

Reference : Merry A, Spearpoint M J. The New Zealand Building Act 2004 and the involvement of the New Zealand Fire Service. Proc. 7th International Conference on Performance-Based Codes and Fire Safety Design Methods, Auckland, New Zealand, pp.47-58, 2008. http://www.sfpe.org/upload/conference_program_updated_012408.pdf

The Building Act 2004 and the New Zealand Fire Service

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BACKGROUND

Prior to 1992, fire safety regulations in New Zealand operated under a prescriptive regime. Such prescriptive requirements provided direct guidance in specific terms for those designing buildings and in effect dictated design criteria.

In December 1991 a new Building Act was passed in law, replacing the existing prescriptive fire safety code, NZ Standard 1900, Chapter 5¹. In doing so, it allowed for performance-based design to be carried out for the first time in New Zealand's history and offered designers a less restrictive design environment.

The changes implemented in 1991 also set out mandatory performance requirements in the Building Code² that must be complied with by the designer. Those relating to fire safety are outlined in the C clauses and contain four categories: C1 Outbreak of fire, C2 Means of escape, C3 Spread of fire and C4 Structural stability during fire.

Assessing compliance with these performance requirements and their enforcement lies with the Building Consent Authorities (BCA's), formerly known as Territorial Authorities (TA's). They must be satisfied on reasonable grounds that the provisions of the Building Code would be met if the building work was completed in accordance with the plans and specifications submitted with the building consent application. At the discretion of the BCA, a performance-based design can be passed to an independent fire engineer for peer review, prior to the BCA issuing consent.

WHY A NEW BUILDING ACT?

The new Building Act³ came into force on 30 November 2004 and was introduced to improve building controls and building practices in the New Zealand building industry. In essence, its introduction largely arose due to the systemic failures in the building control processes that played a significant role in facilitating the “leaky buildings” crisis. The new Act intended to ensure that buildings are designed and built correctly the first time. It also seeks to improve the quality of decisions made throughout the design and building processes by introducing a new framework for regulating building work and by establishing a licensing regime for building practitioners.

In addition, there were perceived conflicts between the requirements of the Fire Service Act⁴ and the Building Act 1991. The Building Act 1991 modified the responsibilities of the New Zealand Fire Service (NZFS) under the Fire Service Act. This then required building owners to lodge an evacuation scheme with the NZFS. This however, was only required 30 days following a code compliance certificate being issued for the building. Difficulties then arose for the Fire Service in processing evacuation schemes due to concerns relating to non-compliance and inadequate building work.

Although the Fire Service had and still does have the statutory obligation to notify the BCA’s of non-compliant building work via Section 29(5) of the Fire Service Act, the only other avenue available to challenge the fire design process was to seek a determination under Section 17 of the Building Act 1991. A determination is a decision made by the Chief Executive of the Department of Building and Housing (formerly the Building Industry Authority (BIA)) on a technical matter of doubt or dispute which is legally binding on the parties involved unless overruled by an appeal to the High Court on a question of law. This process however, is a time-consuming and costly one.

In February 2002, the Hunn Group⁵ were commissioned to investigate the issues relating to the leaky building syndrome. Part of the terms of reference included an investigation into whether the weather tightness failures were due to deficiencies in the Building Act and regulations or to the way in which they were administered.

Some of the findings included: that there were features of the Building Act and Code that were deficient and have contributed to the leaky building problem; and that the scope of the Government’s review of the Building Act at the time be broadened to address these features and to explore how the Building Industry Authority should be structured to best achieve the purposes of the Act.

Following on from the findings of the Hunn report, the Government shifted the responsibility for the policy and regulatory functions from the Department of Internal Affairs to the Ministry of Economic Development (MED).

NZFS INVOLVEMENT IN THE BUILDING ACT 2004

The main reasons for the inclusion of the New Zealand Fire Service Commission (the ‘Commission’) in the Building Act 2004 were (a) to remove the risk of the Commission taking a determination, thereby improving certainty for the building industry, (b) to ensure departures from the compliance documents in terms of facilities for fire fighting were

approved by the Commission and not a Building Control Authority (BCA), and (c) to streamline the approval process for evacuation schemes as required by the Fire Service Act.

