Annex A – Questions for Fire Engineers and other Stakeholders

The following text was sent to fire engineers in advance of meetings to stimulate thinking, discussion and feedback regarding their perceptions of the fire regulatory system in New Zealand.

Professor Brian Meacham from Worcester Polytechnic Institute (WPI) in the USA is spending one year on sabbatical, during which he is exploring the situation with performance-based codes and fire safety engineering in several countries which have implemented a performance-based building regulatory system. New Zealand is one the countries that he is visiting, along with Australia, Japan, the Netherlands, Scotland, Spain and Sweden. During his time in New Zealand, Brian is spending time with MBIE, looking at various items associated with the building code as a whole, but also focusing around fire-specific aspects of the code, compliance documents and verification methods. As part of his sabbatical research, and to help him understand better the situation with respect to fire safety engineering within the New Zealand building regulatory context for his work with MBIE, Brian is seeking input from the fire engineering community in New Zealand. The primary purpose of this meeting is to obtain your views on a wide range of topics, including:

1. What is your general sense of the state of fire engineering in New Zealand?
2. What is working well?
3. What is not working so well?
4. What are your views on the current formulation of the Building Code with respect to fire?
5. What are your views on C/VM2 (in general)? Do you think it results in a design, on its own?
6. What are your views on C/VM2 specifically for tall buildings?
7. Do you think C/VM2 should be eliminated: overall, for tall buildings, …? If so, why? Would you replace it? If so, with what? If you would not replace it, why not?
8. How well do you think the FEB process is working?
9. How well do you think the peer review approach is working?
10. If you could changes something in the review and approval process, what would it be?
11. Should the fire service have a more significant role in review and approval?
12. Do you think there are enough qualified fire engineers in New Zealand – in all areas (design, review and approval, peer review, enforcement, etc.)?
13. Do you think the professional qualifications / certifications are adequate?
14. Do you think some sort of 'expert' review panel, comprised of members from outside of the New Zealand design community, could be helpful in any way?
15. How would you view a risk-informed performance-based approach to the Building Code for fire?
16. How would you view a risk-informed performance-based approach to fire engineering?
17. Any other thoughts, issues, benefits, concerns, enhancements, etc. related to the Building Code or fire engineering within the building regulatory system that you would like to share.

The meeting is intended to be an informal discussion. No formal presentation is planned. Brian will open with a brief overview of his work, and then ask for feedback on the above topics. In addition to obtaining input from you, Brian is happy to answer questions you might have about his research, his experience with / knowledge of performance-based codes and fire safety design in other countries, or related topics. If you cannot attend the meeting in person, feedback on the above topics can be emailed to Brian at bmeacham@wpi.edu.

Annex B – Discussions with Fire Engineers in Auckland (One-on-One)

Persons interviewed: s 9(2)(a)

Disclaimer: These summary points reflect my interpretation of comments received during discussions on 9 February 2016. I have not confirmed my interpretations with any of the individuals involved.

Observations: There seems to be a significant concern with qualifications and competency of fire engineers. There seems to be significant concern that peer-reviewers and designers are too close. There is some concern that the C/VM2 is lacking for tall buildings, and in other areas, but can work well if used by competent persons. Some issues with tall building in Auckland may be due to Auckland City Council not being able to require FEBs or particular content. Centralized review is desired. More robust interpretation systems are desired. Changes would be welcome, but there remains some distrust of MBIE based on 2014 changes.

What is your general sense of the state of fire engineering in New Zealand?

- Not great.
- Comfortable working with quantitative methods. Comfortable in trusting outcome if methods, criteria ok. Not the same for many. Old system, could modify AS with qualitative adjustment, sometimes simple, but sometimes significant (e.g. tall building and single stair). Often judgment on what 'felt' ok. People used to old approach not comfortable with C/VM – not sure what it is meant to do.
- Bit of mixed bag. Different people applying different approaches. All of the compliance documents, including VM, has inconsistencies and gaps, which can result in competing outcomes.
- Not in a very good place. Framework (VM) is capable of helping designs for normal buildings, but not normal buildings. More complex, vertical buildings. Lot of errors. Not good quantitative analysis. Acceptable solutions – too narrowly focused. Large portion of sector in the area – out of scope – go to VM2.
- Evacuation consultants in the past – worked with compliance document. No worries. Now larger portion of FE community – not qualified.
- How did we get to such a large number of unqualified people?

What is working well?

- Key thing is that VM takes away the unproductive debate about input values, which shouldn't be the focus of the design. Focus more on design and important issues.

What is not working?

<u>Qualifications / Competency</u>

- Qualifications is a big issue – wide range – how address
- Issue is competency – not qualifications

- Current system not really working – cutting out some people not on the list due to not having the right paper – some on the list who should be kicked off
- Problem is that industry not meeting the bar – instead of raising bar – MBIE (DBH) lowered requirements
- Should have discussion between regulator and practitioner on qualifications – regulatory does not have anything to say about designer (least controlled)
- For 'old guard', used to qualitative approach, quantitative VM uncomfortable
- Some designers lack experience outside of NZ, or no exposure to other input (in large company)
- Behaviors the same as 11 years ago – doesn't matter what code, or VM says, if behaviors stay the same.
- IPENZ has no teeth – will not take action against people – will not take action against members – not what you know, who you know
- Working under expectation that VM2 only being used by qualified and competent engineer, but no requirements for client to employ competent engineer
- Market has too many unqualified people – systematic issue –

Code – CDs - C/VM2

- Some values don't fit well – fire growth rate (very rigid) – still causes some consternation. Some lack of credibility for certain buildings. Better to have some flexibility on input values.
- Some things too prescribed, i.e., material numbers for surface rating, while others too loose, without quantitative measures, need to use qualitative assessment.
- Too fine in some respects – too prescriptive – takes away tailoring solution for certain buildings or building occupants – e.g., disabled
- System not working particularly well. Still questions about showing compliance with travel distance, even if used VM2. Taking tick box approach.
- Burnout methodology in VM is simplified from Eurocode – can do analysis and be outside the realm of reality. Small compartments ok. Large compartments not anticipated in Eurocode.
- Acceptable solutions – too narrowly focused. Large portion of sector in the area – out of scope – go to VM2.
- Some opportunity for feedback after consultation, but not enough. Industry needed more time. Feedback to DBH did not have the evidence of real work problem.

Peer Review

- Peer review process ok, as long as peer review process is clear (expectations, multiple reviews, … - if peer review, then no council) – streamline process.
- Element of distrust of various regulator of peer reviewers. Last year or so (this peer reviewer cannot review…)
- Key issue – some good designers, but real potential for people being too friendly with peer reviewer – playing the system.
- People playing the system by knowing Councils and what they approve: same issue, 30 pages in Christchurch, 2 pages in Nelson - Number of chartered engineers with lack of ethics
- Eroding of system – back-patting of designers and peer reviewers

Review / Approval

- Interpretation of application (by Councils) varies - expect they are entitled to comment on design that comes out the end of the process. Quantification was intended to get an answer that would not be disputed too much.
- VM has not helped streamline discussions between engineers and councils. BCAs want peer reviewers. Lack of resource and/or skill.
- Discouraging because you went to PB approach and BCA asking for prescriptive solution.
- Some alternative designs, but only unusual buildings. Reluctance to move away from VM. Practice is that designer takes more time, and reviewer asks for more. Council pushed people down the VM – less risk for them.
- BCA don't have capacity. Big issue. Needs to be a national discussion – how to get uniformity. Too few people to have such diversity, and unreliable reviews

Guidance / Interpretations

- MBIE speaking to individuals, not industry. Answer question being given – can have conflicting information. Can be used as sole evidence. Just show email to BCA and get that approved.
- MBIE does not have robust system for making formal interpretation. Lack sufficient resources / approach s 9(2)(a) is well-respected – just has too much on s 9(2)(a) plate – perception is that it is difficult to assure consistency)
- More process needed to get interpretation of code and application.
- Can get competing opinions on same issue, based on how problem formulated. Can conflict with past determinations. Need panel. Need process. Risky (binding decision).
- Need more design guides

What are your views on Building Code and C/VM2 (in general)?

- Some things too prescribed, i.e., material numbers for surface rating, while others too loose, without quantitative measures, need to use qualitative assessment.
- Guidance or examples might be helpful – not sure if in the code, VM, commentary, …
- Works pretty well - comfortable with it
- For most buildings, VM outcomes are reasonable. Some types of buildings are a struggle.
- Good engineers do fine. Poor engineers producing flawed buildings.
- Hospitals with 30-40 patients in single compartment, relying on staff, …large buildings little structural FP, … egress into stair directly
- Can design very tall building – over and above VM – but some people won't - 30 minute rating – very unsafe solution
- Not a great deal of problem with code and act – for competent people – even VM2 – problem is lacking competent people.

What are your views on C/VM2 specifically for tall buildings?

- Can design very tall building – over and above VM – but some people won't - 30 minute rating – very unsafe solution

- Engineers pushing the envelop – for example, 55 seconds of smoke in stair – getting accepted
- Missing opportunity between structural engineering (B1) and fire engineering (C), VM2. Historically, when PB code came in 1992, SE was more or less unchanged. However, FE came in to look at fire. SE were not looking at fire before. Since code, SE not necessarily looking. Most SE not looking at structural response to fire. Assume passive protection, application of standard tests, handling issue.
- Fire service access issue – VM2 not enough – focus on structural reliability (FO scenario) doesn't say much other than for warehouses.
- FO pretty light on requirements in general. No access widths, services, etc., Access into building, flow on stair, width for fire service, …
- Structural engineer and fire engineers not always working – no appropriate communication.
- Application of burnout rating – does not know how to interpret. No requirement to ask for additional protection.
- VM – fire resistance – burnout. Burnout methodology in VM is simplified from Eurocode – can do analysis and be outside the realm of reality. Small compartments ok. Large compartments not anticipated in Eurocode.
- Can design very tall building – over and above VM – but some people won't - 30 minute rating – very unsafe solution
- Uncomfortable

Do you think C/VM2 should be eliminated overall, for tall buildings, …?

- Keep it and tweak it, rather than kicking it out
- More commentary - underlying principles – can deviate, but process to follow is…
    - Here is fire load generally applied, but if you have facilities such as.., than Y may be possible (fire load not representative and can safely be adjusted, based on …), can adjust and agree on
- May be ok if follow VM for less complex design, but not specific design. Keep chartered status at high level for specific design. No variation from VM. If MBIE has register of who could do what, could help.

How well do you think the FEB process is working?

- Lack of clarity around FEB process, and a lot of variability
- Not enforced in Auckland – voluntary…

How well do you think the peer review approach is working?

- Not well (see above)
- If not peer review, then tweak code and VM.

Do you think there are enough qualified fire engineers in New Zealand – in all areas (design, review and approval, peer review, enforcement, etc.)?

- No

Do you think the professional qualifications / certifications are adequate?

- See above
- Qualifications is a big issue – wide range – how address
- Issue is competency – not qualifications
- Current system not really working – cutting out some people not on the list due to not having the right paper – some on the list who should be kicked off
- Problem is that industry not meeting the bar – instead of raising bar – MBIE (DBH) lowered requirements

Do you think some sort of 'expert' review panel, comprised of members from outside of the New Zealand design community, could be helpful in any way?

- Such a panel might help, but not sure of how council would approach that. Councils have list. Only pull from 'approved' list.
- Shift in mentality would be needed. Worked with some people before, but not the only group that could review. Outside (international) panel ok, as long as they know the code.
- MBIE could take on national register – X,Y and Z OK for compliance document, Y and Z OK for VM, Z OK for specific design
- Need central review of some sort.
- Best peer review was international peer review – get someone with expertise
- Good regulation would help. Competency in engineering will not deal with ethics
- Too many BCAs for a small country.
- If faith in VM and peer review can be restored, BCA issue can be addressed. More support for central review of PB designs. DRU / ERU served important role. Missing now.
- Not sure why BCA would not want to be able to shed workload.

Other thoughts, issues, concerns, positive features, ..

- MBIE changed code and VM without discussion with BCA and general consultation, but loss of reputation / a key issue.
- Is code 'safe' – is what resulting safe?

Annex C – Discussion with Fire Engineers in Auckland (SFPE Session)

Persons interviewed: Open discussion at SFPE meeting – about 25 participants (can get list from s 9(2)(a), if necessary)

Disclaimer: These summary points reflect my interpretation of comments received during the SFPE meeting on 15 March 2016. I have not confirmed my interpretations with any of the individuals involved.

Observations: There seems to be a significant concern with qualifications and competency of fire engineers. There seems to be significant concern that peer-reviewers and designers are too close. There is some concern that the C/VM2 is lacking for tall buildings, and in other areas, but can work well if used by competent persons. No concerns about the need to change C/VM2, or the timing: get on with it – form industry group to help. Do a better job at industry consultation this time. Centralized review welcome for unique designs. More robust internal MBIE interpretation system is desired – set up committee – not just single person.

What is your general sense of the state of fire engineering in New Zealand?

- Bit of mixed bag. More fire engineering than 5 years ago, on the one hand, but also have a fair number of 'code lawyers' that do no engineering but focus on getting around code provisions.
- Comfort reached with C/VM2 – by qualified engineers. Qualifications are lacking, which causes problems. The 'acceptable solution' crowd largely has no qualifications.
- Acceptable solutions – too narrowly focused. Forces C/VM2. C/VM2 means less engineering.

What is working well?

- Key thing is that VM takes away the unproductive debate about input values, which shouldn't be the focus of the design. Focus more on design and important issues.
- MBIE working with industry is better than when C/VM2 was introduced.

