Fire Research Report

Fire Safety Regulation for Non-residential Buildings

NZIER

September 2004

The efficiency and effectiveness of the NZ regulatory structure in achieving fire safety in commercial, industrial and community buildings is considered. The NZ approach to fire safety regulation is found to be a 'light handed' relative to other similar countries. The results indicate a poor alignment between the incentives to some individual stakeholders and the net community benefit. In particular, the association between fire service levy and the value insured means that the highest cost often falls on those stakeholders with the lowest fire risk. The regulations primarily impact on new building whereas fire risk is inherent in the whole building stock. The Fire Service's objectives may not align with the optimum net economic efficiency for the community as a whole. The practicalities of conducting a cost benefit analysis are considered.

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Fire safety regulation for non-residential building

The role of the New Zealand Fire Service

Final draft report to New Zealand Fire Service Commission

September 2004

Preface

NZIER is a specialist consulting firm that uses applied economic research and analysis to provide a wide range of strategic advice to clients in the public and private sectors, throughout New Zealand and Australia, and further afield.

NZIER was established in 1958.

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Executive Summary

Background

- The focus of this research is on the effectiveness and efficiency of the New Zealand regulatory structure as it affects fire safety in commercial, industrial, and community buildings. Our aim within that broad ambit is to assess, from social and economic perspectives, the role of the New Zealand Fire Service (NZFS) in that regulatory structure.

- As an aid to analysis, we have adopted the concept of a market for managing building fire risk, and then applied economic techniques to provide a high level evaluation of the current 'market', and the role of regulation in that market.

- The overarching framework for our research is economic efficiency. Thus, throughout the report we try to address the strengths and weaknesses of the structure and operation of regulations, and our suggested changes to them, in terms of social costs and benefits.

- This leads to a cost benefit assessment rather than a cost-benefit analysis. While we outline some potential approaches to quantification of costs and benefits of suggested changes to the regulatory structure, we have not attempted a quantified analysis. In our view, across most of the cost and benefit categories, the uncertainties and assumptions surrounding the data would render any results of doubtful value.

- We think the main case for change is likely to come from agreement among stakeholders about the key weaknesses in the current structure, based on a combination of principles-based analysis and practical experience, as presented in this report. Cost-benefit assessment could be a valuable tool in assessing alternative approaches to regulation, but uncertainty about benefits means that quantitative CBA results will not be the primary motivator of policy decisions.

Regulatory structure

- Our starting point for this evaluation is an examination of the role of regulation as one form of government response to failure or potential failure in the market for management of building fire safety risk.

- Our analysis points to evidence of market failure arising from poor alignment between the incentives of some stakeholders, and social objectives in terms of keeping down the (net) social costs of fires in non-residential buildings. This is an overarching structural weakness in the interaction between regulation and insurance, which is highly pertinent to judgement about the regulatory role of the New Zealand Fire Service.

- Another structural and operational weakness of the regulations is that in the main it is usually only buildings in the planning or construction stages that are subject to rigorous regulatory oversight. However, much of the fire safety risk is likely to lie in the building stock as a whole, which may or may not comply with existing standards, and is unlikely to be subject to regulatory purview.

Conclusions

The main conclusions we can draw out of our description and analysis of the regulatory structure for fire safety in buildings in New Zealand are:

- There is scope for market failure in any regulatory structure, and these are mainly founded in information asymmetries or transaction costs. Fire service regulation is no exception, as evidenced, for example, by examples of determinations by the BIA summarised in this report.

- Conventional building insurance, and the 'insurance' provided by the NZFS, are subject to the classic problems of information asymmetry leading to adverse selection and moral hazard. This leads to the potential for significant misalignment between payments for insurance (i.e. insurance premiums and fire service levies) and expected claims on those pools based on risk profiles. For high risk buildings, this negative externality should be internalised in the form of such building owners paying higher levy payments.

- The central policy objective in regulatory design, or changes to regulations, is 'economic efficiency'. That is the society-wide benefits of any changes should at least equal the additional costs imposed by the changes.

- The Fire Service has narrower objectives than this central policy goal, and in terms of its core operations is mainly concerned with the trend in the frequency of fires, the aggregate costs of fighting them, and the trend in costs relative to its income from the levy.

- The potential for a misalignment between the risks represented by particular buildings and building owners, and their levy contributions, means that the Fire Service may be exposed to a shortfall in funding, or that some lower risk buildings may be cross-subsidising higher risk buildings.

- The New Zealand approach to regulation leans towards being 'light-handed' relative to approaches in some other comparable jurisdictions. While light is better than heavy in most respects, this approach may expose the system to significantly higher risks.

- Our comparison with regulatory structures in the UK, Canada, and Australia indicates that fire authorities have more extensive enforcement roles than in New Zealand, but there is no easy way to calibrate these differences. If this is the case, and it can established that this contributes to better ongoing fire safety performance in those jurisdictions than in New Zealand, there may be a case for expanding the role of the NZFS. But, as with regulation more generally, this would need to be evaluated in terms of economic efficiency grounds i.e. using cost benefit analysis or related techniques.

- Fully quantified cost benefit analysis does not seem possible, because of the difficulty of estimating the benefits (i.e. reduced fire risk) that should result from a more extensive role for the NZFS. However, a cost benefit assessment, combining quantification where possible with qualitative analysis would be an appropriate and informative approach to such an evaluation.

Recommendations

Based on these conclusions we would make the following recommendations:

- The NZFS establish a small taskforce to review the regulatory structure and its performance, focusing initially on the structural weaknesses or potential weaknesses, highlighted in this report. The primary focus would be on implications for the NZFS but the review should also encompass the wider social and economic implications.

- The review should also focus down on information flows, based on practical experience of failures in such flows that have contributed to unacceptable risks.

- The review should also consider in detail the extent to which, based again on actual experience, the current levy structure is an effective and fair reflection of risk, and suggest a revised structure which sets up clearer incentives for these types of building or building owners seen to be contributing disproportionately to the NZFS fire fighting costs.

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1. Introduction

1.1 The brief and our research aims

The focus of this research is on the effectiveness and efficiency of the New Zealand regulatory structure as it affects fire safety in commercial, industrial, and community buildings. Our aim within that broad ambit is to assess, from social and economic perspectives, the role of the New Zealand Fire Service (NZFS) in that regulatory structure.

Specifically, this analysis aims to determine whether NZFS procedures to assess fire safety provisions in new buildings result in socially and economically optimal outcomes.