In effect, incorporating the NZFS into the Building Act was to create better linkages between the Building Act and the Fire Service Act. Under the Fire Service Act, the NZFS has the function of promoting fire safety and in addition, the National Commander of the NZFS has the function of approving evacuation schemes for certain buildings. Both of these functions relate to the requirements of the Building Act and are primarily concerned with ensuring that people can escape from a building safely and firefighters who enter a building for the purposes of rescue or firefighting operations, are adequately protected.

The Building Act 2004 now provides for Fire Service input in the building consent process. Sections 46, 47 and 48 specifically relate to this involvement. Section 47 allows for the Commission to provide advice to the BCA on the fire engineering design of selected buildings and to provide a memorandum setting out that advice. Specifically this advice relates to (a) provisions for means of escape from fire, (b) the needs of persons who are authorised by law to enter the building to undertake fire fighting.

The selected buildings to be reviewed were outlined by the Chief Executive of the Department of Building and Housing via Gazette Notice 56. This notice relates to buildings that may require an Evacuation Scheme pursuant to Section 21 A of the Fire Service Act in which the applicant proposes to demonstrate compliance by means of a performance-based design. A Gazette notice is not a regulation. It has legal effect and must be complied with, but it is not part of a statute (Act).

Once the buildings, as outlined by the Gazette notice have been sent to the NZFS, the BCA's must then have regard for any advice received when making a decision whether to grant Building Consent or not. Under the Act, advice provided by the NZFS does not entitle them to have any role in the final decision making process of whether in their view, a building consent should be granted or not. The sole decision maker is the BCA and it can choose to accept or ignore any advice received from the NZFS. However, no mechanism currently exists that provides feedback to the NZFS on the action taken by the BCA's in relation to the advice given by the NZFS.

ENGINEERING FUNCTION WITHIN THE NZFS AND THE DESIGN REVIEW UNIT (DRU)

The NZFS is split into eight fire regions and each region is overseen by its own management team. Fire engineering within the NZFS prior to the changes to the Building Act in 2004, provided technical support to each region's management by means of a regionally based fire engineer. Fire engineers reported directly to their region's senior management.

With the Building Act changes imminent, and to provide more effective and integrated engineering support to the NZFS, the engineering function was reformed to fit a nationalised structure. Regional fire engineers were maintained in their geographical positions but now reported through the national Fire Engineering Manager, through to the Director of Engineering, Information, Research and Strategic Analysis (EIRSA) at Fire Service national head quarters, Wellington.

In addition, response to the 2004 legislative changes saw the Commission establish the Design Review Unit (DRU), in order to discharge its obligations under sections 46 and 47 of the Building Act. This unit began operation in April 2005 and work is received and processed from their office in Auckland.

The memoranda issued by the DRU under these sections, is required to be provided to the BCA's within 10 working days, otherwise the BCA can determine the application without further input from the NZFS. In addition, the memoranda must not set out advice that provides for a building to meet performance criteria that exceed the requirements of the Building Code.

The DRU charge for its work but this is done so on a cost recovery basis only with no provision for profit. BCA's are invoiced for the work performed by the DRU engineers. These charges are based on an hourly rate for the time spent in terms of Section 47C(1) of the Fire Service Act. In effect, this rate comprises direct labour costs, administration, facility charges and other direct overheads. Audit New Zealand have also reviewed these charges, ensuring they comply with Public Sector guidelines on Crown Entity charges. The BCA in turn re-invoice the client and this is effectively added to the costs of processing the building consent by the BCA. Overall, the DRU accounts for about 30 – 40% of the entire NZFS's annual engineering budget.

The engineering function within the NZFS is split between the DRU, regional support functions, and local and national project work. The team operates on a rotation basis, with engineers performing DRU, regional support and project work. Regional engineers also provide DRU support should the need arise. Entering the engineering team in NZFS is now done through three streams; at technician level where a candidate possesses no formal technical qualification; at fire engineer level with a formal qualification in fire engineering and at senior fire engineer level, where the candidate would possess a Masters degree in fire engineering and several years of technical and management experience. The NZFS supports staff interested in gaining further technical experience and assists them in studying for their Masters degree in fire engineering at the University of Canterbury, Christchurch.

In addition to the DRU and regional support work, the fire engineering team represent the Fire Service on various national standard committees including: NZ 4541 (Automatic fire sprinkler systems), NZ 4503 (Hand-operated fire fighting equipment), NZ 4509 (Fire fighting Water Supplies), NZ 4510 (Rising Main Systems for Buildings), NZ 4512 technical committee (Fire detection and alarm systems in buildings), and the recent Department of Building and Housing review of the provisions for F6, Lighting for Emergency.