What is not working?

Qualifications / Competency

- Market has too many unqualified people – systematic issue
- No longer have fire engineers, have 'code lawyers' that work on getting around code provisions
- Qualifications / competency is a big issue – wide range – not clear how to address
- Problem is that industry not meeting the bar – instead of raising bar – MBIE (DBH) lowered requirements
- IPENZ has no teeth – will not take action against people – will not take action against members – not what you know, who you know
- Working under expectation that VM2 only being used by qualified and competent engineer, but no requirements for client to employ competent engineer
- SFPE willing to help in some way, but not clear how

Code – CDs - C/VM2

- Some input values don't fit well – still causes some consternation.
- Doesn't seem clearly appropriate for very tall buildings. Smoke control, structural resiliency, egress, …
- Some robustness checks gone / going away – not good
- Good for small office buildings, lack of credibility/ applicability for unique buildings.
- Acceptable solutions – too narrowly focused. Large portion of sector in the area – out of scope – go to VM2
- For some, not clear if C/VM2 is a compliance document or verification method (or what is the difference)
- Difficulty with C/VM2 and CDs with respect to ANARP / existing buildings
- C/VM2 has implied safety factor of 1 – people don't understand this, or why C/VM2 cannot be used as basis for specific design with same safety factor
- Line up building code, fire service act and evacuation regulations
- Alternative solution bad term – too much baggage – change

Peer Review

- Peer review process ok when good engineers involved, but can get not-so-good engineers and peer reviewers, which causes problems
- Element of distrust by various regulators of peer reviewers / review process – situation with engineers and reviewers being too close
- No 'engineer of record' concept – responsibility
- Some type of 'central' resource for reviews would be welcome (by engineers and enforcers) – different than fire service engineering review (broad set of stakeholders – not single person / entity)

Review / Approval

- Can be too many players – peer review, council, fire service
- Fire service input welcome at FEB but too late at end (not supposed to be another review)
- FEB helpful – not required in Auckland – can make review more challenging
- Acceptance varies by council (C/VM2 and other)
- Fire service input welcome at FEB stage, but too late at end (not supposed to be another review) – need to control for adding things at end of process
- Hard to achieve national consistency with 60 BCAs…

Guidance / Interpretations

- MBIE does not have robust system for making 'formal' interpretation (not determination). One (or two) individuals responding by phone / email, without full context, sets precedent, which may not be intended or appropriate. Panel of qualified fire engineers and others who know system would be better (separate from 'review' panel)
- Need more commentary (C/VM2), design guides (specific buildings), examples

What are your views on Building Code and C/VM2 (in general)?

- See above
- Not a great deal of problem with code and act – for competent people – even VM2 – problem is lacking competent people
- Allowing for risk / probabilistic approach would be good
- Would be helpful to have some flexibility on input values.
- Adding more to C/VM2 to address shortcomings would be welcomed – more guidance / commentary would be helpful

What are your views on C/VM2 specifically for tall buildings?

- Not discussed in detail
- Can design very tall building – meet C/VM2 – feel uncomfortable (smoke, egress, structure)
- Lack of robustness checks
- Use of 'international' codes / practice helpful (e.g., NFPA, ICC, SFPE, UK, …)

Do you think C/VM2 should be eliminated: overall, for tall buildings, …?

- Keep it and update it, rather than getting rid of it
- More commentary – explain underlying principles – explain how safety factor works, …
- Consider allowing deviation, but with clear process to follow
    - Here is fire load generally applied, but if you have facilities such as.., than Y may be possible (fire load not representative and can safely be adjusted, based on …), can adjust and agree on
- Address tall building issues – and other unique building issues (e.g., hospitals) – structural stability, smoke control, smoke lobbies, sprinklers and 1000 people, firefighting, etc.

How well do you think the FEB process is working?

- Lack of clarity around FEB process, and a lot of variability – clarification would be helpful
- Not enforced in Auckland – voluntary
- Should be included for C/VM2

How well do you think the peer review approach is working?

- Not well (see above)

Do you think there are enough qualified fire engineers in New Zealand – in all areas (design, review and approval, peer review, enforcement, etc.)?

- No

Do you think the professional qualifications / certifications are adequate?

- See above
- Wide variation – no clear competency criteria – all 'self-reporting'
- Qualifications is a big issue – not clear how to address
- Some sort of competency criteria would be helpful – maybe MBIE register?

Do you think some sort of 'expert' review panel, comprised of members from outside of the New Zealand design community, could be helpful in any way?

- Such a panel could be helpful – should have internal and external people – broad representation (regulatory, fire engineer, fire service, …).
- Shift in mentality would be needed
- Need to clarify roles – peer review, fire service, BCAs, … - will not help as an 'extra' level

Other thoughts, issues, concerns, positive features, …

- Mentoring needed of young engineers – should not allow students just out of university to prepare C/VM2 designs and specific designs
- System works well when it works, just too easy for some to do less than appropriate
- Need to increase ethics

Annex D – Discussions with Fire Engineers in Christchurch (One-on-One, Christchurch City Council and SFPE Session)

Persons interviewed: Open discussion at SFPE meeting – about 15 participants (can get list from s 9(2)(a), if necessary). Individual meetings with: s 9(2)(a)

Disclaimer: These summary points reflect my interpretation of comments received during the SFPE meeting on 17 March 2016, as well as individual discussions on 17 and 18 March (and from early February as well). I have not confirmed my interpretations with any of the individuals involved.

Observations: There seems to be a significant concern with qualifications and competency of fire engineers. There seems to be significant concern that peer-reviewers and designers are too close. There is some concern that the C/VM2 is lacking for some buildings but can work well if used by competent persons. Some would like C/VM2 to be guidance, but many see benefit to keeping it mandatory, if fixed, due to other issues in the market (e.g., competency). There is some concern by engineers that the Christchurch City Council requires / engages in too much review. Centralized review is seen as beneficial for complex designs. More robust interpretation systems are desired. More transparency from MBIE is desired with respect to the fire programme, working group appointments, scope, outcomes and consultation.

What is your general sense of the state of fire engineering in New Zealand?

- Challenging – tried to 'dumb down' system – people proposing dumb designs…
- Works well when competent people involved, but lot of minimally qualified people and insufficient measures to keep poor designs / designers out
- 'Dumbing down' of acceptable solutions and lack of minimum competency has hurt reputation of fire engineering
- Things better now, once things settled down after 2012 changes (ANARP, series of major changes …)
- C/VM2 has helped raise bar / gain some consistency

What is working well?

- C/VM2 takes away the unproductive debate about input values, which shouldn't be the focus of the design. Focus more on design and important issues.
- C/VM2 levels the playing field
- C/VM2 too restrictive (FED, etc) – make more open, like UK

What is not working?

<u>Qualifications / Competency</u>

Qualifications is a big issue – IPENZ process allows people to 'let in their mates' and has no teeth with respect to taking action against poor performers – will not take action against members – not what you know, who you know

- Market has too many unqualified people – systematic issue – too much playing the system
- BCAs need help sorting 'competency' issue
- Problem with MBIE saying compliance documents / acceptable solutions can be 'done by anyone' when in fact fire knowledge is needed to use correctly
- Lack of qualified engineers a concern for Councils – have to manage liability
- Need certification of software, or users of software (like FDS for fire)
- Fire service involvement needed because no minimum competency in market

Code – CDs - C/VM2

- System more or less works for new buildings – big problems with existing, which is biggest sector
- Code should have risk benchmarks (e.g., risk to life) – societal protection unclear
- MBIE needs to set level of safety – code too open to interpretation – too many FAQs, interpretations, ...
- Challenges with different approaches between clauses (criteria – no criteria; type of criteria)
- More acceptable solutions helpful (like fire stations, prisons)
- Provide regulated risk / reliability criteria (e.g., failure probabilities)
- C/VM2 stifles innovation. How deal with CLT?
- C/VM2 does not work for small buildings
- C/VM2 does not work well for existing buildings – having something for existing buildings is biggest missed opportunity

Peer Review

- Peer review process is too chummy – eroding the system
- Mix of good designers picking reviewers and bad designers picking bad reviewers
- System not working as it could – same issues as before 2012 changes

Review / Approval

- Councils very pedantic – needed with peer review?
- CCC relies on peer review, but does hard regulatory review, and sometimes fire service review – can be too much. Also, reliance on producer statements can result in difficulties 'bad designer, bad reviewer)
- Concern about outside consultant sitting in CCC and firm maybe getting some benefit (conflict of interest type of issue)
- Concern about CCC undertaking so much review that clients push for acceptable solutions
- CCC accepts any design without consideration of engineers' and reviewers' qualifications
- BCA requiring engineer to stay on project until end construction, well beyond normal scope
- Concern about where problems are that require so much oversight – tail wagging the dog?
- CCC needs to be assured on reasonable grounds
- Councils should allow more use of international standards (US, UK, ...)
- Fire service involvement needs to be better defined / clarified – throughout country (when needed, to do what, ...)
- Fire service involvement needed because engineers no knowledgeable about suppression and operational needs / procedures

- Fire service would like to get out of engineering design review, but until competency issue of market addressed, not practicable

Guidance / Interpretations

- Too many people running to MBIE – should be worked out with peer review, BCA, FS
- People playing system by getting MBIE response on specific question and applying it to other situations / submitting to other BCAs – have committee to make interpretation
- MBIE should consult with engineers more – stop taking things out (robustness, smoke lobbies) without broader consultation
- Have committee / panel for determinations – one person and one consultant too tight

What are your views on Building Code and C/VM2 (in general)?

- Not sure about criteria in fire, especially surface linings, but also other
- Generally has helped – some problems – tall buildings, hospitals, etc., as well as concerns about lobbies, 1000 people in sprinklered building, etc.
- Need clarification on interaction of B1 and C/VM2

What are your views on C/VM2 specifically for tall buildings?

- Not discussed in any detail with most
- Was noted that missed the mark by not tying in importance levels
- Was noted that sometimes people over analyze without thinking, e.g., will get some significant FRR from wallboard needed for acoustics…
- Shortcomings with structure, firefighter operations, egress, smoke lobbies
- Need clarification on interaction of B1 and C/VM2

Do you think C/VM2 should be eliminated: overall, for tall buildings, …?

- Keep C/VM2, but consider as option – not compliance document
- Allow variation of parameters with C/VM2, where justifiable and justified
- Re-introduce specific design (alternative solutions)
- Keep it: fix it – some outrageous designs have been proposed / are possible now

How well do you think the FEB process is working?

- Not working as it should – being used as CYA (reduce liability) over agreement on design approach and parameters
- Many engineers regurgitating past FEBs to 'tick the box' rather than actually engage in FEB process
- Wide variation based on who is doing FEB, where submitted, etc.
- Would be better if was actually used as intended and got stakeholders all talking early in process – would minimize problems and reduce times to approval

How well do you think the peer review approach is working?

- Not well (see above)
- Too much 'mate picks mate' with limited oversight

- System can work well when right people involved
- Something needs to change

Do you think there are enough qualified fire engineers in New Zealand – in all areas (design, review and approval, peer review, enforcement, etc.)?

- No – lack of qualified engineers – they look to BCAs to determine appropriate design / minimum requirements

Do you think the professional qualifications / certifications are adequate?

- No. See above
- IPENZ needs to do more – MBIE should step in – everyone is 'engineer' – could be role of central government to set minimum qualifications / criteria
- Too buddy-buddy
- Should look at other professions, like medical – Hippocratic oath, certification board, review boards, …

Do you think some sort of 'expert' review panel, comprised of members from outside of the New Zealand design community, could be helpful in any way?

- Such a panel could be very helpful – reviews and interpretations – no need for quick responses – take more measured approach
- Could be helpful, but where is hard evidence of failures
- Could be helpful, but who is on it and who is paying? Needs to be independent. Should be supported by MBIE.
- Could be helpful – arbitrator – interpretations panel would be helpful as well
- Some preference for approach of standards with interpretation committee
- Could be helpful – needs right make-up – would help fire service get out of business
- Could help, but what about more audits? DRU good idea in concept, but not in practice.

Other thoughts, issues, concerns, positive features, …

- Concern about where problems are that require so much oversight – tail wagging the dog?
- UC should teach something about the Code
- Central government always sidesteps responsibility – complain about engineers going bankrupt and reopening practice, yet government keeps shifting responsibility BIA, DBH, MBIE: what is next?
- Legislation should be clearer – too many FAQs, interpretations, … - indication of poor wording in legislation
- MBIE has made progress, but needs to be more transparent, needs broader consultation, and should have clear system for identifying why and how actions were taken (e.g., consider and rejected because…, accepted in principle and implement as…, etc.)
  How does MBIE pick people for committees? What happens with feedback?
- Determination process worrisome – one person, one consultant, looks funny…

Annex E – Discussions with Fire Engineers in Wellington (SFPE Session)

Persons interviewed: Open discussion at SFPE meeting, held at the offices of Holmes Fire, 50 Customhouse Quay, with about 12 participants. An attendee list can be compiled if desired.

Disclaimer: These summary points reflect my interpretation of comments received during the SFPE meeting on 11 April 2016. I have not confirmed my interpretations with any of the individuals involved.

Observations: There seems to be a significant concern with qualifications and competency of fire engineers and with BCAs. There is concern that the C/VM2 can result in unsafe designs for some buildings, but it was also noted that it can work well if used by competent persons for appropriate building types / uses. Centralized review would be viewed as helpful. A more robust interpretation system (MBIE) is desired. Changes would be welcome, but there remains distrust of MBIE based on 2012 changes.