The overall goal of the research is to analyse how changing the legislative framework, or improving the effectiveness of information exchange between the various stakeholders in this regulatory structure, could improve fire safety outcomes. Hence, we are interested in both structural and operational aspects of the regulations.

In analysing the regulatory structure, and the regulatory role of the NZFS, we also consider the cost (to society as a whole) of achieving these outcomes.

1.2 Context

1.2.1 The economic costs of industrial fires

To gain some impression of the importance of the issues being discussed in this report, it is useful to consider the overall cost of non-residential fires in New Zealand. The negative economic impact of industrial fires in New Zealand in 2000 was approximately $86 million (Berl, 2002).[1] Industrial fires have a number of negative impacts that affect not only the firms whose premises are directly affected, but also their suppliers, the NZFS, and households.

1.2.2 Regulatory change

This assessment of the role of the NZFS in fire safety regulation should be seen against the backdrop of broader trends in building regulation. The Building Act 1991 was a pivotal move away from a tradition of highly prescriptive regulation in New Zealand towards performance-based approaches, with increased discretion accorded to industry participants. While New Zealand was one of the first countries to move to a

[1] Note that our report covers a wider range of non-residential buildings, as we consider cultural and social buildings as well as purely industrial premises.

performance-based code, similar developments have occurred in Australia, Canada, Norway, and UK.

In the section on Regulation in Part 6 (National Building Code) of the Building Act 1991, the legislation states that: 'The Governor-General may from time to time, by Order in Council, make regulations, to be called the building code, for prescribing the functional requirements for buildings and the performance criteria with which buildings must comply in their intended use.'

The weathertight homes problem, which appears to have had its origins mainly in building practices adopted during the 1980s and 1990s can be seen as illustrating the potential shortcomings, especially in terms of enforceability, of this performance-based approach. These problems were one of the major catalysts for the Building Bill introduced in 2004. The proposed changes to the Building Act recognise that a suite of up-to-date prescriptive solutions and a skilled, trained and regulated industry are needed to achieve compliance in a performance-based code environment.

1.3 Approach

Our approach to this research is guided at a high level by two economic concepts applied to a specific 'market' - that is, the market for management of fire safety risk in non-residential buildings in New Zealand.

- One is the concept of economic efficiency - the society-wide costs and benefits of any change (for example, new regulations, or changes to these regulations) and how these benefits and costs compare.

- The second is 'market failure' – what are the characteristics of the market for the management of building fire safety risk, which make it prone to inefficiencies? And what might the sources and forms of these inefficiencies tell us about appropriate government responses – either through regulation or some other type of intervention?

The structure and effectiveness of regulations is potentially a very broad topic, so we have targeted a few principal topics, central to our brief, which provide the structure of our report:

- The economic role and implications of fire safety regulations.

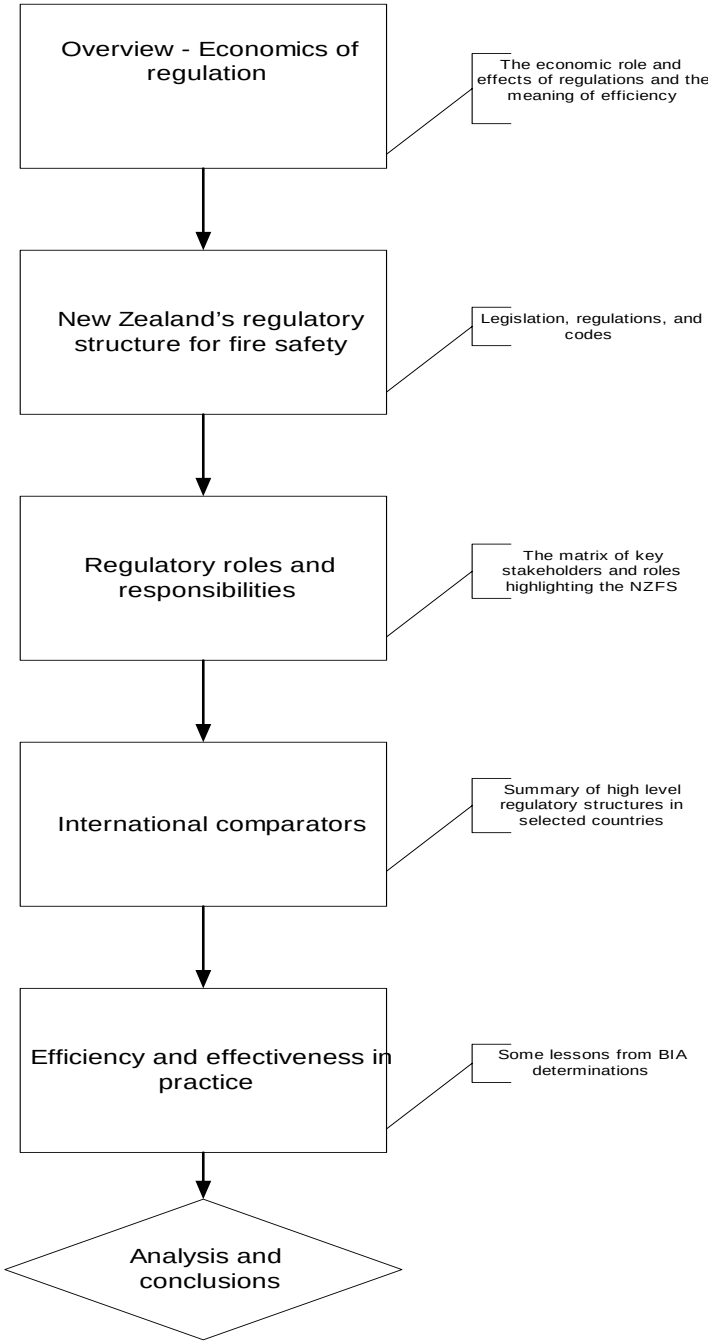
- The main components of the New Zealand regulatory structure for building and fire safety in buildings.

- The strengths and weaknesses of this structure – in theory and in practice?

- How the role of the NZFS might be changed to increase the effectiveness of the regulatory structure as it affects fire safety in buildings

We have broken down these questions further, as shown in the following figure. This provides the structure for this report.

