval not prohibitive

Processing timeframes

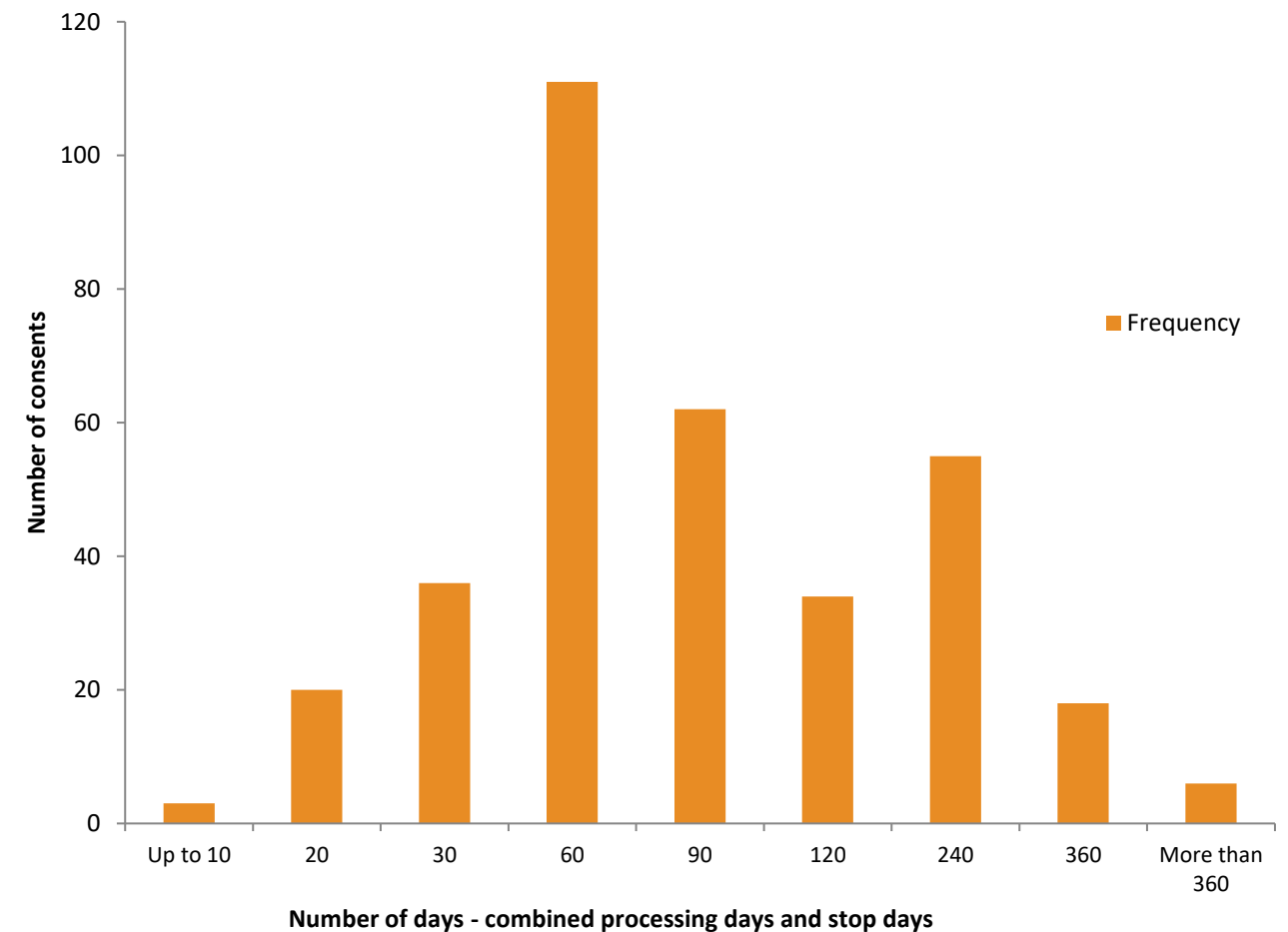
- The three largest councils struggled to meet statutory requirement to determine application within 20 working days
- Timeframes can be extended with 'special circumstances'



Processing timeframes

- Real timeframes extended by being placed on hold
- Auckland
 - 70% of applications for MDH placed on hold
 - 90 business days (18 weeks) needed to obtain resource consent