What is your general sense of the state of fire engineering in New Zealand?

- Challenging – tried to 'dumb down' system – people proposing dumb designs…
- Lack of Alternative Solutions – tough to get BCAs to accept
- Possible to build dangerous buildings with C/VM2
- Lack of trust in MBIE
- No consistency across country
- Things better now, as compared to 2013, once things settled down after 2012 changes
- C/VM2 has helped raise bar / gain some consistency, but many think it better as guidance than compliance

What is working well?

- C/VM2 takes away the unproductive debate about input values, which shouldn't be the focus of the design. Focus more on design and important issues.
- C/VM2 levels the playing field
- C/VM2 has helped generate business for fire engineers

What is not working?

<u>Qualifications / Competency</u>

- Qualifications / competency and ethics are major concerns – inadequate controls – too much acceptance of work by unqualified / unethical people
- Market has too many unqualified people – systematic issue – too much playing the system
- BCAs need help sorting 'competency' issue
- MBIE 'messed up' the Acceptable Solutions (C/ASx) – was better in 1992 – 2001 – continually worse – MBIE says C/ASx can be 'used by anyone' but architects do not use
- Lack of qualified engineers a concern for Councils – have to manage liability
- Low pay for fire engineers in councils and fire service does not help

Code – CDs - C/VM2

- Get rid of quantified criteria, in particular prescriptive material group approach
- System more or less works for new buildings – big problems with existing, which is biggest sector ($1500 for seismic upgrade, $7500 for fire engineering report…)
- More acceptable solutions helpful (like fire stations, prisons)
- C/VM2 does not work for many buildings and can result in dangerous designs
- C/VM2 does not work well for existing buildings – having something for existing buildings is biggest missed opportunity
- C/VM2 would be better as guidance – too rigid – no Alternative Solutions (specific design)
- All design specific design since C/VM2 is never used in total
- Need to reintroduce specific design
- Need to align related acts / regulations

Peer Review

- Peer review process is too chummy – eroding the system
- Mix of good designers picking reviewers and bad designers picking bad reviewers
- System not working as it could – same issues as before 2012 changes

Review / Approval

- Too much diversity between Councils – capabilities, review, allowance for use of international standards (US, UK, …)
- Too much reliance on peer review – and there are problems with peer review
- Fire service still an impediment – lack of qualified persons – overstep their bounds
- Many problems with consent – buildings not as designed
- People doing building works and going for certificates of compliance and then consent (seeking apology not permission)

Guidance / Interpretations

- Strongly worded concerns with way MBIE interpretations are handled – 1-2 people, response via email, FAQs, …, not looking at all issues, setting policy haphazardly
- People playing system by getting MBIE response on specific question and applying it to other situations / submitting to other BCAs – have committee to make interpretation
- MBIE should consult with engineers more
- Have committee / panel for interpretations
- More guidance on C/VM2 would be helpful
- Guidance on prisons not good – wrong people involved – not consulted – shows problems with MBIE and their approach
- Guidance on fire stations is because fire service did not want to pay for fire engineering that would be associated with the type of work their comments typically require (e.g., it is ok for them to tell others to do more and pay more, but MBIE allowed them to not apply the same standards to themselves)

What are your views on Building Code and C/VM2 (in general)?

- Not sure about criteria in fire, especially surface linings, but also other
- Generally has helped – many problems though – can design unsafe buildings
- Misalignment of standards and code changes – out of sync – causes problems
- See comments above

What are your views on C/VM2 specifically for tall buildings?

- Not discussed

Do you think C/VM2 should be eliminated: overall, for tall buildings, …?

- Keep C/VM2, but consider as option – not compliance document
- Allow variation of parameters with C/VM2, where justifiable and justified
- Re-introduce specific design (alternative solutions)
- Fix it – some outrageous designs have been proposed / are possible now

How well do you think the FEB process is working?

- Not working as it should

How well do you think the peer review approach is working?

- Not well (see above)
- Too much 'mate picks mate' with limited oversight – ethics issue
- System can work well when right people involved
- Something needs to change

Do you think there are enough qualified fire engineers in New Zealand – in all areas (design, review and approval, peer review, enforcement, etc.)?

- No – lack of qualified engineers – they look to BCAs to determine appropriate design / minimum requirements
- Lack of qualified engineers in BCAs and NZFS – pay is too low – good people go, remaining people not appropriate

Do you think the professional qualifications / certifications are adequate?

- No. See above

Do you think some sort of 'expert' review panel, comprised of members from outside of the New Zealand design community, could be helpful in any way?

- Could be helpful, but who is on it and who is paying? Needs to be independent. Should be supported by MBIE. Needs NZ people as well.
- Could be helpful – arbitrator
- Need to be careful – DRU had good intents, not implemented appropriately
- Need interpretations panel in MBIE – current approach not working

Other thoughts, issues, concerns, positive features, …

- Need alignment of related acts – building, fire service, RMA, HSNO, … - tough environment
- ANARP needs to be better sorted ($1500 for seismic upgrade: $7500 for fire report)
- Act needs to change to give BCA clear power to make decisions
- Need to address issue of how to ensure building constructed as designed, and that design documents include agreed changes, and…
- No quality control – bring back the Clerk of Works
- Legislation should be clearer – too many FAQs, interpretations, … - indication of poor wording in legislation
- MBIE has made progress, but needs to be more transparent, needs broader consultation, and should have clear system for identifying why and how actions were taken
- Blow up system and start over
- Go back to 1992 version of system – each iteration of compliance documents gets worse
- Test new documents on real buildings – find out how they work before releasing them
- Cost of compliance has skyrocketed due to current approach

Annex F – Discussions with Fire Engineers with Tall Building Projects – Auckland

Attendees: s 9(2)(a) Brian Meacham

Disclaimer: These summary points reflect my interpretation of discussions on 15 March 2016. I have not confirmed my interpretations with any of the individuals involved.

Summary: s 9(2)(a) opened discussion by identifying some issues associated with the viability of C/VM2 for tall buildings, pointing to documents such as the SFPE Guide on Fire Safety in Very Tall Buildings. In particular, structural fire resiliency, facilities for fire service, and evacuation issues were raised. Discussion was held on various issues being considered in Auckland, including staged evacuation, use of lifts for occupant evacuation, single means of escape, use of lifts for fire service access, and structural stability in fire. It was noted that higher reliability is needed, such as generators, for water supply, communications, etc. On the issue of structural stability, the appropriateness of the simplified Eurocode time equivalency approach was raised, and it was noted that other methods 'could' result in lower fire resistance ratings. Overall, it was generally agreed that some conservatism is worthwhile. It was noted that the fire service has not addressed the issue of operations in very tall buildings, so engineers lack guidance on what is desired. There is concern the fire service will come in at the end and ask for something that is impractical in a final design. s 9(2)(a) ultimately presented the one-page overview (guidance) on considerations for very tall buildings, and the three-page document on fire design guidance to be developed. It was noted by a participant that those present were 'on notice' with respect to expectations. It was asked that participants get back to s 9(2)(a) with comments on the tabled documents.

Annex G – Discussions with Auckland City Council – Tall Buildings

Attendees: s 9(2)(a) Brian Meacham

Disclaimer: These summary points reflect my interpretation of discussions on 15 March 2016. I have not confirmed my interpretations with any of the individuals involved.

Summary: The issue of current Auckland City Council (ACC) policies and proposed changes were discussed, including FEB requirements. Specific issues with a handful of proposed projects were tabled. Concerns were broadly as raised in previous discussions, including structural resiliency, fire service access and operations, and egress. While Ed as fire engineer wanted more support, to do more review (like Christchurch City Council (CCC)), s 9(2)(a) cautioned about asking for too much, and being focused on not taking on too much (specifically around requiring FEBs). Some discussion was held around producer statements, qualifications (or lack thereof), and actions open to ACC. Draft FEB guidance was shown. Feedback from ACC to an engineer about an FEB process for a tall building was shown. Discussion was held about the limitations that BCAs have when confronted with a design that meets a 'deemed to comply' document (C/VM2). Changes to the C/VM2 to address issues with tall buildings will be welcome. It was viewed that lack of connection between importance levels and C/VM2 requirements was unfortunate (e.g., assuming a very tall building warrants a higher level of importance). Benefits of having an 'external' review panel were mixed, could provide some benefit, but could end up being another means for determination. (Some benefit seen as a means for help before a formal determination is required.) Could help given so many BCAs in such a small country.

Annex H – Discussions with Tauranga City Council and Hamilton City Council

Attendees – Morning Session: s 9(2)(a)

Disclaimer: These summary points reflect my interpretation of comments / discussion during the meeting on 24 March 2016. I have not confirmed my interpretations with any of the individuals involved. s 9(2)(a) will be able to add significantly more detail as they know the participants and understand the issues better.

Overview: The nominal agenda for each meeting was to discuss the Fire Programme overall, with a focus on the Fire Engineering Brief (FEB), Peer / Regulatory Review processes, and Reasonable Grounds (see agenda sent by s 9(2)(a) on 22 March). Each of the meetings, after introductions, was started by s 9(2)(a) providing a brief overview of the Fire Programme, but noting that the MBIE team was there nominally to hear from the assembled Councils / contractors on how things are working.

Observations: There seems to be a significant concern with qualifications and competency of fire engineers. s 9(2)(a) noted that there are 30 fire 'engineers' working in the region, of whom 16 are not engineers. It was noted a major player has a business model of 1000 reports per year at $1000 each (for C/ASx solutions). There was concern that this model / approach results in inadequate design and challenges for regulatory review, and that Councils are *de facto* designers, since the 'engineers' use them to fix problems with design and state what they want in the documentation. (It should be noted that s 9(2)(a) / Beca undertake 'regulatory' reviews on behalf of TCC and HCC, as well as undertake designs and peer reviews, which is in part a reflection of the lack of qualified fire engineers in the market, and approaches that are needed to fill the gap.) It was stated that part of the reason that the C/ASx system is not working is that the documents are 'too complex' and not being used by architects or other designers: they hire fire 'engineers' who then develop these low end, low cost compliance reports.

Given lack of qualified engineers, C/VM2 not working particularly well (about 5% of designs, no FEBs, concerns about peer review), and ANARP not working well. ANARP not working well in part due to lack of qualified persons, but also unclear understanding of what needs to be upgraded under what conditions. Discussion about 'risk-based' and/or 'risk-informed' approaches ensued. Seems more could be done in this area. (Note: when I looked for ANARP guidance on the MBIE building standards website(s), I could not find any…)

Some discussion was held regarding passive fire protection and inspections in general. All agree there are problems. Not clear who should be checking buildings when, and how to enforce (difficult for fire engineers, whose contract is typically front end design stage, and Councils are not inspecting in great deal due to resource limitations and reliance on producer statements). Discussion about 'risk-based' and/or 'risk-informed' approaches was held on this topic as well.

With respect to ANARP and consenting, in particular regarding 'risk-based' or 'risk-informed' approaches, one challenge is that Councils are focused more on managing their risk than on

managing risk (to occupants, etc.) in buildings. This type of systemic issue was observed in Christchurch as well.

It is observed that TCC is very 'process' oriented – many flowcharts for review – seem focused on managing their risk.

There was some discussion on what goes to the fire service, and when, and the extent to which they comment at multiple steps. In brief, it was noted that in addition to the FEB stage, the fire service is coming in at the end and requesting changes / additions. This relationship is not clear. Guidance is not clear on when reports have to go to the fire service (any building involving a 'specified' system, any building with respect to evacuation, other?).

Given the wide range of issues with lack of competency, use of external regulatory reviewers, uncertainty about peer reviews, range of fire service involvement, and focus by each entity to manage their own risks with respect to the regulatory system, it seems that there could be a situation where at-risk buildings are being missed due to volume of reviews being undertaken, and the focus on managing liability risk rather than building-related risks.

Annex I – Discussions with Small / Rural Councils

Attendees: s 9(2)(a)

Disclaimer: These summary points reflect my interpretation of comments / discussion during the meeting on 24 March 2016. I have not confirmed my interpretations with any of the individuals involved. s 9(2)(a) will be able to add significantly more detail, as they know the participants and understand the issues better.

Overview: The nominal agenda for each meeting was to discuss the Fire Programme overall, with a focus on the Fire Engineering Brief (FEB), Peer / Regulatory Review processes, and Reasonable Grounds (see agenda sent by s 9(2)(a) on 22 March). Each of the meetings, after introductions, was started by s 9(2)(a) providing a brief overview of the Fire Programme, but noting that the MBIE team was there nominally to hear from the assembled Councils / contractors on how things are working.

Observations: The small BCAs are all quite familiar with the C/ASxs, most having looked at them within the past few days. Most like the current structure and find it helpful. Problem is market doesn't necessarily understand them (architects / designers), in part because they don't use them often. Also some problems with definitions and concepts in C/ASxs (e.g., notional boundaries, 'attached' as in 'attached' garage, etc.).

Not much use of C/VM2 or Alternative Solutions. Darrel from FLC spoke of some issues with complex buildings, specifically a hospital and a chemical storage facility. In the case of the chemical storage facility, there are issues with Hazardous Materials legislation and fire service. Fire service was involved in FEB, but still wants more. Participants have been trying tom come to agreement / obtain resolution since July last year.

Problems with ANARP also discussed in this group. Many in this discussion try to 'guide' engineers rather than focus on process / local risk management (as with TCC, for example). More comfortable with 'risk-based' or 'risk-informed' approaches than larger Councils (e.g., TCC and HCC).

Concern on fire service involvement, at level of detail they are looking, being far too late in process was discussed within this group as well.