Figure 1 Structure of report



Source: NZIER

2. The role of the NZFS in building fire safety

Currently the NZFS has no formal role within the Building Act building consent review process. This function is principally allocated to TLAs. As part of pre-operational planning, NZFS persons can conduct building inspections (section 29 of the Fire Service Act). However if any non-compliance with the Building Act is found, the NZFS is required to notify, in writing, the relevant TLA.

This then makes the NZFS a named party (section 16 of the BA 1992) and thus a party which is allowed to take determinations with the Building Industry Authority. The NZFS has used this mechanism a few times with more extreme design and/or construction non-compliance as summarised in Section 7.3.

If this non-compliance is significant, certain nominated competent persons within the NZFS can advise the TLA that the Fire Service considers the building dangerous (refer section 64 of the Building Act). The TLA is not obliged to do anything with this information.

2.1 The requirement to consider fire safety during construction

The NZFS legislative mandate as prescribed in the Fire Service Act 1975, is described in general in section 20. Evacuation schemes are referred to in Section 21. NZFS approaches its objective using a risk management approach. This involves identifying, analysing, prioritising and treating fire risks in the community. The risk management model focuses on threat, people, property, processes and hazards.

The risk to property, and the role of the NZFS in influencing that through the regulatory structure, is at the heart of this research. A key question arising is the relationship between the risk of damage to buildings and risks to health and safety of the occupants of the building. The primary focus of building regulations in general, and of fire safety regulations, is on minimising risk to people.

Amongst key stakeholders, only the fire and general insurance industry is primarily concerned with risk of damage to buildings and business interruption.

Arguably, a focus on property preservation automatically saves lives. In a warehouse, for example, a high quality smoke detector/sprinkler system and fire resistant materials will have positive effects on people safety and building preservation. However, design for people safety, that is an

emphasis on easy evacuation, is not necessarily helpful to building preservation.

The factors that affect the likelihood of a fire threat or fire hazard to people or property loss that relate to buildings include:

- Construction (new building or alterations)
- Condition
- Contents
- Protection

During the design and construction phases, decisions are made about whether an evacuation scheme is required to be integral to the design of the building (which might mean having two stairwells) as opposed to providing for the alternative i.e. an evacuation procedure.[2]

Questions that need to be asked to determine if an evacuation scheme is required are:

- Is it a common venue for 100 or more people?
- Does it employ 10 or more people?
- Does it accommodate 5 or more people?
- Does it provide early child care facilities?

In addition to evacuation requirements are the requirements for sprinklers, alarms and use of fire resistant building products. All these decisions are made at the time of construction or alteration of the building because they involve some change to the initial design.

2.2 Fire safety regulations - current[3]

The regulatory framework sets out standards (codes) to be adhered to in construction practices. The emphasis is on principles of fire safety to be included in the design and construction of the buildings rather than rules to be followed. In saying this there are standardised approaches, which include requirements that will meet the 'standard approach'. Other options for design are considered 'alternative solutions' and are expected to follow more rigorous processes to ensure that the design fulfils the BIA-determined principles of building construction, which includes fire safety.

The NZFS website provides considerable information on fire engineering that is aimed at informing those involved in construction of the key fire safety principles in non-residential buildings. In particular the website

[2] The differences are outlined in detail on the NZFS website: www.fire.org.nz

[3] Source: http://www.bia.govt.nz/building/index.php and http://www.fire.org.nz/

highlights the role of NZFS with respect to fire evacuation (as required by s21 Fire Service Act) and the requirements that are set out in the Building regulations.

The formal provisions of the Building Act 1991 related to fire and the NZFS, are set out in Appendix A to this report.

The Building Bill (2003) Bill repeals and replaces the Building Act 1991 (the **1991 Act**) in its entirety. While the Bill re-enacts most of the existing provisions of the 1991 Act, it also contains a number of provisions that are not currently in that Act. Pertinent to the NZFS is the requirement that certain applications for a building consent be copied to the New Zealand Fire Service Commission to allow the Commission the opportunity to provide advice on matters relating to fire safety and, in particular, on the means of escape from fire in respect of the building to which the application relates (*clauses 133 and 134*).

3. Market failure and the role of the NZFS

Before exploring in detail the regulatory structure for fire safety in buildings, it is important first to be clear about the economic fundamentals which generate the need for regulation and shape the major elements of that regulation.

3.1 Market failure

In a mixed economy such as New Zealand's, the private self-interest of firms and individuals is a powerful motivator of activity, so a role for government intervention is to align private incentives with public interests. In the context of fire risk, two important regulatory objectives from the viewpoint of the community as a whole are to:

- Incentivise individual building owners and occupants to manage fire risks efficiently[4] and effectively[5]; and thus
- Create a situation where, across the community as a whole, fire safety risk is managed in an economically efficient way and costs fall broadly in line with where the risks are incurred.

A prominent paradigm widely used internationally involves identifying the role of various forms of market failure as a way of identifying possible improvements to market operation.

Of the potential factors contributing to market failure, information asymmetries, uncertainty, and externalities, are the most pertinent to management of fire risk.[6] We examine examples of these below in the context of the incentives on individual building owners. What are some of the reasons why a building owner (or occupant) may not bear the full cost of a fire, or the risk of a fire?

1. An inefficient insurance market (i.e. insurance premiums not properly reflecting relative risks) may result from information asymmetries. In particular, the actual fire risks that result from the construction or use of a building may be much better understood by the building owner/occupier than by insurers. But the incentive acting on building owner/occupiers, who want to keep their

[4] Efficiency here refers to the alignment between the societal benefits achieved through regulation and (i.e. reduced risk of fire damage) and the costs to all the various parties affected by the regulations.

[5] Effectiveness refers to the degree to which objectives are achieved.

[6] Risk conflates the probability of an event, such as a fire, and the impact of that event.

insurance premiums as low as possible, is to understate the level of risk.[7]

2. Similar comments apply to the funding of the NZFS which is based on levies applied to insured values.[8] In the same way that insurance premiums may not properly reflect individual risks, the pooling effects of the levy may insulate some properties from the full extent of the fire risk they generate. The costs of fighting fires are influenced by many factors such as material used in construction, scale and complexity of the evacuation of building occupants, vehicular access, waters supplies, and risk of spread. In many cases these will not be properly reflected in the associated contribution to the pool.

3. Fire spreading to adjacent buildings, or causing disruption to businesses in the neighbourhood are examples of so-called 'negative externalities.' Usually, there is no way of sheeting the costs home to the source of the risk. For high risk buildings, this negative externality should be internalised in the form of such building owners paying higher levy payments.