A DECLINE IN PERFORMANCE-BASED DESIGN IN NEW ZEALAND?

At the time of writing, the DRU had been operating for 34 months. To date, the DRU have provided in excess of 1,900 memoranda to the 57 BCA's throughout New Zealand and the statutory timeline of 10 days has not been exceeded. One of the objectives of this work was to see whether the changes brought about by the Building Act 2004 had any impact on performance-based design in New Zealand. To determine whether this has been the case or not, data collected by the DRU regarding the numbers of building consents received were looked at. In addition, a questionnaire was sent to consulting fire engineers around the country. Part of this questionnaire asked individuals to indicate the levels of performance-

based versus prescriptive design that they have carried out before and after changes to the Building Act came into existence in 2004. Results of this questionnaire are referred to below. Further details can be found in the report by Merry⁶. Figure 1 shows a monthly breakdown of the number of building consents received by the DRU since it began operating.

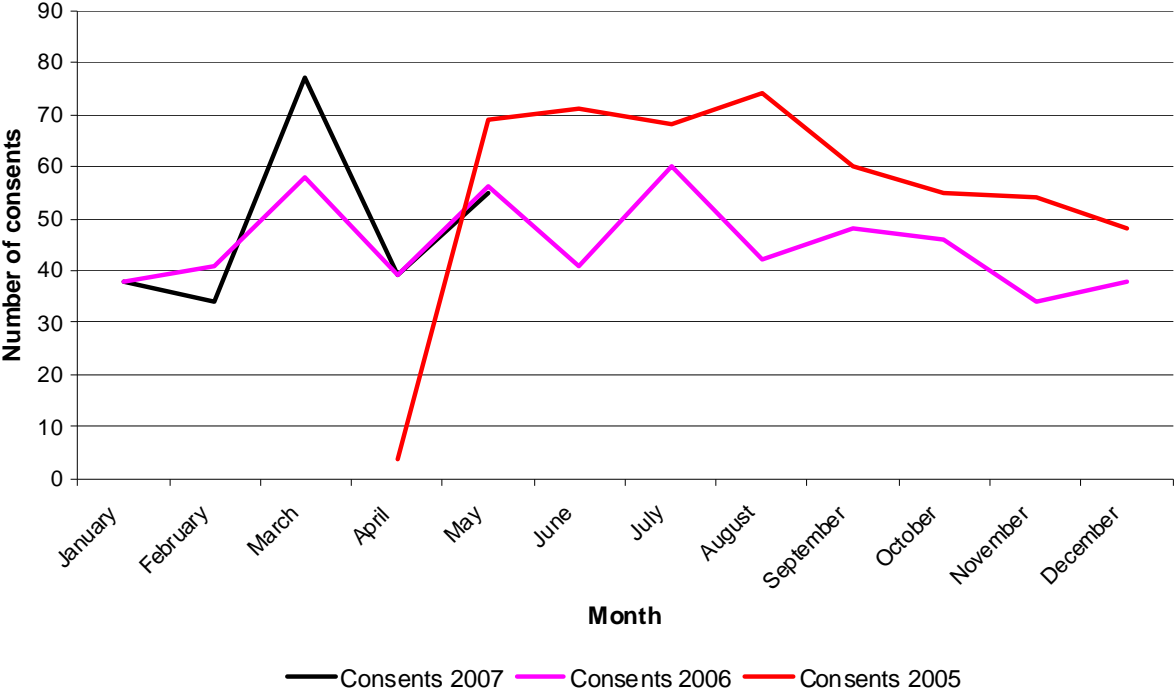


Figure 1: Total number of consents for New Zealand by month⁷

The monthly figures refer to the total number of building consents forwarded to the DRU by all of the BCA’s throughout New Zealand. Although a relatively short timeframe has elapsed, a clear decline in numbers is evident between April 2005 and December 2006. Breakdowns for the three main centres of Auckland, Wellington and Christchurch can be seen in Figures, 2, 3 and 4. These also show a similar decline with Auckland and Wellington regions showing more consistency in this decline than that of Christchurch. The numbers of consents received from Christchurch appears unusually low compared with the other smaller, metropolitan councils and given the level of construction activity and the size of the population base.