Some discussion of 'accountability' missing in the system, especially with respect to 'engineers' (in particular, unqualified ones). Too many fire 'engineers' relying on Councils to sort out design (same problem as observed by TCC and HCC).

Overall this group, while having concerns of competency in the market, are not impacted as much as larger Councils. Nonetheless, it seems as if more clarity (ANARP, FEBs, etc.), and better system of qualifications / competency, would be welcome. In addition, sorting out role of fire service, and better aligning related legislation (e.g., building, evacuation, fire, hazardous materials) would be welcome.

Annex J – Draft MBIE Tall Building Guidance and Resources

There have been various versions of the 'tall building guidance' document drafted and circulated by Michael Belsham. Below is an earlier draft with some of my comments included. A final version will come from Michael. Based on discussion with Mike Stannard, this is expected to ultimately be in the form of a practice note.

Tall Building Practice Note – Draft Text (by Michael Belsham with Meacham Comments)

With the advent of high-rise developments in Auckland City the following guidance is provided to supplement the Verification Method C/VM2.

International experience with the design of fire safety measures for tall buildings has identified a series of challenges in terms of safe evacuation, fire-fighting and protection of other property and the wider society. International best practice suggests that there is a range of specialist features that should be considered for high-rise buildings, most of which are not described in C/VM2. Designers and BCA's should consider the issues that are unique to tall buildings when applying C/VM2 such that the safety of the building has sufficient robustness to mitigate the fire risks of occupancy at height and to the surrounding community.

A useful reference for identifying appropriate fire safety measures for high-rise buildings is SFPE's **Engineering Guide: Fire Safety for Very Tall Buildings**. The guide can be purchased via the link below: https://sfpe.site-ym.com/store/ViewProduct.aspx?id=4603146

The fire safety issues and the corresponding measures to address them that must be considered in the fire designs for high-rise buildings include:

- Fire Resistance and Robustness of Structure
- Fire Fighting Access and Facilities at Height
- Staged/Phased Evacuation Design and Refuge Areas

Other issues include Protection of Special Hazards, Reliability of Fire Safety Systems, Situational Awareness, Combustibility of Façade Materials and Passive Fire Protection.

- The fire resiliency of the structure for tall buildings warrants additional consideration due to the time required for occupant evacuation and firefighter operations, as well as the potential impact that local or global collapse could have on neighbouring property (e.g., adjacent units in a residential building or adjacent tenants in an office building; adjacent buildings on the same site, adjacent buildings on adjacent sites). In some countries, assessment of the complete burnout of a full floor (whether or not there are multiple fire cells on a floor) is required, so as to minimize the potential for local or global structural failure due to fire. While the C/VM2 provides for assessment of fire cells, it is also required to demonstrate that the structural stability is not compromised by fire under B1 of the code. It is therefore required that verification of structural stability during and after fire, as required in B1, be provided, in addition to compliance with C/VM2.
- Firefighting operations in tall buildings are challenging in that the fire service typically needs to move equipment vertically in the building, they often stage operations from a floor below the

fire floor and utilize one or more stairwells to run hoses to the fire floor, they might need a lift to help evacuate occupants with disabilities, and they can sometimes have poor radio communications as a result of the building materials and construction. For these and related reasons, a variety of specific facilities to support fire service operations are often utilised, including protected / hardened lifts to facilitate firefighter access and operations, including evacuation of at risk populations, redundant or more reliable water supplies, smoke protected lobbies, and so forth.

- A variety of evacuation strategies have been implemented in tall buildings, including staged evacuation, relocation and defend in place (refuge areas / floors), and full simultaneous evacuation. In many cases, multiple strategies are used, since there are a wide range of events which might warrant evacuation (e.g., long-term power outage, fire, earthquake). To account for various types of events, the time required to evacuate part or all of the building, and / or the loss of a stairwell due to firefighting operations, some jurisdictions require additional egress capacity (more stairs, more exit width), require use of refuge areas / floors, allow for use of lifts for evacuation by occupants, or some combination, to provide for reasonable means of assuring the occupants can reach a place of safety given the range of events and associated impacts on the egress system.

As one might expect, reliability of systems becomes a concern where reliance on systems is critical to the safety strategy (e.g., emergency power if lifts are used by occupants and/or fire service, redundant firefighting water supplies / risers, etc.) and should be addressed. Likewise, systems to facilitate situation awareness are essential, for occupants and the fire service. Fire spread by external façades which contain combustible materials (coatings, insulation, etc.) is a significant concern for very tall buildings, as has been demonstrated by fires in Australia, China, Dubai and elsewhere, and minimizing the potential for internal smoke and fire spread through passive and active means is essential to avoid such situations as the MGM Grand Hotel fire in Las Vegas and other tall building fire events.

The fire designs for high-rise buildings will either apply the Verification Method or a specific design. In both cases the design and consenting process will include a Fire Engineering Brief (FEB). The fire safety issues relating to high-rise buildings noted above should be addressed in the FEB process to feed into the design process.

In deciding whether or not to approve a building consent application for a high-rise building, the BCA should have regard to whether the FEB process has addressed the fire safety issues above and whether the consequent fire design incorporates appropriate measures that address the issues applying to the building. This should inform the BCA's consideration whether there are 'reasonable grounds' to approve the building consent.

This guidance for high-rise buildings is issued as an interim measure. The fire safety issues and corresponding measures that need to be considered for high-rise buildings will be incorporated into amendments to the Verification Method C/VM2.

Annex K – Competency and Qualifications

Discussion: Through the course of discussions with fire engineers and councils in various parts of the country, it was quite apparent that the fire engineering and regulatory communities have significant concerns with the way in which fire engineering qualifications and competency is addressed. In brief, there is no protection of the term 'fire engineer' so anyone can call themselves a fire engineer, even if they lack an engineering degree or competency in fire engineering. In addition, there is no requirement that complex designs, including application of C/VM2, be undertaken by a PEng, although this was clearly the intent.

As things stand, qualifications are partially addressed through IPENZ, with SFPE acting as the nominated body to review applications for fire engineer. However, this system does not appear to have rigid competency requirements, and is based largely on the portfolio a person submits and the persons who happen to undertake the review.

There is also the concern that an IPENZ PEng, who meets some fire engineering qualification, deems themselves competent to practice in all areas of fire engineering. This can be problematic, and even dangerous, especially in specialized areas, such as computational modelling and structural fire engineering, which some (many) fire engineers may not be competent in. Some type of control for this would seem warranted.

A clear competency framework would help. It is understood that some activity is underway within IPENZ to look at accrediting the fire engineering program at University of Canterbury as a basis for competency, but even with this, the change in the market will approach a generation.

Following are some thoughts on the qualifications and competency issues.

Competency / Qualifications in Various Countries

Issues of minimum competency requirements and qualifications vary by country. However, in most countries of which I am aware, a key requirement is a university degree in engineering, ideally (but not always) in the area of practice (e.g., fire engineering). There is also often requirement for membership in a professional body, and sometimes requirements for examination, licensing and evidence of continued professional development.

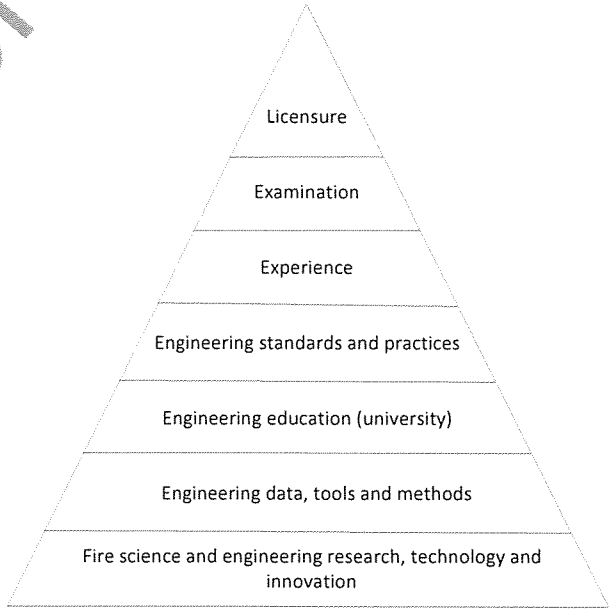
As one example, I refer to the US, wherein generally to become a registered (licensed) engineer, one requires a university engineering education, successful completion of a Fundamentals of Engineering examination (http://ncees.org/exams/fe-exam/), a nationally administered exam, professional experience working under the supervision of a licensed engineer (typically at least four years), successful completion of a Principals of Engineering (Professional Engineering) examination in a specific discipline (http://ncees.org/exams/pe-exam/), a nationally administered exam, and registration by the State in which you intend to practice. The subject area for the PE exam in Fire Protection can be viewed here https://cdn.ncees.org/wp-content/uploads/2012/11/PE-Fire-Oct-2012.pdf. In some states, it is required that one passes an examination on Structural Engineering to practice in that area (http://ncees.org/exams/se-exam/). This is particularly required where engineering analysis will be used / required, more so than compliance with design standards. The SE exam is required in California, for example, to undertake any structural design.

There are other, less regulated environments as well. England is an example, where becoming chartered in one's professional body is an indication of competence, but is not mandated by legislation. For fire safety design, for example, it is not mandated that one be a Chartered Engineer through the Engineering Council division of the Institution of Fire Engineers, but it helps, and the market plays a role in 'requiring' that designation, particularly for complex projects.

While on the topic of England, which has been put forward from time-to-time as a model that New Zealand might consider / benchmark against with respect to professional practice (competency, qualifications), building control, and related building regulatory features, I suggest that there are some important differences. I admit my ignorance of the details of the English system, and I know there is expertise within MBIE on the English system, so I defer to their knowledge and experience.

However, it is my view that the English approach works because the system seems to have a reasonable number of 'belts and suspenders' and a large majority of actors in the system more or less 'play by the rules.' In part, I suggest, this is due to the person undertaking the work, along with the building owner, are the responsible / liable entities at the end of the day – not the Councils, as here in New Zealand. From the IRCC document on performance-based building regulatory systems as related to England (IRCC, 2010): "The duty to comply with the requirements of the Building Regulations is placed on the person carrying out the work. In most cases this would be the builder / installer. However, the duty also falls on the building owner. Prosecution for contraventions of the Building Regulations may be taken against the person carrying out the work (builder / installer), the building owner, or both. Notices requiring work to be brought up to the required standard or pulled down or removed may be served only on the building owner." In this regard, I think there is more attention given by owners to engage qualified and competent practitioners (designers, engineers, builders) so as to manage their own liability. The fact that in New Zealand it is easy for builders to go out of business (and restart under a new name), that owners have little liability, and that Councils carry the bulk of liability as the 'last entity standing' make the dynamics much different.

Going back to the competency issue, as I understand there is no current registration / designation for PEng (Fire) through IPENZ. The process involves SFPE (New Zealand), as the Technical Interest Group for fire in IPENZ, providing guidance for applicants and providing reviewers (who are IPENZ registered). I understand a competency framework is in development, and that some type of accreditation of the University of Canterbury program in Fire will serve as a competency basis. These are all good steps. However, it is not clear what the areas of competency will be, how they will be assessed, and how future changes will impact existing practitioners / practice. Within the SFPE (international), the diagram to the right reflects the hierarchy of professional practice.



At the base is the 'body of knowledge' (BOK) which underpins the discipline. Based on the BOK, a variety of data, tools and methods of engineering analysis and design are available to support the practice of fire engineering. The BOK and associated data, tools and methods are introduced / taught to students in engineering curricula. In practice, a number of engineering standards and practices are in place to guide the application of the fire engineering BOK to projects. After working with the BOK, tools, methods and standards, under the mentorship of registered (licensed) engineers, graduates become experienced with engineering practice. After achieving some minimum experience, they sit the Professional Engineers examination (in the USA), and become licensed engineering professionals. This approach is consistent with other engineering disciplines and societies.

At present, the competencies for fire (protection) engineering in the USA, as related to the PE examination, are as outlined above (https://cdn.ncees.org/wp-content/uploads/2012/11/PE-Fire-Oct-2012.pdf). Moving forward, SFPE (international) has posited 10 areas which should underpin fire engineering competency, regardless of country. These are as follows:

1. Principles of the PBD/FSE Framework and Process
2. Principles of Fire Growth, Development and Spread (Fire Dynamics)
3. Principles of Fire Detection, Alarm and Notification Systems Design
4. Principles of Fire Suppression Systems Design
5. Principles of Passive Fire Protection / Structural Fire Engineering Design
6. Principles of Smoke Development, Spread and Control Systems Design
7. Principles of Human Behavior and Egress Systems Design
8. Principles of Fire Hazard and Risk Assessment
9. Principles of Fire Protection Engineering Economics
10. Principles of Engineering Ethics for Fire Protection Professionals

Additional discussion regarding each of the areas is provided in below. These areas of competency are under discussion, and feedback to SFPE (International) is welcome.

SFPE Proposed Core Competency Framework for Fire Engineering

Within the SFPE (International), the following ten 'minimum' core competencies are being discussed. These are not finalized and should not be cited as such. Feedback is welcome.

1. Principles of the PBD/FSE Framework and Process
2. Principles of Fire Growth, Development and Spread (Fire Dynamics)
3. Principles of Fire Detection, Alarm and Notification Systems Design
4. Principles of Fire Suppression Systems Design
5. Principles of Passive Fire Protection / Structural Fire Engineering Design
6. Principles of Smoke Development, Spread and Control Systems Design
7. Principles of Human Behavior and Egress Systems Design
8. Principles of Fire Hazard and Risk Assessment
9. Principles of Fire Protection Engineering Economics
10. Principles of Engineering Ethics for Fire Protection Professionals

The intent is that engineers, in order to become 'recognized' as a fire (protection / safety) engineer, would have to demonstrate competency in each area. Ideally, the core competencies will be used as

a basis for licensing / registration / certification in various countries. (These are fundamentally consistent with the requirements for PE (Fire) in the USA, although the PBD/FSE framework is not currently included, and ethics is a topic for the Fundamentals of Engineering exam.)