4. There is considerable uncertainty about the extent to which affected parties can achieve compensation, if for example, they incur costs as a result of the negligence of a third party. The results of a litigation are usually uncertain because, for example, of the difficulty of proving negligence or consequential losses. Alternatively, bankruptcy of the offending party may prevent full recovery of damages, especially involving loss of life or fire spread, where the sums involved may be large.

The insurance industry is the principal party concerned with the first of these, and the third falls mainly into the ambit of territorial local authorities (TLAs). The second and fourth are closely interrelated with the structure and operation of regulation as a whole.

These are examples of potential failures in the market for the management of risk, where for various reasons, the expected costs of fire do not align with the ongoing contributions, by property owners or occupants, to the level of risk. While the immediate reaction to this might be a call for more

[7] Another inefficiency results from asymmetric information is 'moral hazard' – a tendency for insured building owners and occupiers to take less care in preventing fires than they would if they had to carry the full cost of damage.

[8] Commercial property is levied at 7.3 cents per $100 of insured value (sum insured). Where the fire insurance contract for other property provides for settlement of any claim on a basis more favourable than its indemnity value (I V), or where there is no sum insured, the amount of the insured value is the I V of the property (provided it is supported by a declaration or a valuation). The I V is calculated as the replacement value of the property, less any depreciation on an age and condition basis.

regulation, policy design in New Zealand recognises that there are costs associated with additional regulation which may not always be compensated for by risk reduction benefits. Hence the need for proposed changes to regulations to be subject to some sort of evaluation, such as cost benefit analysis, as discussed later in this report.

3.2 Role of the NZFS

One of the challenges here is to examine the various regulatory issues and roles and to decide where the boundaries lie between one institution and another. Some guidance is given by the NZFS mission statement, vision, and strategic objectives as set out on the NZFS website, and summarised below.

Mission: To reduce the incidence and consequence of fire and to provide a professional response to other emergencies.

Vision: Working with communities to protect what they value.

Strategic Objectives: The Fire Service Commission developed a statement of strategic direction in June 1999 which comprised four elements:

- Focus on fire prevention, fire safety and fire outcomes
- Resource reallocation and 'value for money' expenditure
- Best practice organisation
- Strong Fire Service governance and management

The Fire Service's core skills and experience are in the areas of fire risk management at a practical level. It thus seems very well placed to advise in particular on the level and design of the levy, as discussed in item 2 in the previous section.

It is not clear which of the various agencies currently involved in fire safety regulation is best placed to control decisions about the extent of regulation or how current, or strengthened regulation, should be enforced. More extensive regulation involves additional costs both for the subject of the regulation (building owners) and the various other stakeholders in the regulations.

So individual agencies, such as the NZFS, are primarily concerned with the management of the full span of their operations within current budgets, and do not have a clear-cut incentive to support more extensive regulation, even if it appears to be socially efficient. This is because they cannot be sure if and to what extent their own funding would be increased as a result of more efficient regulation.

3.3 Risk reduction

The overarching objective of the legislation and regulations is to reduce fire risk across the community. The term risk conflates the probability of an event occurring and the consequences of that event. Once an event such as a building fire occurs, its consequences flow in various ways across the various stakeholders in the regulatory system. For example, the NZFS in fighting fires incurs financial costs and members of the service are exposed to serious health and safety risks

Risks are not immutable – both the probability and consequences of building fires, for example, can be influenced in various ways. Britton and Clark (1999) describe the "4 Rs" of emergency management as follows:

Reduction of emergencies. They make a distinction between short term risk reduction (amelioration) and long term risk reduction (prevention) as follows:

> *Amelioration* (i.e. short term reduction) involves developing policies and programmes that help limit the magnitude of future impacts. They are introduced following disaster impact as a direct result of the damage or disruption caused by a specific impact. In this respect, they are reactive and are designed to restore the community to pre-impact levels.
>
> *Prevention* (i.e. long term reduction) actions are designed to decrease existing levels of danger, enhance overall resilience and provide sustainable hazard management measures. These actions are deliberately designed to prevent or impede the occurrence of a future disaster event and/or prevent such an occurrence having harmful and long-lasting effects on communities. In this respect, they are pro-active measures.

Readiness policies and programmes are usually involved with the development of response plans, identification of resources, the training of emergency services personnel, and public awareness programmes.

Response policies and programmes are those that become operational once a disaster occurs or threatens.

Recovery policies and programmes address the immediate problems of stabilising the affected community and assuring that life-support systems are operational. These programmes also extend into the longer-term programmes for community rehabilitation and restoration.

The focus of the regulatory problem here is primarily on risk reduction, but also on readiness. One of the key economic questions is what incentives does the regulatory framework create to encourage behaviour that will reduce the risk of fires in buildings?

4. Economics of regulation

4.1 Regulatory objectives

In order to assess why or how governments should regulate, we first need to consider the objectives of this regulation. In the main, governments regulate to overcome market failures, as discussed in Section 2. In the context of building regulation, the key source of market failure is *imperfect information.*

For example, many aspects of building design and standards actually adhered to are only observable during the course of construction, and very hard to evaluate after completion. Even then, only experts may be able to pick up fundamental flaws in design, construction methods, materials etc. which could, for example, add to fire risks.

Information is often not costless to obtain, nor easy to fully understand. In such circumstances, consumers[9] and producers[10] may make 'inefficient decisions.' In particular, consumers (i.e. building occupants) may be unaware of fire risks, and consequently underinsure their businesses or contents, or fail to take adequate precautions to protect their staff, records, equipment etc.

Producers (i.e. builders) may adopt building practices which are cost-effective from their own perspectives, but which impose long-term costs on society in general through adding to risk of fire or to other negative aspects of building performance.

Here government intervention has two roles:

- By increasing the supply of information, it can help to improve decision-making by reducing uncertainty.
- By setting minimum standards, it can protect uninformed market participants against adverse outcomes.

Ideally the design and operation of regulation should be both efficient and effective. As noted earlier, economically efficient regulation is regulation which achieves the desired outcomes at least cost to society as a whole. Effectiveness of regulation refers to the extent and rate at which desired outcomes are achieved.

[9] Building owners and tenants, in this context.

[10] Principally construction firms, but also sub-contractors and service suppliers such as architects and engineers.

4.2 Regulatory failure

Market failure, to some degree, can be observed in many economic activities. But government intervention such as regulation, aimed at correcting or compensating for these market failures, is not necessarily desirable. Increased government intervention may be inefficient – imposing costs on society that are larger than the value of any benefits – or ineffective i.e. fail to deliver on its objectives.