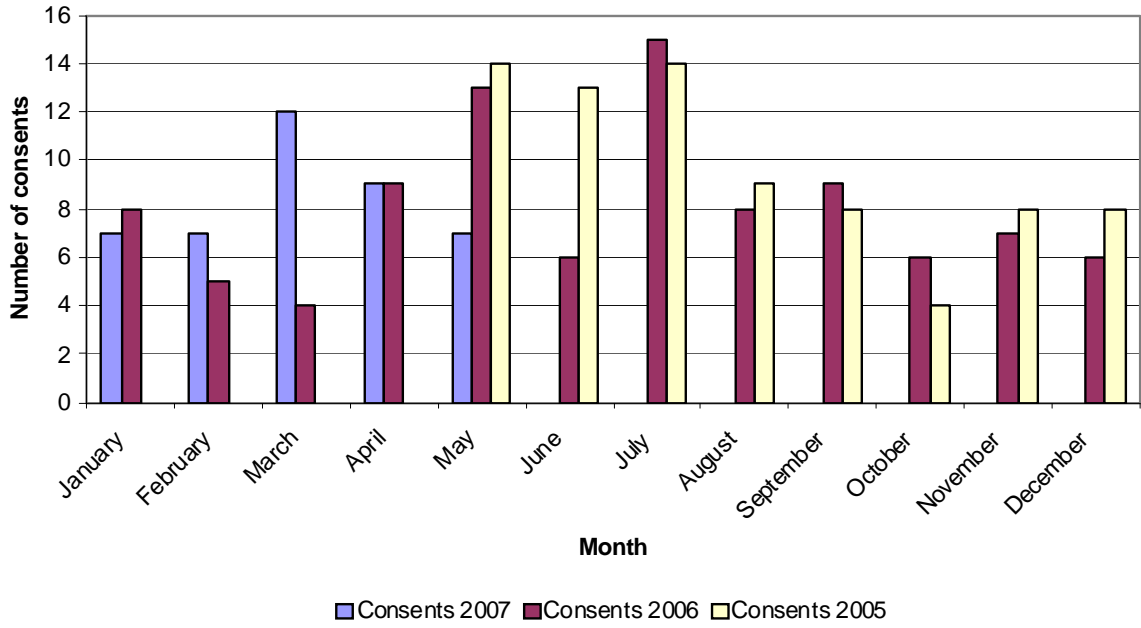


Figure 2: Auckland City Council monthly breakdown⁷

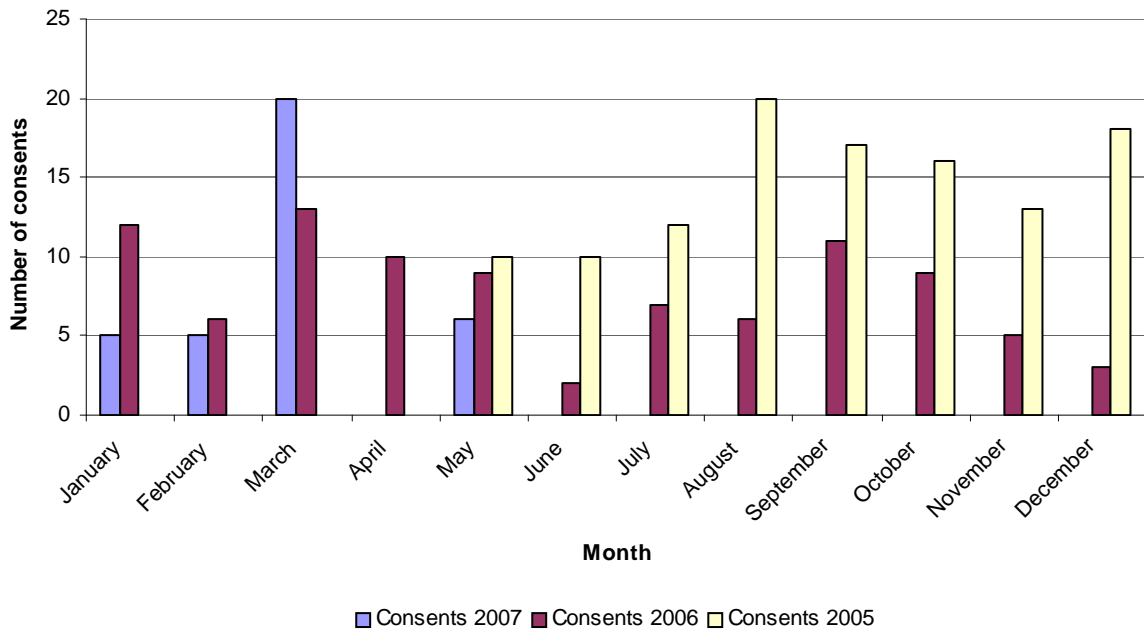


Figure 3: Wellington City Council monthly breakdown⁷

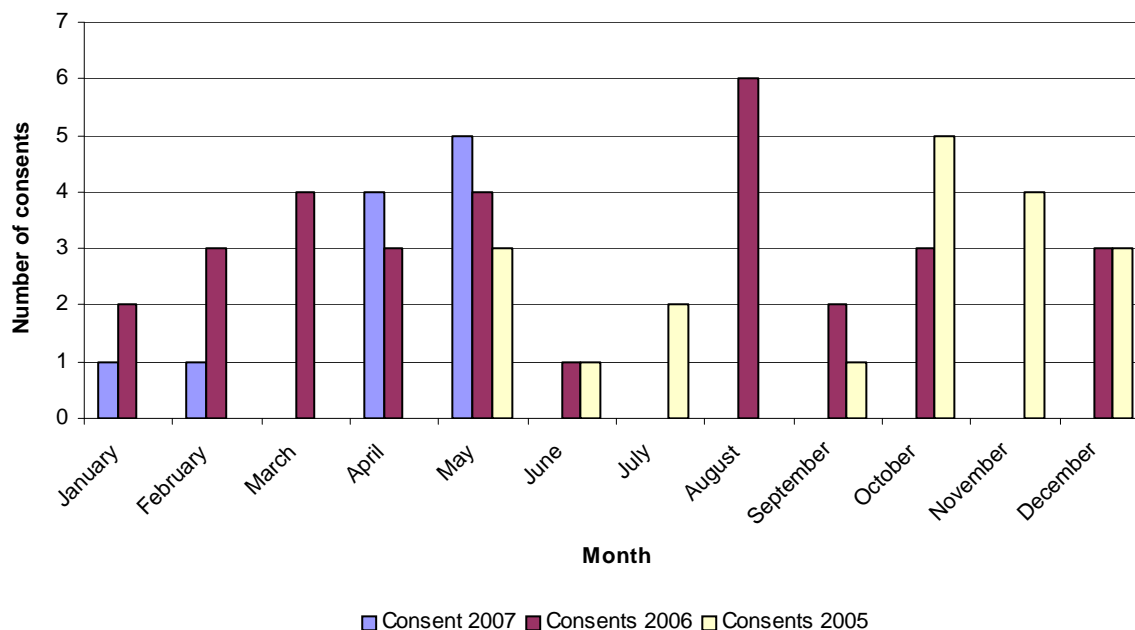


Figure 4: Christchurch City Council monthly breakdown⁷

Comparison with the questionnaire responses confirmed this decline. Of the responses received, all but several fire consultants stated that they are engaging in less performance-based design following the changes to the Building Act in 2004, than they were prior to these changes taking effect. Results obtained from this questionnaire are discussed below.

AUDIT OF THE DRU

In mid 2006, one year after the DRU began operating, two independent audits were commissioned by the NZFS. The principal aim in commissioning these audits was to provide assurance to the Commission and the Minister of Internal Affairs that the DRU was carrying out its duties in a technically competent and accurate manner. In addition, and in the context that the quality of the advice given by the DRU may depend on the quality of the applications received, the auditors were also asked to provide comment on the quality of the fire engineering reports received by the DRU. The audits were carried out by Warrington Fire Research, Melbourne, Australia and by the Centre for Environmental Safety and Risk Engineering (CESARE), Victoria University, Melbourne, Australia.

In carrying out this audit, the auditors each reviewed 5% of the building consent applications received at that time. This accounted for about 25 building projects each. The NZFS had no influence of the choice of projects selected by the auditors, but simply requested that a range of building projects be looked at. Figures 5 and 6 highlight a summary of the auditors' findings. Following completion of the audits the findings were made aware to the Commission, the Department of Building and Housing and Local Government New Zealand. In addition, the reports were forwarded to the Institution of Professional Engineers of New Zealand (IPENZ) with a request that they be considered by a fire engineering taskforce that had been set up to look at the practice of fire engineering in New Zealand.