1. The PBD/FSE Framework and Process
    a. This would consider the overall / integrative approach, including: goals, objectives and criteria, hazard analysis, the 'subsystems' available for FP design, discussion of scenarios and design fires, consideration of integrated design approach for selection of appropriate FP strategy, concepts for evaluating design options, ASET/RSET, concepts of uncertainty, sensitivity analysis and treatment of uncertainty, establishing boundary conditions and limits of analysis and design, and documentation.
2. Principles of Fire Growth, Development and Spread (Fire Dynamics)
    a. This would consider principles of ignition, heat transfer, mass transfer, pool fires, point source models, pre-flashover compartment fire dynamics and assessment, post-flashover fire dynamics and assessment, development of design fires.
3. Principles of Fire Detection, Alarm and Notification Systems Design
    a. This would consider identification and selection of design fires, fire signatures, detection technologies, criteria selection, principles of engineering analysis and design of detection, principles of alarm notification, including visibility / intensity, audibility and intelligibility, notification systems design and reliability and robustness.
4. Principles of Fire Suppression Systems Design
    a. This would include identification and selection of design fires, basic hydraulic principles, concepts of friction losses in piping systems and components, design density requirements for different hazards, types of sprinkler heads, spray patterns, drop sizes, response times and related issues, water supply systems and reliability and robustness.
5. Principles of Passive Fire Protection Design / Structural Fire Engineering
    a. This would include identification and selection of design fires, principles of fire resistance and testing, thermal response of structural elements (timber, concrete, steel, composites), engineering analysis, mitigation options, and reliability and robustness. Reliability-based design, Eurocodes, SFPE design Guides and similar could be considered.
6. Principles of Smoke Development, Spread and Control Systems Design
    a. This would include identification and selection of design fires, establishing criteria, principles of smoke production and spread, entrainment, axisymmetric and spill plumes, stratification, principles of natural and mechanical smoke exhaust system design, and reliability and robustness. Could be built around Handbook of Smoke Control Systems Design.
7. Principles of Human Behavior and Egress Systems Design
    a. This would include discussion on human behavior and response (cues, recognition, decision making, response, social and cultural issues, crowd dynamics), characterization of population, toxicity, tenability and physiological issues, setting criteria, FED/FID analysis, environmental impact on responses, pre-movement assessment and data, movement assessment and data, integrated assessment of overall response and movement times, and development and application of safety margins. Could be built around FPE Guide.

8. Principles of Fire Hazard and Risk Assessment
    a. This would include basic principles of hazard analysis, from defining hazards, assessment of hazards using tools such as what-if analysis, FMECA, and fault trees, analytical and computational tools for hazard analysis (toxicity, explosions, fire, etc.), data for hazard assessment, principles of risk assessment, probability, frequency, consequence analysis, event trees, different approaches to quantify and express risk, data for risk analysis, reliability-based analysis, concepts of acceptable risk and risk management. Could use the SFPE Guide on FRA and other guides.
9. Principles of Fire Protection Engineering Economics
    a. This would include basic economic principles, time value of money, amortization, capital and lifecycle costs, expected losses, PML, MFL, risk-cost optimization, benefit-cost analysis, decision analysis and related issues.
10. Principles of Engineering Ethics for Fire Protection Professionals
    a. This would explore the issues of minimum competencies required, working within limits of knowledge, data and tools for FPE, documentation of limits of analysis, bounding conditions, range of validity of engineering analysis, societal responsibilities (safe design, reporting unsafe designs / buildings / conditions, etc.), and related issues.

There could, of course, be additional offerings / requirements in areas of computational analysis for several of the above topics (fire effects, egress, structural response to fire, etc.) and other areas, as important to different jurisdictions.

Annex L – Issues and Suggestions for 'Central' Peer Review

Discussion: Through the course of discussions with fire engineers and councils in various parts of the country, it seems quite clear that the fire engineering and regulatory community does not believe that the peer-review system is working as well as it could or should. In addition, it is widely felt that some type of 'centralized' resource for peer-reviews could be helpful, especially for complex designs.

Situation with Peer Review for Fire in New Zealand

The primary issues with current peer-review system generally include the following:

- There is a clear lack of enforced, minimum competency and qualifications criteria, for use in determining which engineers have the appropriate knowledge, expertise and skill set to undertake fire solutions – or sit in review of fire solutions as 'peers' – across a wide spectrum of needs, from 'simple' adherence to Acceptable Solutions, to the more challenging C/VM2, to specific designs (Alternative Solutions, a term which many people have concerns with for historical reasons). For example, during a meeting with Tauranga City Council, Hamilton City Council and Beca, it was reported by [redacted] that there are 30 fire 'engineers' working in the region, of whom 16 are not engineers.
- There is a perceived shortage of adequately qualified and competent fire engineers in New Zealand. Note: in some respects, this is a function of the fact that the 'simple' Acceptable Solutions, intended to be used by architects and other non-fire engineering personnel, are not being widely used by these groups. This puts pressure on the fire engineering community then to pick up the work in this area.
- Peer reviewers, while paid for by the Client, are generally selected by the consulting fire engineer. This creates the potential for engineers to pick 'friendly' reviewers over comprehensive (detailed, qualified, …) reviewers. It has been reported that 'bad actors' on the design side often select 'bad actors' on the review side.
- There is a lack of clear legislation / guidance on qualifications, responsibilities, liabilities and consequences of inadequate performance of engineers and peer-reviewers in the peer-review process. Discussions reflect frustration at all levels regarding what qualifications / competency can be required and how the process can be managed (i.e., what actions are available to MBIE, Councils, other engineers, …).
- The lack of clear qualifications / competency requirements, lack of engineers and lack of clear legislation / guidance combine to result in a system where:
    - The design / consulting engineers and peer-reviewers can become too 'friendly' – changing positions from one project to the next – and therefore be reluctant to push too hard from the position of a peer reviewer, since they do not want to have similar pressure when they are a designer.
    - The more 'strict' (detailed, comprehensive, pedantic, qualified) peer reviewers can be marginalized, allowing a system where 'poor actors' on the design side select 'poor actors' on the review side, and there are few options for controlling for this.
    - Some BCAs, which can afford to hire fire engineers, are employing them to provide more detailed regulatory review, since there is low confidence in the peer-review process. In some cases, while they identify issues, their hands are tied with respect to requiring anything more than Acceptable Solutions / VMs require. In other cases,

they are undertaking detailed regulatory reviews, which industry sees as being burdensome.

- Some BCAs, which cannot afford to hire fire engineers on staff, are using contractors, to assist with regulatory review. This can create concerns where (a) the contractors do not meet minimum competency / qualification requirements, and therefore poor regulatory reviews could further exacerbate poor designs with poor peer reviews, and (b) where contractors are from firms providing design and peer-review services in the market, leading to some concerns of perceived conflict of interest / access to inside information / preferential treatment.

It is not clear that the peer-review system can be 'fixed' without both competency requirements for engineers and BCAs – and legislative requirements around the process, including as related to appointment, quality control, conflict of interest, and dismissal of reviewers.

There are many models for peer-review used in other jurisdictions. A brief discussion of some of the approaches, for a select number of jurisdictions, is provided in the following section. Generally, for any peer-review system, a high level of qualifications by the reviewer(s) is needed, generally clear separation of the reviewer from the entity / project for which they are providing reviews is required, and often some type of legislation is in place to help assure the system operates as intended (at least outlines responsibilities and expectations).

Likewise, I have included discussion on qualifications and competency issues in various countries, primarily for fire. In brief, while I have not had the time to speak with IPENZ and obtain a thorough understanding of the New Zealand system, I believe there are some shortcomings associated with lack of (a) clear competency criteria / requirements, (b) clear educational requirements, (c) clear experience requirements, working under a registered engineer, (d) a robust and conflict-free means of disciplining bad actors, and (e) some form of legislation which addresses the licensing of engineers (with appropriate discussion of disciplinary action / procedures).

If the decentralized peer-review approach is kept, would suggest consideration of the following:

- Establishment of minimum competency requirements, as outlined above and in annexes. This includes competency in analytical methods and computational models required by / used in design (e.g., BRANZFire, Fire Dynamics Simulator, egress models, etc.)
- Establishment of legislation around the practice of engineering.
- Establishment of legislation around the peer-review process, including aspects of the following:
  - Separation of design from review, as happened with financial accounting / consulting following the Enron case in the US.
  - Institution of oversight (corporate governance) requirements, following the above, as reflected in the Sarbanes-Oxley Act (would not be the same, but the same idea – separate functions and reporting: design and review).
  - Institute clear, national, conflict of interest / non-disclosure requirements, forms, reporting, oversight and enforcement.
- Establishment of clear responsibility / accountability / liability for peer-reviewer, in terms of assuring public interest (as opposed to financial opportunities).

- Establishment of guidelines for peer-review – across the entire design process (e.g., FEB, computational methods, etc.). This may include reference to such documents as the *SFPE Guide to Substantiating a Fire Model for a Given Application* and similar documents.
- Establishment of the requirement that, while Clients pay for peer-review, the BCA assigns peer-reviewers from a list of suitable reviewers (those who comply with the above), which is maintained by MBIE.
- Development of documentation that clearly differentiates peer-review (i.e., design is appropriate from a fire engineering and societal safety perspective) from regulatory review (design complies with Code provisions).

In addition to citing specific guidance documents, such as for computer fire model substantiation identified above, guidelines for the peer-review process might include several attributes, such as:

- Request for assignment of a peer reviewer must be made to the local Council.
- Council must assign a peer reviewer, from the approved list, within 5 days (some time is needed, so as to contact and gain agreement of reviewer).
- Reviewer and designer required to submit conflict of interest forms / non-disclosure forms.
- Scope of peer review agreed by reviewer, designer and Council.
- Peer reviewer is required to attend FEB meeting / discussions.
- All designs are required to include a sufficiently detailed FEB report (see FEB guidance).
- Reviewer is authorized to request any information deemed appropriate as justification for design assumptions and analyses, and designer is compelled to provide information.
- Review must follow guidelines (see above).
- Upon completion, when design is accepted, written confirmation is required by Reviewer.

Alternatively, a 'centralized' panel / committee for peer review could be established. It must be decided who 'owns' the panel / committee: MBIE, Councils, the industry, other. Whoever 'owns' the panel / committee needs to establish a clear and transparent process for selecting and appointing people to serve. Considerations might include:

- Whether the panelists are paid, and if so, how much and by whom (flow of funds).
- Establishment of an appropriate number of panel participants (large enough to be representative: small enough to function efficiently). Probably a target of 3-5 would be reasonable. There could be a larger pool, from which panelists are drawn, as outlined below.
- Decision on the range of interests which should be represented (e.g., all sectors of the fire industry, only engineers, …). This could depend on the nature of the project.
- Decision on how members are selected. It is suggested that 'the owner' might identify minimum qualifications (see above), put out a call for members to serve, and establish a pool of candidates from which a panel can be formed as needed (the pool might have 20-30 people, but specific panels only 3-5 people). Formation of a panel could be in different ways: establish a panel, and have it sit for a period of time, or form a panel only when needed for a specific interpretation, or take a hybrid approach. The hybrid approach may be most flexible, say sitting a core panel of 3 persons to serve a period (year?), and draw from the pool if specific expertise / perspective, beyond the core group, is needed on a specific interpretation question. Ultimately, the format would have to fit with time and resource

constraints. Issues of confidentiality and disclosure of proprietary information would need to be addressed. Having some international expertise / experience could be helpful.

- Establishment of term(s) of service. This would lay out period of time someone is in the pool (maybe 3 years?), how long they can serve on a panel (maybe 1 year?), how many times they can be reappointed to the pool or a panel, reasons / process for dismissal, and so forth.

While the panel / committee approach could be more involved to establish and to manage, as compared with keeping the peer-review process decentralized, the panel approach could carry more weight with BCAs and be viewed as being fairer and more balanced (i.e., not a single person's view).

It is suggested that MBIE consider being the 'owner' of the panel / committee, in partnership with IPENZ and SFPE (and perhaps IFE). It is suggested that participants include engineers with New Zealand design experience, who are no longer practicing, as well as current practitioners. It is suggested that international participation be included, as appropriate to project type.

How Peer Review is addressed in Selected Countries

The manner in which peer reviews are addressed internationally vary widely, but in all cases of which I am aware, a high level of qualifications is needed, and often some type of legislation is in place to help assure the system operates as intended. Some countries, specifically Germany and Singapore, have dedicated reviewers. Germany uses the concept of 'Prüfingenieur fur Bautechnik' (literally, test engineer, or review engineer), which is a dedicated professional who confirms calculations, specifically structural calculations. This is part of a system which requires calculation for risk-significant designs to be checked by a suitably qualified person. This is required by law, and there are requirements around the qualification of professionals. (More can be found here, in German http://www.bvpi.de/). In Singapore, they have a system of 'Accredited Checkers' (see https://www.bca.gov.sg/BuildingControlAct/building_control_ac_regulations.html), which like in Germany, serve the purpose of review calculations and designs. Started for structural engineering, the concept also applies to geotechnical engineering (see) and now has a parallel in fire http://www.scdf.gov.sg/sites/www.scdf.gov.sg/files/Singapore%20Fire%20Safety%20Engineering%20Guidelines%202015_0.pdf (see Ch7 and 8). For structural in particular, there are significant requirements for education and experience, qualifications, and experience. For fire, both a peer reviewer and use of a 'registered fire inspector' is needed for performance-based designs (http://www.scdf.gov.sg/content/scdf_internet/en/building-professionals/fire-safety-permit-and-certification/registered-inspector.html).