So in reviewing the regulatory structure for building fire safety, and the role of the NZFS in it, we need to consider such questions as:[11]

- *Is the regulation clear and concise?* It should be communicated effectively and be readily accessible to those affected by it. Not only should people be able to find out what regulations apply to them, the regulations themselves must be capable of being readily understood.

- *Is it consistent* with other laws, agreements and international obligations? Inconsistency can create division, confusion and waste.

- *Is it enforceable?* It should embody incentives, and sanctions for non-compliance, but no greater than needed for reasonable enforcement, and involve adequate resources for this purpose.

We focus in the rest of this report mainly on the third of these, which is at the heart of the problem of achieving effective and economically efficient regulation, as discussed in the previous section.

[11] Refer Gary Banks 'The Good, the Bad, and the Ugly: Economic perspectives on regulation in Australia.' *Economic Papers,* Volume 23, No.1, March 2004.

5. Regulatory structure for fire safety in buildings

This section discusses the current operating environment for fire safety: the relevant legislation and the stakeholders, and the roles and responsibilities that currently exist. The section also refers to the proposed changes outlined in the Building Bill (August 2003) and what this might mean in terms of changes to roles and responsibilities, especially for the NZFS.

5.1 Legislative structure

Building work is primarily governed by one piece of legislation, the Building Act 1991. The Building Act is supported by subordinate legislation in the form of regulations and the building code that set out the approved solutions to building construction and the process for seeking approval for alternative solutions. The relevant laws are:

1. The Building Act 1991 [BA91] describes what is covered by building controls and sets down the law for building work in New Zealand.

2. The Building Regulations 1992 [BR92] contain the mandatory New Zealand Building Code [the Code] and particular details about the processing of building approvals.

3. The Approved Documents are non-mandatory documents written by the Building Industry Authority to assist compliance with the Building Code.

The Act applies to the construction, alteration, demolition and maintenance of new and existing buildings throughout New Zealand. The Act does not apply to planning and resource management, the finish and appearance of a building, or protection of capital investment.

5.2 The stakeholders in building regulation

The following is a summary of key agencies and their roles in building regulation.

5.2.1 New Zealand Fire Service

- The NZFS is charged with reducing the incidence of fire, the risk to life and property, and achieving unity and completeness in fire safety law and practice (s20 Fire Service Act 1975). In respect of the construction of buildings this has been narrowed by s21 Fire Service Act to ensuring that the building has an adequate evacuation scheme. The emphasis is on protecting people rather than protection of the buildings themselves.

- The building regulations BA92 detail how the evacuation policy is administered and enforced. Most notable about the regulations is the requirement for the evacuation scheme to be approved 1 month after the building is occupied.

- The NZFS also oversees the application of the building construction code that relates to fire safety and investigates if the standards have been followed.

- The NZFS is funded by a levy at a fixed rate per insured value across all buildings. The income from this levy is unlikely to be an accurate reflection of risk, and especially the cost of fighting fires, in all cases.

5.2.2 Building Industry Authority

The Building Industry Authority is the New Zealand government body that manages the building control system.[12] It reviews New Zealand building control law (the Building Act 1991, and the Building Regulations 1992 – which includes the Building Code). It also produces design and construction solutions, known as Approved Documents, which help ensure building work meets legal requirements. Specific functions of the BIA include:

- Reviewing the New Zealand Building Code.

- Writing documents that set out detailed methods of complying with the Building Code (Approved Documents).

- Providing information and advice on building controls to the building industry and public.

- Issuing technical rulings (determinations) on matters of dispute.

- Approving specific products, systems or methods as complying with the Building Code (accreditations).

- Approving building certifiers (private sector equivalent of council building inspectors).

- Monitoring the operation of territorial local authorities (TLAs) and building certifiers.

5.2.3 Insurance Council of New Zealand

As the representative body for Fire and General Insurers in New Zealand, the Insurance Council provides advice to government agencies on all aspects of policy that affect its members. Building regulation and fire safety are some its key concerns.

[12] The BIA was established as a crown entity in 1992, pursuant to the Building Act 1991.

The insurance industry can provide incentives to encourage investment in safety at the time of construction. The interests of the insurance companies are to minimise fire risks to buildings, and there is thus potential for them to use economic incentives (e.g. discounted premiums) to encourage risk minimising behaviour by their customers.

However, problems can arise if the insurance companies are unable to determine who is liable for fire prevention mechanisms not being present or failing to work. This means the appropriate allocation of costs to those creating the risks is not as efficient as possible. This reduces the ability of the insurance companies to accurately reflect risk in premiums (or decisions to accept or reject certain business) and in turn their ability to use premiums as an incentivising or sanctioning mechanism.

Furthermore, the use and influence of incentives such as discounts on premiums can be influenced by such factors as:

- Variations over time in the insurance market. When competition for new business is intense, individual companies will tend to extend discounts on premiums to attract new clients, even when the quality of such business is uncertain.

- Larger companies tend to insure in bulk, and because of their leverage with insurers, may be able to negotiate premiums which do not fully reflect the risk profiles of individual buildings in their property portfolios.

5.2.4 Government departments

Those principally responsible for building and fire safety regulation are the Department of Internal Affairs and Ministry of Economic Development. Their main role is to develop and evaluate policy.

5.2.5 Territorial Local Authorities

The various territorial local authorities (TLAs) are responsible for:

- Administering the building consent process

- Administering building construction policy during the design of buildings

- Enforcing standards including fire safety standards

- Applying sanctions to a building if it does not meet fire safety requirements. These sanctions can be in response to investigations by NZFS fire safety engineers.

5.2.6 Private fire engineers

Provide advice on building codes and acceptable solutions in design and construction stages.

5.2.7 The building industry (producers)

The various producers of non-residential buildings (e.g. developers, builders, contractors) all have a role in determining the application of the regulations at the time of construction, in respect of requirements for evacuation schemes, sprinklers, alarms and fire resistant building products.

5.2.8 Consumers

The owners and tenants of industrial, commercial and community building space determine the 'use' of a building and hence whether a building is "fit for use". This group can be critically affected (e.g. in terms of safety, business continuity etc.) by the way the regulations have been applied by other stakeholders.

5.3 Regulatory structure, roles, and responsibilities

The previous section introduced most of the stakeholders in building regulation, and gave an initial indication of their accountabilities and incentives regarding building fire safety.