Engineering Reports		Percentage of reports				
		Poor	Incomplete	Acceptable	Good	Very Good
Formal fire engineering design process	<i>Identified</i>	70	30			
	<i>Followed</i>	90	10			
Acceptance criteria	<i>Specified</i>	70	20	10		
	<i>Comprehensive</i>	100				
Engineering methods used	<i>Appropriate</i>	50	40	10		
	<i>Technically correct</i>					
Conclusions	<i>Clear</i>	70	20	10		
	<i>Substantiated</i>	70	20	10		
Each line adds up to 100%						

Design Review Unit Memos		Percentage of reports				
		Poor	Incomplete	Acceptable	Good	Very Good
Legal Background specified				20	80	
Well presented format				10	90	
Technically accurate				20	80	
Information actionable				100		
Each line adds up to 100%						

Figure 5: Audit evaluation sheet summary⁸

DRU MEMORANDUMS		Percentage of reports				
		Poor	Incomplete	Acceptable	Good	Very Good
Assessment Background		41%	0%	59%	n/a	n/a
Well presented format		n/a	n/a	100%	n/a	n/a
Technically accurate		0%	38%	62%	n/a	n/a
Information actionable		15%	38%	47%	n/a	n/a

ENGINEERING REPORTS		Percentage of reports				
		Poor	Incomplete	Acceptable	Good	Very Good
Formal fire engineering design process	<i>Identified</i>	4%	8%	83%	4%	0%
	<i>Followed</i>	29%	63%	8%	0%	0%
Acceptance criteria	<i>Specified</i>	13%	21%	42%	17%	8%
	<i>Comprehensive</i>	21%	38%	42%	0%	0%
Engineering methods used	<i>Appropriate & Technically correct</i>	17%	75%	8%	0%	0%
Conclusions	<i>Clear</i>	4%	19%	50%	19%	8%
	<i>Substantiated</i>	4%	77%	12%	8%	0%

Figure 6: Summary of DRU work and fire engineering reports received by the DRU⁹

The audit reports concluded that the quality of the submissions received by the DRU was generally poor and felt a strong case exists for an improved standard of fire engineering reports. The audit also highlighted a consistent use of “expert judgement” in the cases reviewed, where little or no documentation was provided to support such claims. It was highlighted that the DRU should be less “wedded” to the compliance documents and could by leadership and example, encourage better standards of fire engineering design and documentation. It was noted that where inadequate documentation was provided to the DRU for review, an appropriate assessment was provided by the DRU in 47% of cases. Where sufficient information was provided in the submission, 80% of cases were appropriately assessed by the DRU. It was further noted that limitations in the holistic approach by the DRU was identified as the primary reason for technical deficiencies in the memoranda.

Review of Professional Associations and Technical Qualifications

It is noted that no formal limitations exist in New Zealand to prevent non-formally qualified individuals from operating as a fire engineering practitioner. This being the case, a review took place of designers whose design reports were subject to the DRU audit. This review aimed at putting some further context as to the professional qualifications, memberships and associations to technical bodies and organisations of those performing this engineering work. In addition, it was initially questioned whether those whose reports were reviewed were actually professionally qualified to do this work or whether a higher percentage of those reviewed were not formally qualified in the discipline of fire engineering. Results showed that of the reports reviewed as part of the audit process, 78% of individuals held either an affiliation to IPENZ, were members of the New Zealand chapter of SFPE or held a Masters degree in fire engineering, 12% did not hold any memberships, affiliations nor held a formal fire engineering qualification. No records were available for a further 10%. Figure 7 highlights the breakdown of individuals with IPENZ affiliation, are members of the SFPE and hold a Masters degree in fire engineering.