In the USA, there is also use of peer review, especially for performance-based design. This is required for alternative (performance-based) seismic design in California (e.g., see Los Angeles requirements, http://www.ladbs.org/docs/default-source/publications/information-bulletins/building-code/alternative-design-procedure-for-seismic-analysis-and-design-of-tall-buildings-and-buildings-utilizing-complex-structural-systems-ib-p-bc2014-123.pdf), and in some jurisdictions, for performance-based fire engineering designs (e.g., see http://www.mass.gov/eopss/docs/dps/8th-edition/9-fire-protection-systems.pdf, Section 901.2, for requirements for 'alternative designs' for fire in Massachusetts), the key aspects of which are excerpted and presented below:

"2. Where alternative fire protection designs, which vary from any prescriptive requirements of this Chapter, are to be utilized, the owner shall engage an independent *registered design professional*, to review said alternative design. The scope of the review shall include, but not be limited to:

a. Design assumptions, methodologies, and resulting proposed system designs, to determine whether or not:
    i. the proposed fire protection systems and any other systems which are affected by the alternative design, are consistent with the general objectives and prescriptive provisions of this Chapter;
    ii. they all conform to accepted engineering practice.
b. Preparation of a written report to the building official as to the appropriateness of the proposed design specifically listing any variances from the prescriptive provisions of this Chapter and describing, in detail, the design provisions used to achieve compliance.

If the reviewing engineer concurs with the proposed design, the owner shall make application for a variance, to the State Building Code Appeals Board as provided in section 113.0. In addition to all supporting information and materials, the reviewing engineering's report required per this exception shall be included in the application for variance. A building permit shall not be issued until the variance, if required, has been granted, or unless the building permit is issued in part per section 107.3.3."

In Massachusetts, a *registered design professional*, is defined as "An individual who is licensed or otherwise authorized to practice their respective design profession as defined by the statutory requirements of the professional registration laws of Massachusetts." Similar definitions exist in other states. In Massachusetts, Fire Protection Engineering is one of the licensed disciplines (see list of disciplines on this page - http://www.mass.gov/ocabr/licensee/dpl-boards/en/, opening paragraph).

There are also guidance documents for independent review of structure, fire and other (e.g., see Connecticut, recommended guidelines for independent structural review - http://b3tg6t0eoc.site.aplus.net/wp-content/uploads/2014/08/SEC-CT-301-Structural-Peer-Review-Guidelines-2008.pdf).

Several countries use an approach where some sort of centralized review committee or panel is used to review designs, adjudicate appeals / variations from Code requirements, etc. This includes some states in Australia, Hong Kong, Japan, and some states in the USA. In Victoria, Australia, the Buildings Appeals Board (http://www.vba.vic.gov.au/disputes-and-resolutions/building-appeals-and-disputes) will consider alternative designs which seem to fall outside of the requirements of the National Construction Code (as adopted in Victoria). In Japan, there are nominally three routes to compliance: prescriptive code (Route A), prescribed-performance (Route B) and full performance (Route C). Full performance (Route C) requires review by a performance verification committee established by the Ministry of Land, Infrastructure Transport and Tourism (MLIT). An overview of the process can be found here (http://www.iafss.org/publications/fss/7/777/view/fss_7-777.pdf), as well as in IRCC documents (www.ircc.info). In the USA, several states require submittal of 'alternative designs' to some type of review board. This is the case for Massachusetts, discussed above, where in addition to having a peer review, the 'approved' design must still be submitted to the State Building Code Appeals Board for final regulatory approval. The make-up of these Boards vary by country, but often

include representation from across the sector, including suitably qualified engineers and academics (academics play a large role in review panels in Hong Kong and Japan, for example).

Annex M – Issues and Suggestions for Fire 'Interpretations'

Discussion: Through the course of discussions with fire engineers and councils in Auckland and Christchurch, it seems quite clear that the fire engineering and regulatory community has significant concerns with interpretations being made, very quickly, by single MBIE staff members, without necessarily due consideration of impacts outside of the specific case for which a question is asked. The following reflects concerns raised and a possible path forward.

The primary issues with interpretations by single staff members at MBIE generally include the following:

- Questions are asked in specific ways, with the hopes of gaining answers that fit specific needs. In many cases, specific interpretations could be helpful if limited to the project in question. However, it has been widely reported that some engineers are taking such interpretations, which are on emails with MBIE letterhead, and presenting them to other councils and/or on other projects as formal (official) MBIE positions. One outcome of this approach is that precedents are being set, whether legally binding or not, that impact the situation of fire engineering design and compliance. Such action by poor actors in the fire safety community seems difficult to control for in the current system (e.g., see discussion in summary papers from discussions with fire engineers on lack of action by IPENZ on poor actors).

- Interpretations are being made that materially impact application of C/VM2, and in some cases have resulted in changes to C/VM2, without any type of transparent consultation or interaction with the community. It has been reported that the situation has gotten to the point where engineers and BCAs are having difficulty understanding what is truly required, versus guidance, versus nonbinding interpretation, etc., as they are presented with emails, FAQs, practice notes, and other forms of 'interpretation.'

While not specifically associated with interpretations, the process of determinations was also highlighted as a concern by many, in particular given the perception that determinations are made by a single person, using a limited pool of consultants, without transparency and significantly broad consideration of the issues. (Note: this concern was not voiced nearly as often as the less formal interpretations that are occurring on a daily or weekly basis.)

There are various approaches MBIE could take to help alleviate these concerns, should they choose to do so. One approach might be to add more staff. However, this does not address the issue as to whether staff alone should be making the decisions. In some jurisdictions, staff does not issue interpretations: those are issued by committees (e.g., standards development arena, building and fire code arena in the USA). Another approach might be to use a consultant to help. However, this does not help the concern of transparency and 'favoritism' in selection of consultants used to assist in decisions. A third option might be to establish some form of industry / sector panel, with a range of interests represented, that would provide input to formal interpretations.

Should MBIE adopt any of these approaches, or variations on the theme, it would be helpful to have a clear and transparent process by which to handle interpretations. In part the lack of such a

process, and the fact that numerous means exist to communicate interpretations (e.g., phone, email, FAQs, practice notes, …), contributes significantly to the concerns.

A formal interpretation process might include several attributes, such as:

- Only requests submitted in writing, with sufficient context to understand the issue and impact of the interpretation, will be considered.
- Should insufficient information be provided, MBIE may reject the request for interpretation or require additional information to be submitted.
- All requests for interpretations will be reviewed by (__), within 10 (20?) business days of acceptance by MBIE, and a formal interpretation will be issued.
- An agreed tracking and determinations reporting system will be used to log requests for interpretations and subsequent action (e.g., what is the question, is it appropriate for interpretation action [i.e., clear request, sufficient information / justification provided, clear understanding of potential impact, …], what decision has been taken, based on what information, and what the final interpretation is).
- All formal responses will be of a common and agreed format (e.g., could be FAQs, but some type of more 'formal' mechanism seems appropriate).
- All responses / interpretations will be posted on the MBIE website in a conspicuous and continuously maintained area.
- A decision will have to be made by MBIE as to the extent to which the collection of interpretations constitutes policy decisions, and how they will be used to inform future changes to the Code, Verification Methods, Compliance Documents, etc.

In the case of a panel, there will also be the need to have a clear and transparent process for selecting and appointing people to serve on the panel. Considerations might include:

- Establishment of an appropriate number of panel participants (large enough to be representative: small enough to function efficiently). Probably a target of 3-5 would be reasonable. There could be a larger pool, from which panelists are drawn, as outlined below.
- Decision on the range of interests which should be represented (e.g., all sectors of the fire industry, only engineers, …). This could depend on the nature of the interpretation being requested.
- Decision on how members are selected. It is suggested that MBIE might identify minimum qualifications (i.e., PEng (Fire) and/or CEng (Fire) for engineers, years of experience in New Zealand, …), put out a call for members to serve, and establish a pool of candidates from which a panel can be formed as needed (the pool might have 20-30 people, but specific panels only 3-5 people). Formation of a panel could be in different ways: establish a panel, and have it sit for a period of time, or form a panel only when needed for a specific interpretation, or take a hybrid approach. The hybrid approach may be most flexible, say sitting a core panel of 3 persons to serve a period (year?), and draw from the pool if specific expertise / perspective, beyond the core group, is needed on a specific interpretation question. Ultimately, the format would have to fit with time and resource constraints. Issues of confidentiality and disclosure of proprietary information would need to be addressed. It has been suggested having some international expertise / experience could be helpful.

- Terms of service. This would lay out period of time someone is in the pool (maybe 3 years?), how long they can serve on a panel (maybe 1 year?), how many times they can be reappointed to the pool or a panel, reasons / process for dismissal, and so forth.
- There will also need to be guidance on scope of interpretation (e.g., what are the limits of the panel, what type of information can they request, etc.), and how confidentiality is addressed.

While the panel approach could be more involved to establish and to manage as compared with adding more staff, the panel approach would likely carry more weight with industry, and be viewed as being more balanced (by the benefit of more input to the decision).

Annex N – Fire Engineering Brief Guidance

Associated with the need to provide guidance on tall building design for fire, there is general internal consensus on the need to provide guidance on the Fire Engineering Brief (FEB), especially since guidance is limited, and going forward, Auckland City Council (ACC) is looking to require an FEB for all C/VM2 and specific designs for fire (tall building and other, as I understand).

As with the guidance in Annex J, Michael Belsham has drafted some FEB guidance. I have included a version below which incorporates my comments. A final version will come from Michael.

Fire Engineering Brief (FEB) Process:

Background

The Fire Engineering Brief (FEB) is a precursor to any fire engineering design to establish the objectives and design methods before detailed analysis takes place. A FEB is a document in which the fire design requirements of key stakeholders are identified, discussed, agreed and recorded. A FEB is required for either Verification Method or Alternative Solution designs.

The purpose of the FEB is to describe the fire safety strategy, describe essential elements, and to serve as a basis for testing options when preparing trial designs. The form of FEB documentation will vary depending on the complexity and scale of the project and the design issues. Good communication with key stakeholders is essential during the FEB development process (the FEB process).The key features of both the FEB communication and documentation are that it is unambiguous, complete (i.e. provided with appropriate context) and recorded in some form for later reference.

Purpose and scope of advisory

This Practice Advisory is to summarise:

- What a FEB is
- What the FEB process for a C/VM2 should entail
- Who the key stakeholders are
- What key stakeholders roles are

Internationally recognised fire engineering process documents such as *The International Fire Engineering Guidelines* (IFEG) provide further guidance for detailed information on the FEB and the FEB process.

What is an FEB?

The Fire Engineering Brief (FEB) is a document that defines the scope of work for the fire engineering analysis, the basis for required analysis, and essential considerations for resulting designs, as agreed by the key stakeholders.

The documentation provides the key stakeholders with an understanding of the design concept so that issues can be identified before the designs are fully developed and therefore avoids the rework and delay.

The goal of the FEB process is to obtain the agreement of the key stakeholders on the design approach. This manages the risk of rework during building consent and commissioning and it allows other members of the design team to progress their individual design packages with a higher degree of confidence.

The objective of the FEB is to capture (a) high level design requirements, (b) performance objectives and criteria, (c) fire scenarios, (d) design basis fires, (e) methods of evaluation, and (f) analytical and computational methods to be applied early in the design phase of a project. These requirements can have significant impact on fire engineering design and need to be established before any detailed modelling is undertaken.

Typical high level issues include

- Location, size and use of the building
- Method of compliance i.e. C/VM2 or Alternative Solution
- Life safety strategy (e.g., full simultaneous evacuation, protect in place, etc.)
- Main escape routes and location of exitways
- Fire protection systems proposed (i.e. provision and extent of sprinklers, fire detection, smoke control, passive systems)
- Firecells and Protection of Other Property
- Structural Fire Resistance
- Fire service approach, water supply and facilities

Performance requirements and criteria

- Begin with what is stated in the Building Code, supplemented by design-specific requirements

Fire scenarios

- For C/VM2 designs, as specified
- For Alternative Solutions, as developed and justified following the IFEG or other internationally recognized guidance

Design basis fires

- For C/VM2 designs, as specified (i.e., growth rate, peak HRR, species yield, etc.)
- For Alternative Solutions, as developed and justified following the IFEG or other internationally recognized guidance

Methods of evaluation

- For C/VM2 designs, as specified (i.e., ASET/RSET and structural fire engineering options)
- For Alternative Solutions, this might be ASET / RSET for life safety, specific structural fire resiliency approaches, risk-based approaches, or other
- For Alternative Solutions, the methods selected need to be justified based on internationally recognized guidance / approaches / theory

Analytical and computational methods to be applied

- For C/VM2 designs, as specified

- For Alternative Solutions, as justified following the such internationally recognized guidance as the SFPE Guidelines on Substantiating a Fire Model for a Given Application, Eurocodes for structural fire engineering, NIST Best Practice Guidelines for Structural Fire Resistance Design, etc.