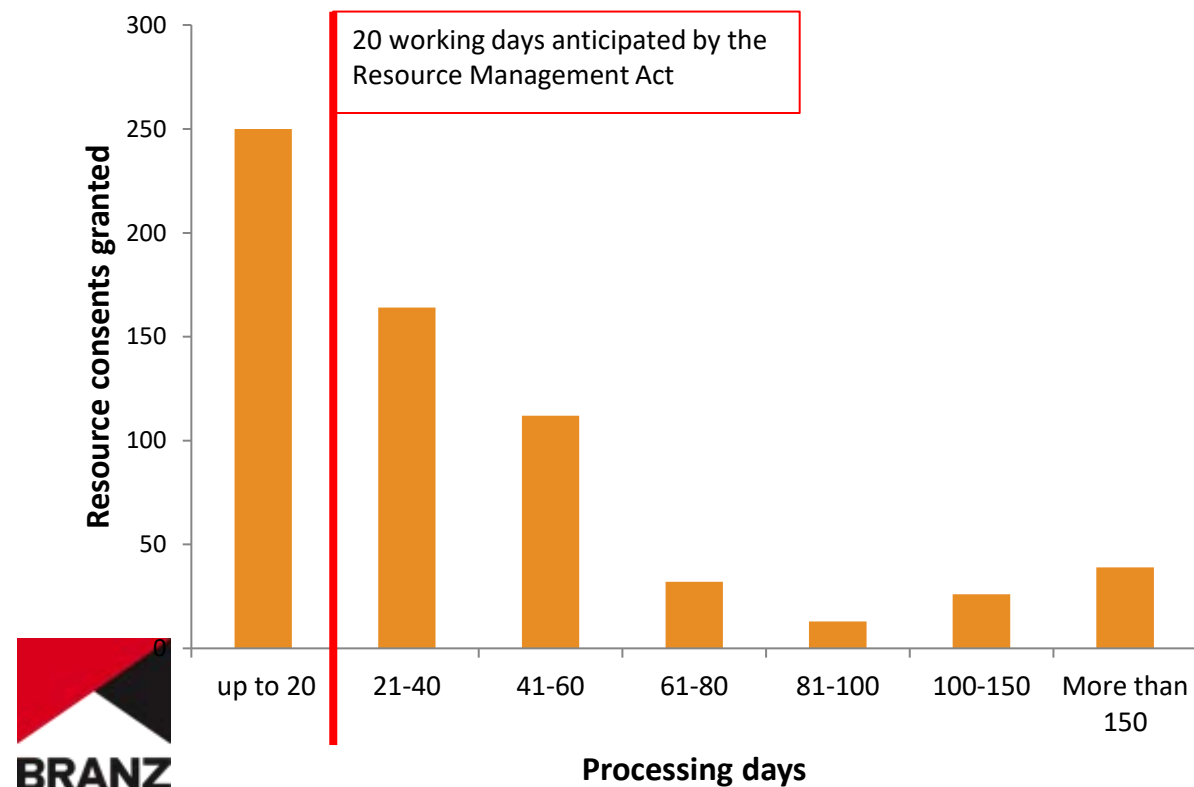
Combined processing days and stop days
for resource consent to be granted
Auckland 2015-16



Processing timeframes

- Timeframes well outside those set down in the legislation
- Developers must be capable of carrying costs through period of uncertainty

Obtaining resource consent for MDH projects



	Auckland	Wellington	Christchurch	Palmerston North	Hastings
MDH consents granted	383	37	143	5	2
Statutory days* (including S37 days)	37	22	55	20	18
Total days* – statutory days plus days on hold	90	77	104	64	28
Cost* (Council fee)	\$23,715	\$5,902	\$3,749	\$5,000	\$1,360

Prescriptive nature of development rules

- Prescription general in nature and designed to lift outcomes at bottom
- Not responsive to particular circumstances
- Planners default to rules
 - Inexperience
 - Risk management



Subjectivity & variability in assessment

- Assessment that pushes personal agendas
- Lack of experience or confidence on part of assessor
- Changes in personnel
- Inability to address subjectivity through training



Discussion

- While district plans may seek to promote higher density dwelling typologies, the RMA naturally favours low density development
- Developers seek to avoid risk
 - Tenacity and resources required to pursue higher densities
 - Processing timeframes create uncertainty and increase cost of development
- Lack of leadership at national level is problematic
- District plans could be written to expect medium density housing development



Conclusions



- Medium density housing in the right areas can help New Zealand address current crisis
- Planning approval processes present challenges to those wishing to build MDH
- Specific issues include:
 - Long timeframes needed to obtain planning approval
 - Variability in expert opinions and assessments
 - Prescriptive rules limit potential of some developments
- Leadership is needed at national level
- Data is not complete or comprehensive