The following table depicts in greater detail the roles of the stakeholders in the policy framework and application of the regulations, as required by specific legislation. The table reveals the roles of the different stakeholders in the construction process in respect of administering, enforcing and applying the regulations.

We can make the following observations:

- While most expected aspects of the regulatory structure are 'covered' it is very hard to make judgements on whether the resources available for each of the key functions are 'adequate' in relation to the fire risks affected by those functions.

- It is hard to judge the extent to which the regulatory structure impinges on the non-residential building stock (and thus the aggregate fire risk). For example, the NZFS has a limited advisory and enforcement role. And the opportunity for the NZFS to become involved in enforcement (e.g. by taking determinations to the BIA) only arises in certain circumstances. This is usually when a new building, or change of use of an existing building, requires input from NZFS fire safety engineers to ensure that evacuation schemes and other safety measures are 'fit for purpose.'

Fire Safety Policy – set out in the Building Act 1991, Building Regulations 1992, the Building Code, and the Fire Service Act 1975								
Agency/ Stakeholder **Key:** *Direct responsibility: DR* *Consulted: C* *Affected: A*	**Develop** - responsible for designing the policy	**Administer** responsible for overseeing the operation of the policy	**Investigate** responsible for investigating recommending if policy is being followed	**Enforce** – direct responsibility for determining if policy is being adhered to.	**Promote** – an indirect responsibility for ensuring policy is being adhered to.	**Apply** those that policy applies to.	**Sanctions** – who are the sanctions imposed on?	**Evaluate –** responsible for reviewing if the policy is working
DIA or MED	**DR**							**DR**
Building Consent Authority (TA)		**DR**	**DR**	**DR**	**DR**	**DR**		**DR**
BIA	**DR**	**DR**		**DR**				**DR**
Insurance Companies	**C**		**DR**				**DR**	
NZFS	**DC**		**DR**		**DR**		**C**	**C**
Fire Engineers		**C, A**				**A**		
Building owners	**A**					**A**	**A**	
Builders	**A**					**A**	**A**	
Building users						**A**	**A**	

5.4 Summary – risk and incentives

Based on this high level of roles, risks and incentives, we can highlight several main areas where there is scope for more detailed review of the current regime and modifications to it.

- **Building insurance**: No insurance system can perfectly match the structure of premiums (i.e. the contributions to the insurance pool) to risks. But the attenuated information flows (for example between building designers, TLAs, building owners, and insurers) about risks and changes in them and heterogeneity of the non-residential building stock (in terms of design and usage) raise the potential for some major misalignment between premiums and costs in particular cases.

- **TLAs**: Local authorities have to deal with a diverse range of consent applications from builders or developers whose main immediate concern is to progress new construction, alterations, and additions. Under time pressure, there are practical limits on the degree to which compliance with regulations can be investigated before consents are granted. And given the complexity of information flows during projects, there is scope for divergence over the course of these construction projects between standards expected at the consent stage and actual outcomes in terms of fire safety.

- **NZFS**: Because the fire service levy is related to insured values, the NZFS is exposed to a misalignment between contributions to its income and its risks, analogous to that facing building insurers. However, whereas insurers are primarily concerned with the insurance costs of fires (relative to premium income) the NZFS is primarily concerned with the costs and safety risks arising from fires. There is no necessary correspondence between the reinstatement costs of a building, and the costs of fighting a fire in that building.

A general concern with the regulatory structure as summarised in the previous table is that it is mainly oriented towards overt changes in the building stock i.e. new construction or additions and alterations requiring consents. Much of the ongoing risk of fire lies with the pre-existing stock, and the change over time in the overall level of risk may come from alterations to buildings or their use which are never subject to regulatory oversight.

These issues stem mainly from information asymmetries (leading to problems of moral hazard or adverse selection) together with the transaction costs involved in maintaining ‘ideal’ levels of information flow.

6. International comparators

This section provides some initial understanding of the type of regulatory environment that is operating in the UK, Australia and Canada. By considering fire safety regulatory structures and roles in comparator countries, we can get some indication of whether the NZFS role in ensuring fire safety in industrial buildings is 'normal' in an international sense. If it is not, international alternatives may provide us with some pointers about how things could change for the better in New Zealand.

The detail we have been able to discover about these national and state jurisdictions is set out in Appendix A. From this we have drawn the following points.

NB *The information in this section and Appendix A, is based on a web-based and document search of a wide range of international sources, and is an attempt to distil the key point in concise form. It is by no means a complete coverage of the structure of relevant regulations in these jurisdictions nor can we guarantee that it is completely up-to-date.*

6.1 General points about UK fire safety regulations

Based on the brief outline in Appendix A:

- The emphasis has been on safety of people both through the Fire Precautions Act and the Workplace Fire Regulations.

- The Fire Authority in each local authority is the enforcing authority for Fire Safety legislation affecting most non–residential buildings, and for the Workplace Fire Regulations.

6.2 General points about Australian fire safety regulations[1]

- The emphasis of the Building Code of Australia (BCA) is on safety of people and the prevention of fire spreading between properties. Protection of property is not specifically addressed.
- Each State and Territory's legislation adopts the BCA subject to the variation or deletion of some of its provisions, or the addition of extra provisions. These variations, deletion and additions were originally contained in the Appendices to the BCA. Now eight separate State or Territory Acts refer directly to the BCA.
- The introduction of the Performance Based BCA in 1996 meant that owners of buildings could employ alternative performance based design

[1] Code of practice for fire safety design, certification & peer review in accordance with the BCA, Institution of Engineers, Australia, October 2002.

solutions to the deemed-to-satisfy provisions, as long as they were judged suitable. The level of competency required to be able to authorize an alternative solution is considerably higher than for deemed-to-satisfy provisions

- While building control legislation varies by state, a common requirement is for the building design to be certified as being acceptable prior to construction and the completed building to be certified as fit for occupancy at the conclusion of construction. This was typically done by local government authorities but in many states can now be undertaken by suitably qualified private sector companies.

6.3 General points about fire safety regulations in Canada

- The relevant legislation is the Fire Protection and Prevention Act 1997
- Responsibility for enforcement of the legislation is spread across national, provincial, and local fire authorities.

6.4 Summary

Based on information in Appendix A and above, it is hard to make like-with-like comparisons – partly because we do not have complete information about the various official and bodies that constitute the 'action' component of the regulatory structure, and how they work together. Nor do we have any information of the resources at their disposal relative to the size of the fire risks they are managing.