Other issues which are important to establish at FEB stage are:

- Insurance Requirements for Property Protection
- Requirements of other Agencies (eg. Fire Service, Resource Management, Ministry of Education),
- Storage of Use of Hazardous Goods,
- Stage Evacuation or Complex Locking Arrangements,
- Sprinkler Water Supply i.e. Tank and Pumps and location on site.

The FEB needs to be complete and agreed by all interested parties before progressing into detailed design. Should some stakeholders choose not to participate in the FEB process and therefore not have their input documented in the FEB, this reflects their choice to not be involved in the design or consenting process. Upon completion, the agreed design parameters should not be subject to change later in the project.

What is the purpose of the FEB?

The overarching objective of the FEB is to ensure the design will comply with the building code Clauses C1-C6. For fire safety the three key objectives of these clauses are within NZBC Clause C1 as follows:

(a) safeguard people from an unacceptable risk of injury or illness caused by *fire*,
(b) protect *other property* from damage caused by *fire*, and
(c) facilitate firefighting and rescue operations.

It is important that FEB has satisfactorily address these three key issues before design progresses.

Who is involved in the FEB process?

The FEB should be developed collaboratively by all the relevant stakeholders in the particular project. The stakeholders add value to the overall design process by providing good advice, relevant to that building in a timely fashion. Stakeholders are divided into mandatory and non-mandatory as follows:

Mandatory Stakeholders

- Fire Engineer
- Peer Reviewer
- Architect/Main Consultant
- New Zealand Fire Service (NZFS)
- Building Control Authority (BCA)

Note that the BCA may elect to have a Regulatory Reviewer represent their views for complex projects outside of their expertise.

Non-Mandatory Stakeholders

- Client
- Project Manager
- Other Design Team Members
- Insurer (if known)

What is the role of the stakeholders in the FEB process?

The stakeholders and their required role in the process are reflected in table 1.

Table 1. Stakeholders and Required Roles

Stakeholder	Required Role in FEB Process
Fire engineer – Mandatory participant	The fire engineer should be suitably qualified professional engineer, i.e., a Chartered Professional Engineer (PEng) or, where permitted, a Chartered Engineer, Member Institution of Fire Engineers (CEng) or equivalent The fire engineer shall: develop and document the FEB concept coordinate consultation with stakeholders during the FEB process revise the FEB concept to reflect stakeholder feedback Obtain and record final FEB agreements Where a trial design is found, by analysis, to be unacceptable (it does not meet the objectives or performance requirements) revisit the FEB process.
The Building Consent Authority/ Territorial Authority (BCA) - Mandatory Participant	BCA provides approval of the FEB and needs to be satisfied on reasonable grounds all stakeholder input is included. Confirm that the correct sections of the Act are applied and that the relevant Clauses of the Building Code are to be met. Provide any input to the concept design as deemed fit. Determine if the designer and peer reviewer are suitably qualified and confirm is producer statements are required.
The New Zealand Fire Service - Mandatory Participant	Confirm if the proposals described in the fire-fighting facilities checklist meet the NZFS operational needs, including; Fire-fighting water supply, access to site and buildings, Fire Alarm Panel and Fire Systems Centre (if applicable)
The peer reviewer - Mandatory Participant where BCA/TA discharges this duty	Undertake a technical review of the fire engineering design concept, and provide feedback and comment to the design. Confirm if PS2 producer statement is going to be provided.
The Project Manager – recommended participant	Confirm that the design concept meets the projects needs and ensure that all relevant members of the design team are aware of the FEB concept design elements that impact them.
The Developer /	Confirm that the design concept reflects the owner's needs and end user

Stakeholder	Required Role in FEB Process
Building Owner, Building manager, Special interest groups (e.g. user groups) – optional participants	or operator. Confirm building use, occupancy, storage heights, etc., period of validity of these parameters, and associated facility- and operations-related assumptions, as stated in the concept design, accurately reflect proposed use. Responsibility for impacts associated with failure to provide accurate information about use, materials, operations, etc. of the in-use facility rests with the Developer / Owner (e.g., should incomplete / inaccurate information facilitate redesign or additional fire safety features, or result in fire-related impacts, etc.).
The balance of the design team - recommended participants	Confirm that the FEB concept and base assumptions are compatible with own discipline concept design and base assumptions e.g. structural solutions, fire protection systems, architectural features etc. Note: structural engineers retain responsibility for stability of structure during and after fire as per B1 of the Building Code.
Insurance Representative – optional participant	Provides any additional requirements for the insurers needs, such as property protection or business continuity.

What should the FEB Report contain?

The FEB report communicates the fire engineering concept design. While C/VM2 prescribes scenarios for testing, design parameters and acceptance criteria that must not be varied, there are many design assumptions, inputs and analysis tool choices to be made by the design engineer and communicated in the FEB for each project.

Note that full FEB is not required for all projects and for some simple projects a short FEB would suffice. The suggested content of FEB for various sizes of projects is described in the table.

The FEB is agreed to by the stakeholders, including the fire engineer, and should be signed by app participants as a record of the agreement.

The fire engineer then has the basis for the design, which should help in the timely, cost-effective delivery of a design that meets legal and any stakeholder requirements. The FEB does not restrict the fire engineer in developing the design to meet the agreed needs of the stakeholders in any way. It serves to inform the fire engineer of the wishes and the needs of the stakeholders and provides agreed criteria.

When are FEB meetings required?

For complex designs the most expedient way to confirm the FEB concept design is to have all stakeholders meet simultaneously to discuss the design concept.

For more well defined design problems an email trial may be a more expedient way to gain consensus amongst stakeholders, here all correspondence should be copied to the mandatory stakeholders (listed in table 1) and any other relevant stakeholders.

What should a technical review of the FEB concept entail?

This process is for stakeholders to ask questions to better understand the concept and comment on the trial design solutions proposed by the fire engineering designer. This ensures independence of review in their respective roles in the consent process.

Those stakeholders whose role requires them to undertake a technical review of the fire engineering design concept should ensure that they have enough information to have an understanding of the works and the proposed fire engineering design concept.

Is Agreement of the FEB Design concept required?

Yes. All stakeholders should provide written feedback on the FEB content. This feedback must relate to Building Code compliance including base assumptions about the building geometry and use. It may also relate to other objectives however objectives that exceed the requirements of the buildings code shall be clearly identified such that they do not hold up the Building consent process. Only the BCA can accept that FEB is complete and addresses views of all stakeholders. Should some stakeholders choose not to participate in the FEB process and therefore not have their input documented in the FEB, this reflects their choice to not be involved in the design or consenting process. Upon completion, the agreed design parameters should not be subject to change later in the project.

These items relating to Building code compliance should be resolved before the detailed design is progressed to the consent stage.

What type of FEB is required?

For a fire engineering analysis that considers a simple departure from compliance document the FEB might be a short document however for large and / or complex projects the FEB could be a major document.

The form of FEB documentation will vary depending on the complexity and scale of the project and the design issues. There are three levels of FEB documentation as follows:

Simplified Qualitative FEB

This is a simple description of the project outlining the high level issues to be resolved by a qualitative assessment. These designs do not require modelling and fire engineering methods are to be developed qualitative. Typical building are low rise non-sleeping use where issues to be tested by fire engineering analysis are simple. This process requires a short description of the building and the fire engineering issues to be resolved. The document outlines building, occupants, location on site and general fire safety systems and any known hazards. An example is large glasshouse, crop covering or cold storage.

<u>Simplified Quantitative FEB</u>

This is typical FEB required for C/VM2 designs where there are multiple fire engineering issues. The design will typically require modelling where the type of model and input data are defined in the C/VM2. The building needs to be fully described with the occupant profiles and intended use. The design fire locations should be determined for Design Scenarios and access and facilities for fire-fighting. This process does not require trial design.

Full FEB (to IFEG or other)

This FEB is for complex projects of mixed use where comprehensive FEB is required to determine all fire engineering issues. This typically required complex modelling where inputs and geometry needs to be determined for series of scenarios are developed. This method would require a meeting between main stakeholders to discuss the issues. The report should provide full risk assessment of fire hazards and proposed mitigation. The occupant load and fire separations need to be established to allow the design fire to be tested in this process. The document will need to go into the modelling geometry details of doors that assumed open or closed and agree the passage of smoke from each design scenario.

Checklist for FEB

	Simple Qualitative FEB	Simple Quantitative FEB	Full FEB
C/VM2 or Alternative Solution	X	X	X
Building Description	X	X	X
Occupant Characteristics	X		X
Occupant Density		X	X
Occupant Loads			X
Building Size & Geometry	X	X	X
Location on Site	X	X	X
Fire Safety Systems	X	X	X
Fire Ratings	X	X	X
Fire Separations		X	X
Fire Service Access & Water Supply	X	X	X
Fire Fighting Facilities		X	X
Fire Hazards	X	X	X
Fire Risk Assessment			X
Design Fire Locations		X	X
Acceptance Criteria		X	X
Modelling Tools		X	X
Model Inputs		X	X
Modelling Geometry			X
Trail Design Fire Scenario			X

Annex O – Considerations for C Clauses

With the changes in 2012, quantitative criteria were added to some of the C Clauses (Fire). Unfortunately, these criteria were of different type and level of specificity from one clause to another. Furthermore, there were other changes to the code which seemed inconsistent from one clause to another, and with respect to the C/VM2.

I was asked to comment on this in October 2014 as part of the fire programme review at that time. Below are the comments / questions about the C clauses that I provided at that time. I have added some additional comments / clarifications based on further consideration, including during this visit. These additional comments are in parentheses with text in italics.

Relationship between Clauses A1, A3, B, C and F6

It appears as if there were changes made to various clauses without checking relationships between them and consistency between them. For example:

- There should be a close relationship between Classified Uses (A1) and Building Importance Levels (A3), yet there are building uses in A3 not defined, or which use different terminology, as compared with A1. Some of these are perhaps minor (college versus secondary school?) while some seem more critical (how does A1 define 'health care facilities' as used in A3?
- There should be a close relationship between how risk is used as a basis for Building Importance Levels (A3) and how risk groups are used / defined in F6. It is confusing to have different risk characterizations for different parts of the code, especially when they overlap (risk with respect to egress, and lighting for paths of egress).
- Is the 'place of safety' definition what is intended? The way I read it, if you have a building with numerous fire cells, and the building is fully sprinklered, one only needs to get occupants out of the fire cell of origin, and then occupants have reached a place of safety. Is this correct? If so, why all the detailed calculations in the verification method? If not, what do you really mean?
- There should be a strong parallel – and deviation only when justified – between Clauses B1 and C6, since fire is a load in B1 and structural response to fire is described in C6. As is – which clause has priority if competing criteria, loads or verification methods are put forward? (*Note: This issue has been discussed during my current visit, and it is being addressed by the Structural Fire Engineering Working Group. There seems to be agreement within the WG and within MBIE that the project structural engineer should have responsibility for assuring structural stability during and after fire. Details of how this will work, and whether code changes are needed, have yet to be decided. Ultimately, I would recommend that MBIE consider removing requirements for structural stability during fire from the C clauses (C6) and making it more explicit, if necessary, in B1.*)

Clause C1

In C.1.(a), what is an 'acceptable' risk? If not defined, how does one estimate / calculate / measure 'unacceptable risk? This is critical not only for benchmarking and assessment, but in that it should

be clear how all subsequent functional requirements and performance objectives work to this objective. (It may be that this should be through A3 but it is not clear.) (*Note: The issues of how to address 'risk' in the building code, and how to align Importance Levels, remain issues of concern, not only in the C clauses, but across the code.*)

Clause C2

In C2:

- C.2.1 seems incorrect. Should it not be that the objective is to reduce the likelihood of fire initiating from the fixed appliance, or from illness occurring due to improper installation of the appliance? As written, fire could be anywhere, including as an integral part of a properly functioning heating appliance.
- C.2.2 should read at the end, 'must not exceed 90C as a result of the fixed appliance'? The temperature rise should be tied to the appliance, yes?
- C.2.3 reads as appropriate to me.

Clause C3

In C3:

- General: there does not appear to be any functional requirement associated with interior surface flames spread: requirements seem to be for fire effects 'away' from the fire source (C.3.1) regardless of transport mechanism, exterior vertical fire spread (C.3.2) and horizontal or vertical fire spread across a property boundary (C.3.3). It is really hard to read 'surface flame spread' into C.3.1, if that was the intent.
- In C.3.1, what does 'close proximity' mean: adjacent to with no intervening barrier, or within 0.5 m (even if on the other side of a door), or?
- There is no connection between C.3.4 (a) and any functional requirement. Also, it would be good to state criteria and not material groups, and some tie to F6 should be provided. (*Note: The issue of material groups has been the focus of a working group and has been discussed extensively. As noted earlier in this report, it is my view that the criteria are acceptable as is, and that more detail is required around definition of the term 'crowd' so as to assure the limitation on combustible lining is associated with risk to large numbers of occupants (as the term crowd typically refers to) as compared with as few as two people, which is how the code can currently be interpreted. By better defining crowd, and perhaps placing some limiting language in the code, this issue seems like it can be reasonably resolved.*)
- There is no connection between C.3.4 (b) and any functional requirement. Criteria are good; however, should it be worded to the effect that materials should not ignite when exposed to these radiant flux levels or lower levels?
- What is the basis and criteria for C.3.4.(c)?
- C.3.5 reads as appropriate to me.

- C.3.6 reads as appropriate to me.
- C.3.7 reads as appropriate to me.
- C.3.8 is confusing. Is the intent to say provide smoke vents / smoke exhaust for non-sprinklered spaces?
- Should not C.3.9 be worded something to the effect that if installed fire safety systems are used to control the spread of fire, then consequences of a failure of those systems needs to be taken into account? Also, if one has a fully sprinklered building, why are there even surface flame spread restrictions on materials (C.3.4.(a)), especially if you also have 'robustness' scenarios to apply during the application of the verification method (is this a double hit)?