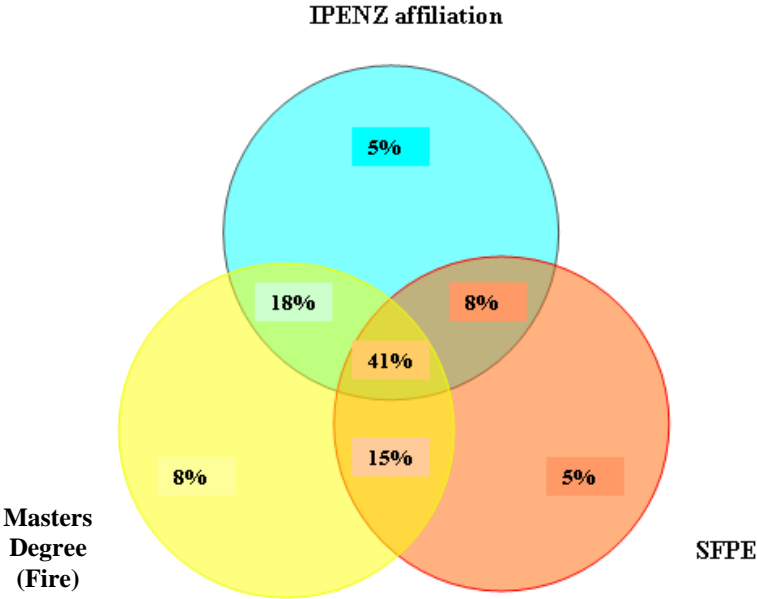


Figure 7: Breakdown of professional qualification and affiliations

Of the 78% referred to above, 55% of individuals hold membership to the New Zealand chapter of SFPE, 65% hold a Masters degree in fire engineering, and 59% of individuals hold IPENZ affiliation. Figure 8 further highlights the breakdown of those holding IPENZ affiliation. Although Figure 8 highlights those with IPENZ affiliation, it must be noted that Fellows and those with CPEng may also be MIPENZ. This was not taken into account when compiling the data. In the same manner, those with MIPENZ are those who do not hold CPEng nor are Fellows. It is therefore seen that the majority of those designs reviewed under the DRU audit process were done by professionally qualified individuals with over half being affiliated to IPENZ and also holding SFPE membership.

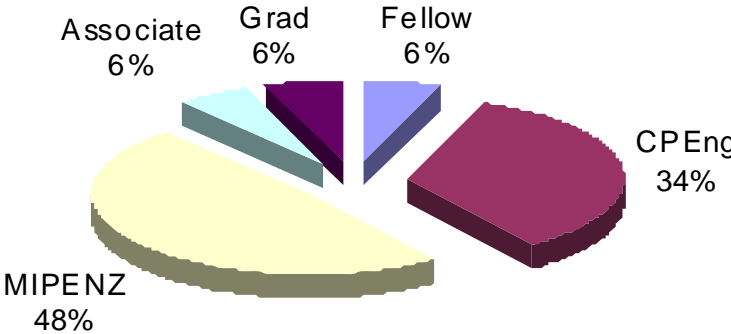


Figure 8: Breakdown of IPENZ affiliations

FIRE INDUSTRY QUESTIONNAIRE

Following the release of the audit reports noted above, a questionnaire was made available to SFPE members of the New Zealand chapter. This list extended over a wide range of individuals and companies from consulting fire engineers to building consent authorities. The questionnaire asked 14 questions in total and was intended to get an overview of their views about the involvement of the NZFS in the building consent process and more specifically, the involvement of the DRU. The questionnaire also asked them to indicate the levels of performance versus prescriptive design they have undertaken pre and post Building Act 2004. In addition, members were asked to indicate the levels of site inspection and construction monitoring activities they undertake. Of the 17 responses received to date, all were consulting fire engineers and represented a range of small to large consultancies, with more responses forthcoming. Further research is looking into this and will be contained in the report by Merry⁶.

82% of respondents indicated that the NZFS should be involved in a building design prior to a building consent being issued, with 18% saying not. Of those that indicated yes, 47% indicated that this involvement should be restricted to firefighting issues, 39% to design criteria, 24% to design methodologies, with 12% indicating that involvement should be related to evacuation scheme matters.

53% of respondents indicated that the DRU do not bring very much value if none at all to the building consent process. However, 12% indicated that the DRU’s involvement was substantial. This being said however, 65% of individuals indicated that engaging in a Fire Engineering Brief (FEB) process was beneficial to their work, with 35% indicating otherwise. For some designers, the FEB process is that as described in the International Fire Engineering

Guidelines¹⁰. For others, it simply constitutes a document highlighting the building project and a summary of fire related issues and is circulated to local stakeholders for comment and feedback but does not necessarily follow a formal structure or process.