The general point we take out of the information is that in these other jurisdictions fire authorities tend to have more explicit enforcement roles than in New Zealand and greater involvement in the consent process. So potentially at least, they are activated earlier in the regulatory process, and have a broader mandate, than in New Zealand.

But it is difficult to gauge from the sources we've used how well these regulatory systems work in practice e.g. in terms of efficient information exchange between parties, early detection of and responses to problems, and so on, relative to the New Zealand regime.

7. Regulation – efficiency and effectiveness in practice

7.1 Economic efficiency of regulation – costs and benefits

This section discusses the range of outcomes that can potentially result from application of the existing policy. Section 7.2 discusses why we think a range of outcomes exist, linking these back to the policy process and requirements in legislation.

The desired policy outcome is that, in all cases, construction and alterations of building in New Zealand will meet safety requirements, that is, minimise the risk of damage to buildings and to lives. This includes provision for sprinkler systems, evacuation schemes and the building materials that minimise the risk of fire, and minimise the impact of fire on buildings and lives. These policy outcomes should be achieved 'at reasonable cost.'

The benefits should be evident both to those primarily involved in the construction process (especially the prime contractor), the owner and major tenants, and third parties. However, if the costs associated with the consequence of a fire are not, or cannot be, attributed to the individuals who should be liable for the damage then the incentives are not in place to encourage behaviour that seeks to minimise the risks. So, for example, if construction firms or their advisers take cost cutting approaches that significantly add to fire risks, then ideally the regulatory process should pick this up before problems occur and impose appropriate sanctions.

The issue of liability and attributing responsibility comes back to the system design for the policy. For instance, are there checks and balances in place, such as being able to hold to account those responsible for granting consents for sub-standard buildings? This requirement is necessary if the nature of the information is such that it is difficult for people to check the validity of the certification after the fact e.g. structural elements that are not visible to the naked eye. In such circumstances, stakeholders are forced to rely heavily on the certification process and the reliability of the system. Therefore, the robustness of the system (the sequence of steps such as site inspections, certifications, and consents, and the accompanying exchanges of information between the various stakeholders) is crucial.

In addition, if the system does not attribute liability for faulty decisions to the decision makers, such as fire inspectors, then incentives can be skewed for these individuals towards immediate benefits arising from good relationships held with stakeholders, such as builders and constructors. This is because their relationships are day-to-day and ongoing and so it is desirable "to get on". This does not necessarily mean avoiding the law as

much as not seeking to enforce those things that are desirable but discretionary. The parties that would benefit from stricter interpretations of fit-for-purpose tend to be future owners and tenants that do not have ongoing contact with these decision makers.

7.2 Information and incentives

The current regulatory framework for fire safety in buildings provides considerable degrees of discretion across most of the core parties to the regulation. This can be seen as a positive feature because it is 'light-handed' and likely to involve lower compliance costs than more prescriptive legislation. It may however, raise the risk of fire because of the number of parties with some influence on fire risk, and the complexity of the regulations.

This section sets out some of the factors that can contribute to the wide range of outcomes in any regulatory system where significant degrees of discretion are allowed. These include:

- **Incentives for stakeholders** at the time of construction – for example, builders who are often on fixed price contracts have an incentive to minimise construction costs. Some aspects of design, materials, or building techniques, have a bearing on building performance, including fire safety, but such effects may only be discovered long after buildings have been completed.

- **Characteristics of the information** pertinent to building fire safety. For example asymmetries that can arise when actions cannot be observed or the technical nature of the information means that it can only be interpreted by specialists.

- The implications of **changing use of buildings** over their lifetime, which has implications for fire safety. Given the long lives of commercial, industrial, and community buildings, it is impossible to allow for all possible future uses at the time of design and construction.

- The lack of clarity as to **who bears responsibility for ensuring** the building is fit (in terms of fire safety) for the current or proposed purpose in respect of structural requirement.

- The **transaction costs** associated with obtaining information to enable questioning of the decisions or calculating the risks – for instance establishing the building materials and processes used in construction, after a building has been completed.

- The **problematic nature of fire safety risks** - they can be difficult to identify and assess

- The fact that **costs resulting from fires cannot usually be sheeted home** to those who most directly contributed to either the fact that the fire occurred in the first place, or the extent of damage and loss. The cost burden tends to be spread across a number of stakeholders. This may be a satisfactory outcome in circumstances where no single factor contributed to the fire risk; in other cases it is both unfair and inefficient.

These factors point to the many potential weaknesses in fire safety regulation and practice, and the difficulty in determining which factor or set of factors may be most in need of additional regulatory attention.

7.3 BIA determinations involving fire safety

Determinations (by the Building Industry Authority) illustrate how problems can occur in practice with the building regulatory framework. The two summaries below relating specifically to fire safety, and arising from applications for determinations by NZFS Fire Safety engineers. These determinations illustrate some of the gaps that can occur in the practical application of regulations.

7.3.1 Summary of Determination 2004/5: Fire safety provisions in a medical centre building

> *"The medical centre was a building of structural steel and concrete construction on six levels. It contained dental and medical offices and laboratories, operating theatres, recovery rooms, a hyperbaric chamber, and similar facilities, together with car parking, sanitary facilities, and so on.*
>
> *The sprinkler system covered only the floor containing the operating theatres and recovery rooms (but not the hyperbaric chamber). The applicant was the Fire Service Commission, and the other parties were the owner, the building certifier concerned, and the territorial authority.*
>
> *The Authority commissioned two independent fire engineers to visit the building and prepare reports which were copied to the parties.*

The building had been constructed in stages as the needs of particular tenants were established, with a separate building consent for each stage. The fire designer had prepared a fire report for the building as a whole, and then prepared subsequent reports for the completion of various stages (essentially fit-outs of particular levels). Those reports treated the fit-outs as being alterations to an existing building. The Authority did not agree with that approach, taking the view that a building is to be treated as a new building under construction until all of it is actually completed and ready for use.

The fire designer was not engaged to check that the plans and specifications for the building, whether initially or in respect of the fit-outs, complied with the fire reports. The Authority did not regard that as good practice.

The Authority concluded that at the time the code compliance certificate for the entire building was first issued the building did not in fact comply with the Building Code in various respects. Since then various alterations had been made or were intended to be made. Some of those alterations were necessary because of shortcomings in the fire designer's fire reports. Most of them, however, were necessary because neither the plans and specifications approved for building consent nor the building as constructed complied with those reports.