Clause C4

In C4:

- C.4.1 (a) reads as appropriate to me.
- C.4.1 (b) references F6), which is good, but how tied to A3 (this risk and importance level issue)?
- C.4.2 reads poorly to me. Is means of escape only in case of fire? If so, the clause should say so. If not, what about earthquake, flood, wind and other hazards, and impacts due to collapsed stairs, walls, dropped ceiling tiles, broken windows, …? Should tie to Clause B.1.
- C.4.3 reads poorly. There should be some recognition that these are 'design' or 'calculated' (or 'required') egress times, and shouldn't it say that the building and its fire safety systems should be designed to facilitate movement to a place of safety? Should there be a time component to (a), (b) or (c) in the code (c in particular)? (*Note: To the latter point, discussion has been held during this visit that the criteria are thresholds and result in 'lines in the sand.' The FED CO and Thermal include a factor of safety (0.3 as opposed to 1.0). The Visibility criteria does not, and it is here in particular that a time component might be helpful. The issue of the C/VM2 allowing momentary smoke entry into a stairway during modelling, and the difference in zone modelling (uniform smoke layer) and computational fluid dynamics modelling (variable smoke concentrations) could be addressed with some guidance on time averaging or similar.*)
- C.4.4 reads as appropriate to me. (*Note: The value of 1000 persons seems to be arbitrary, and while I understand the background, the value might be reconsidered, or at a minimum, commentary about this provision and why it exists should be published. This comment has been made in the body of the report as well.*)
- For C.4.5, see comment on C.3.9 (same concept).

Clause C5

In C5:

- C.5.1 reads as appropriate to me.
- C.5.2 reads as problematic to me. Should it not be focused on environment that is unacceptable in terms of personal protection equipment (PPE) or other measures? As is, there is no difference between protection of fire fighters and protection of occupants, which does not seem appropriate to higher risks tolerated by the fire service in conduct of their duty.
- C.5.3 reads as appropriate to me (tied to C.5.1).
- C.5.4 reads as appropriate to me (tied to C.5.1).
- C.5.5 reads as appropriate to me (tied to C.5.1).
- In C.5.6, under what conditions? 40 minutes? 60 minutes? 180 minutes? Seems to need time component. (*Note: This clause is problematic with respect to the C/VM2 and the issues of structural design for fire. It is my view that the C/VM2 does the fire service a disservice by saying that 20 minutes fire resistance rating, or any value calculated using the time equivalence method – without a factor of safety – is appropriate. This carries into C6 as well. This issue is under review, at least with respect to C/VM2 and the roles of structural engineers and fire engineers.*)
- C.5.7 reads as appropriate to me (tied to C.5.1).
- For C.5.8, see comment on C.3.9 (same concept).

<u>Clause C6</u>

In C6: (*Note: The issue of who should be responsible for assuring structural stability during and after fire has been discussed during my current visit, is being addressed in the Structural Fire Engineering Working Group. It seems generally agreed that the fire engineer should assess and quantify the fire environment (e.g., fire load, temperatures generated, duration, etc.) and provide that information to the structural engineer, who under B1, will assess the stability and capacity of the structure to withstand the fire to meet these objectives. Going forward, it is worth considering (a) whether the C6 clauses should be moved to B1, or (b) if the language is even necessary in B1, since the structural engineer needs to design for stability during and after fire. Should MBIE decide to undertake a comprehensive assessment and restructuring of the Code, this item should be addressed as part of that effort.*)

- C.6.1 should match B.1.1 – why are they different? B.1 includes fire loads. Should be consistent unless absolutely necessary to deviate, and if deviation is needed, rationale should be stated.
- C.6.2 reads well. Might it be good to tie to compartment (fire cell) burnout, or fuel loads (FLED)? Could be good criteria to add to the code?
- In C.6.3, if in a wooden structure, the stair enclosure is load bearing, does that mean the stairway and enclosure must be noncombustible? Not clear.

- C.6.4 reads as appropriate to me

Clause F6

I would suggest this clause be considered as part of the overall review, and in particular, the risk groups be addressed / aligned with importance levels as identified above.

(End of section from 2014 review.)

I do not have particularly much to add to the assessment of the C clauses, based on discussions during this visit, other than as noted above. In brief, although some changes could be beneficial, the criteria have proven to be workable, and I recommend that the criteria stay in the code. This is particularly important given the variability in competence and qualifications in the market, the trend by many to be 'code lawyers' instead of engineers (looking for ways around provisions rather than in delivering well-performing buildings), the 'friendly relationship' between engineers and peer-reviewers, and the BCAs being largely focused more on manging their liability than helping to deliver well-performing buildings. Given this situation, removing the criteria from the code could lead to bad behaviour by bad actors in the market, which could then lead to unsafe buildings.

In closing, I will again note that I believe it would be helpful to the market for MBIE to take decisions on: (a) should criteria be in the Code or in lower tier documents (e.g., Acceptable Solutions, Verification Methods, Reference Standards, Guidance), (b) should there be a consistent approach to presenting criteria in the code, and (c) and should there be a common basis for the criteria (e.g., risk to life or some other safety objective). The fact that there is not common approach across the code can result in problems.

Annex P – 2015 Fire Regulation Development Programme[1]

In late 2014, a review of the fire regulation changes implemented in 2012 was undertaken to determine if any adjustments are needed, and how MBIE can support industry in terms of adapting to the changes. The review utilised feedback from an extensive stakeholder engagement process, guidance from international fire experts, and a critical review and assessment of the 2012 changes. The review identified issues that need to be addressed and the Fire Regulation Development Programme has been developed in response. The programme is made up of 14 projects and the following brief outlines a short description of each project. Stakeholders will have multiple opportunities to provide input and become informed during delivery of each project. More information about these opportunities will be outlined as each package is released.

Projects

1. Fire Safety Requirements for Community Care Housing
2. As Near As Reasonably Practicable (ANARP) Decisions for Fire Safety Requirements
3. Material Group Numbers – Timber Linings
4. MBIE and New Zealand Fire Service (NZFS) Partnership
5. MBIE Guidance and Information
6. Re-Introduction of Alternative Solutions
7. Errors and Inconsistencies in Acceptable Solutions C/AS1-7
8. Change from Purpose Groups to Risk Groups
9. Design and Consenting for Classes of Specialist Buildings
10. Stability of Structural Systems During and After Fire
11. Evacuation for Persons with Disabilities
12. Passive Fire Protection
13. Construction Monitoring and Post Construction Compliance
14. Alignment with other Acts and Regulations

Project Descriptions

1. Fire safety requirements for Community Care Housing

In 2014, an amendment to the Acceptable Solution C/AS3 bought Community Care Housing under the new Risk Group Care or Detention. The fire safety measures required under C/AS3 are calibrated to the highest risk buildings in the Risk Group (hospitals), without regard to management structures or the nature of Community Care Housing in a normal residential setting. The amendment has created issues for the sector with Building Code compliance, and the provision of supported living in a normal residential setting with the appropriate fire safety measures.

MBIE will work with service providers, housing provides, funders (MoH) and the disability sector to recommend appropriate fire safety provisions for Community Care Housing.

2. As Near As Reasonably Practicable (ANARP) decisions for fire safety requirements.

There was significant stakeholder feedback that ANARP decisions are more difficult following the 2012 changes for alterations to existing buildings. The consequence has caused uncertainty for

[1] Direct reprint from MBIE Fire Regulation Development Programme document.

building owners, designers and BCAs resulting in delays, building upgrades not proceeding, illegal work and additional costs.

This project will develop guidance along with worked examples to support better quality ANARP decisions for fire safety measures. This will be further supported by workshops and training for designers, fire engineers and BCAs.

3. Material Group Numbers – timber linings

The way the spread of fire requirements were included in the revised Building Code Clause C 3.4(a) in 2012 is too restrictive and has particularly affected the use of timber linings.

The project will review Code Clause C3.4 and then investigate if possible alternative ways to specify performance levels that enable different solutions to achieve the performance standard and maintain the level of rigour of fire spread for surface finishes.

4. Partnership with the New Zealand Fire Service (NZFS)

Stakeholder feedback from the Fire Review identified a number of issues relating to the role of NZFS in the building regulatory system including:

- The standing of NZFS advice in the consenting process
- When should fire designs be referred to the NZFS for review
- Need for better alignment between fire safety features in buildings, the evacuation scheme, the Building Warrant of Fitness (BWOF) and firefighting requirements
- How MBIE and industry can improve the effectiveness of the Fire Engineering Brief (FEB) process.

The Building Act outlines a role for the NZFS in the consent process; being to provide non-binding advice on design for evacuation and firefighting.

Issues raised by stakeholders about the NZFS' role in the building regulatory system will be addressed by MBIE and NZFS, working in partnership with industry stakeholders.

5. MBIE Guidance and Advice

MBIE proactively provides a significant amount of Guidance and advice and in response to queries raised by BCAs and other parts of the sector. Previous research showed that this is highly valued. Guidance, advice and information are delivered in a number of different forms and via various channels however, it can be hard to find on the website.

The flow of information between MBIE, the sector and BCAs is critical to the effective functioning of the regulatory system. The project objective is to ensure BCAs and the sector can easily access the information they need and then receive prompt, consistent responses to queries.

6. Re-Introduction of Alternative Solutions

The 2012 changes limited the use of Alternative Solutions and promoted the Verification Method C/VM2 to introduce consistency and increased rigour into fire engineering design.

The 2012 changes resulted in a restrictive approach and the system settings that govern the use of Acceptable Solutions, the new Verification Method and Alternative Solutions need to be adjusted. In particular, Alternative Solutions need to be re-introduced, whilst ensuring the quality of fire designs is maintained.

7. Errors and inconsistencies in Acceptable Solutions C/AS1-7

Feedback from stakeholders noted the change from a single Acceptable Solution (C/AS1) to seven Acceptable Solutions (C/AS1-7) has resulted in a number of errors and inconsistencies. This change also introduced new terms which are not well defined, and the commentary also conflicts with the text of C/AS1-7.

The documents will be reviewed as a whole and the updated commentary will be completed.

8. Change from Purpose Groups to Risk Groups

The change from 16 Purpose Groups to Seven Risks Groups has unintentionally created complexity to the way in which acts that require a change of use are categorised within the building regulatory system for fire. This has made it difficult for end users to understand and apply the regulatory requirements correctly. The activity use groups that apply for the Change of Use regulations no longer align with the new Risk Groups, creating further difficulty for users trying to determine if a Change of Use has occurred.

The project will review the way in which the categorisation system is currently applied and will recommend improvements and/or how they can be rationalised. Guidance will then be developed to assist users to navigate the building categorisation systems as they apply to fire.

9. Design and consenting for classes of specialist buildings

The 2012 changes removed Prison Buildings from the Acceptable Solutions. Additionally, the introduction of the Verification Method incurred an increased cost for fire engineering design for Fire Stations being upgraded to meet seismic standards. Corrections and NZFS have developed design manuals for fire safety for their specialist buildings to meet Building Code requirements.

The project will develop guidance to support the design manuals as Alternative Solutions to meet Building Code requirements. The project will also investigate if this approach is suitable to apply to other classes of specialist buildings.

10. Stability of structural systems during and after fire

The 2012 changes amended the Building Code Clause C6 Structural Stability during and after a fire and also changed the requirements in the Acceptable Solutions for structural stability. These changes created uncertainty about the requirements for structural stability for housing and warehouses. The linkages between Building Code Clauses B1, C6 and B1/VM1 and C/VM2 need to be investigated.

MBIE will review the structural stability requirements during and after fire and align the different requirements.

11. Evacuation for persons with disabilities

The 2012 changes did not specifically address requirements for additional features to assist with the evacuation of people with disabilities.

The project will recommend how the evacuation of persons with disabilities should be factored in to the fire safety measures required under the Building Act and Building Code. This will also be linked with any requirements from the broader access review that is currently underway within the Office of Disability Issues (ODI).

12. Passive fire protection

There was significant stakeholder feedback about the lack of adequate passive fire protection measures in construction and maintenance of commercial buildings. Stakeholders indicated significant concern about the correct specification, installation, inspection and maintenance of passive fire protection features. The sector has requested guidance on passive fire protection systems and fire stopping systems. There are several product specific installation guides, but no Code of Practice for fire stopping.

The project objective is to increase knowledge about correct passive fire protection measures and improve the quality of construction and maintenance of passive fire protection systems in buildings.

13. Construction monitoring and post-construction compliance

The 2012 changes did not directly affect construction monitoring or post construction compliance; however a number of issues were raised by industry stakeholders about both. This included uncertainty around the process to secure a Code Compliance Certificate and requirements for ongoing inspections and maintenance of buildings under the BWOF system. Stakeholders indicated that building owners often lack, lose or never receive critical information regarding specific fire design parameters and other building design features contributing to the building's compliance at the time of construction.

The project objective is to improve the quality of information, inspection and auditing to ensure buildings continue to perform at the standard when they were constructed.

14. Alignment with other Acts and Regulations

Stakeholders highlighted the difficulty in ensuring fire designs comply with overlapping legislation and regulations including; the Resource Management Act, the Hazard Substances and New Organisms Act, the Fire Service Act and the Building Act. The relationships between the different legislation and regulations that relate to fire are also not well understood.

The project will investigate possible opportunities to better align the different Acts and regulations. Guidance on how to navigate the requirements under the different legislation and regulations will also be developed.