Questions were posed relating to the memoranda issued by the DRU as per Section 47 of the Building Act 2004. These related to whether the memoranda received were clear, useful and informative. 53% of respondents indicated that the memoranda were clear with 47% indicating otherwise. 18% of respondents indicated that the memoranda were useful, with 82% feeling otherwise. This figure mainly represented the feeling that there is a failure of the DRU to appreciate the holistic design of buildings. 41% of respondents indicated that the DRU's memoranda were informative, and at times pointed out relevant errors in the detailed design process. 59% indicated otherwise.

The survey also asked whether individuals were involved in post building consent site inspection and construction monitoring activities. 94% of respondents indicated that they were, with 6% indicating that they had no involvement in such activities. Of those that indicated yes, for 44% of respondents, such activities accounted for 0 – 10% of their overall work. For 25% of respondents, these activities formed 11-20% of their work. A further 25% indicated that these duties accounted for 21-30% of their work. 6% indicated that these activities accounted for 41 – 50% of their overall work.

Of most interest from the questionnaire was the impact on performance-based design since the changes to the Building Act 2004 and the inception of the DRU. Individuals were asked to indicate the percentage of performance versus prescriptive design that they have undertaken pre and post Building Act 2004. Responses were consistent with the downward trend seen in the numbers of consents being received by the DRU.

Both pre and post 2004 showed that prescriptive design accounted for a higher portion of work than performance-based. Prior to the changes seen in 2004, this was represented higher at the 70-100% and 0-20% percentiles of the performance-based versus prescriptive workloads respectively. The 40-70 percentiles of individuals' work did not vary considerably and accounted for similar percentages of individual's workloads. Post 2004, the changes in the percentages become more apparent. Following this change in the legislation, responses by individuals show an increase in the higher percentile ranges for prescriptive design. This is coupled by a noticeable increase in the lower percentile ranges for performance-based design.

Respondents were also encouraged to identify any reasons for such changes. Designers felt that the inclusion of the DRU in the consent process has added an extra layer of complexity into the design process, has incurred extra delays to construction projects and incurred additional and unnecessary cost for their clients. It is felt that it is now easier to gain consent if the design is not performance-based and that changes to the Building Act in 2004 have now provided a much higher degree of uncertainty into the fire industry in New Zealand. Ultimately, designers are indicating that their clients prefer to be involved in a building project that will be automatically accepted by the BCA and not run the risk of adverse DRU comments.

CONCLUSIONS

Figures to date received by the DRU point to a decline in performance-based design. That being said however, the DRU has only been operating since April 2005 and a lengthier timeframe would be needed to confirm this with certainty. The majority of consulting fire engineers have also confirmed this decline in their workload, citing a lack of certainty upon submitting a building consent application as well as a lengthier and more costly building consent process since the changes to the Building Act in 2004 and the inclusion of the NZFS. Although the majority of the consulting community confirmed in the questionnaire that they felt the DRU added little value to the consent process apart from matter relating to firefighting, they did support and value the involvement of local NZFS personnel prior to submitting for building consent. This is especially the case where Fire Engineering Briefs are distributed and pre-consent meetings are held.

The audit reports provided to the Commission highlight deficiencies in the standards of fire engineering designs reviewed. The use of engineering judgement was prevalent in most reports and technical matters were discussed rather than demonstrated. In addition, over half of these designers hold a Masters degree in fire engineering and hold an affiliation to IPENZ and/or to SFPE.

Very little site inspection and construction monitoring appears to be taking place in New Zealand. Certainly, this is the case from the responses received through the questionnaire. 45% of respondents indicated that site inspection and monitoring activities account for between 0 – 10% of their work, with a further 50% indicating that such activities account for 11 – 30%.

Although changes have been implemented into the New Zealand Building Act to better the construction industry and processes that underpin it, it is clear that a challenge exists for BCA's to provide regulatory reviews in a niche environment such as fire engineering, which requires such specific expertise. Although the NZFS provide a form of guidance and support through its memoranda, and also through the determinations it has elected to take, no mechanism currently exists to check whether this advice is accepted or followed through as part of the building consent process, nor is it clear whether it translates to the final construction itself. In this regard, it is difficult to measure the extent of the benefit these changes have brought about. It would prove advantageous to revisit this in the future, to perhaps look at any further effects on the levels of performance-based design and review further workings of the NZFS within the building industry.

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