The Authority reversed the building certifier's decision to issue the code compliance certificate. The Authority had not been asked to make any Determination about the building as subsequently altered. That was a matter for the owner to demonstrate to the building certifier or the territorial authority so that a final code compliance certificate could be issued."

7.3.2 Comment

The source of the of the problem here is captured in the penultimate paragraph in the above summary – most of the alterations were necessary because neither the plans and specifications approved for building consent nor the building as constructed complied with the designer's fire reports. So some basic procedural errors led to major failures in design and construction.

7.3.3 Summary determination 2003/3: Fire safety provisions in an atrium apartment building.

"The Authority determined that a seven-level atrium apartment building had inadequate means of escape, inadequate means to control the spread of fire, and inadequate fire separation between the ground level parking and the atrium, and between the atrium and the apartments.

The Authority accordingly reversed the building certifier's decision to issue a code compliance certificate.

The building had a basement car park, a ground floor containing an office, a gymnasium and sauna, swimming pool and spa pool, lobbies, other facilities, and further car parking. The five upper levels contained a total of 60 apartments arranged around an atrium the entire height of the building above ground floor level.

The building was the subject of a specific fire design by a consulting fire engineer, with aspects of the design peer reviewed by two other consulting fire engineers. In effect, engineering calculations were used to justify the omission of various fire safety provisions required by the acceptable solution.

The Fire Service considered that the design did not comply with the Building Code and applied to the Authority for a determination.

The Authority considered written evidence from the consulting fire engineers engaged by the owner and from two of the Fire Service's own fire engineers. In addition, the Authority obtained reports from three independent fire engineers. At a hearing by the Authority, the Fire Service and the owner were each represented by legal counsel, and evidence was given by the two Fire Service fire engineers and by two of the fire engineers engaged by the owner. The building certifier and the territorial authority did not appear at the hearing.

In order to determine whether the building complied with the performance-based Building Code, the Authority used the Acceptable Solution C/AS1 as a guideline or benchmark. That was an example of the level of fire safety necessary to comply with the Building Code, but was not the only means of complying with the Code.

As it had in several previous determinations, the Authority made the following general observations about acceptable solutions and alternative solutions:

Some acceptable solutions cover the worst case so that, in less extreme cases, they may be modified and the resulting alternative solution will still comply with the Building Code.

Usually, however, when there is non-compliance with one provision of an acceptable solution it will be necessary to add some other provision to compensate for that in order to comply with the Building Code.

Applying that approach, the Authority in effect considered various specific aspects of the fire engineering design of the building in order to compare the level of fire safety achieved by the design with the corresponding level indicated by the acceptable solution.

Although design calculations had been used to justify the omission of provisions required by C/AS1, such as an automatic sprinkler system, the Authority considered that other provisions had not always been included to compensate. In respect of such omitted provisions, therefore, the building as designed did not achieve the level of fire safety achieved by C/AS1.

That meant in effect that the design, by the use of specific engineering calculations, indicated that the level of safety achieved by C/AS1 was higher than was necessary for this building.

The Authority recognised that acceptable solutions are amended or revised from time to time, which might well result in a higher or lower level of safety. However, that is done by widespread consultation as required by section 49 of the Building Act. The Building Code's required level of safety, exemplified by the current acceptable solution, cannot be replaced by some lower level that has not been authorised by that statutory process, no matter how well the lower level might be justified by fire engineering considerations."

7.3.4 Comment

In this case, fire engineers responsible for key aspects of the design of the building had chosen to interpret building codes in an apparently selective way that led to a sub-standard result. Both in this case, and the earlier example, there may have been pressure on these specialists to achieve construction cost savings. But whatever the basic cause, these were both serious failures leading to significantly increased risk to building occupants.

8. The case for change

8.1 Overview

All regulatory systems, including those for building and fire safety in buildings are compromises. They include rules and processes that should, if properly applied, help achieve the objectives of policy. At they same time, they should aim to avoid imposing complexity and costs which are not justified by the likely benefits (i.e. reduced fire risk).

In Sections 7.1 and 7.2 we outline various factors which can lead to uncertainties in terms of regulatory outcomes, especially the impossibility of achieving incentive alignment across all parties. The two BIA determinations summarised in Section 7.3 illustrate how in some cases errors of interpretation or communication failures can, in certain circumstances, combine to generate unacceptable levels of risk in design and construction.

Our brief was to examine what changes, especially to the role of the NZFS, might increase the efficiency and effectiveness of the regulatory structure for buildings as it affects fire safety.

Our examination of international comparators and of the regulatory structure and processes in New Zealand identified the following as areas possibly requiring attention:

- The very narrow role of the NZFS in terms of consents and enforcement;
- The fact that the NZFS, and in particular its Fire Safety engineers, have limited opportunities to be involved in enforcement activities;
- The structure of the levy by which the Fire Service is funded.

New construction, which is usually (but not always) open to full regulatory oversight and latest thinking in terms of regulatory standards. But the existing stock of commercial, industrial, and community buildings – many of which are unknown quantities in terms of fire safety risks – seems to be an area of weakness in terms of regulatory purview.

8.2 Problem definition

In considering changes to the design or operation of regulations, the basic questions, in the context of fire safety risk, are:

1. What aspects of the market for fire safety risk in buildings may contribute to a higher level of risk than is socially efficient?

The discussion in Sections 1 and 2 of the report reviewed potential market failures, sourced mainly in information asymmetries. We noted that more extensive regulation was one possible response, but not the sole or necessarily the most economically efficient option.

2. What changes, including regulatory changes, would most effectively address these weaknesses?

   In Section 4.2.3 we discussed the role of insurance and the potential for this to be used more effectively as an incentive alignment mechanism. We suggest that this approach could possibly flow on to the fire service levy and the way it is aligned with the risk facing the Fire Service.

3. What aspects of the current regulatory structure for building fire safety appear to be the major points of weakness?

   We addressed this in Section 7 and noted that conclusions on this are problematic because it is often the interaction of several factors, rather than one particular factor, that can lead regulatory shortcomings

4. If the best approach were judged to be more extensive regulation, which government agency or agencies would be best placed to implement and manage the new regulatory provisions?

   This is principally a matter of fiscal costs, which in turn depends on the types of additional resources that would be needed to effect the changes (e.g. more fire engineers), and the economies of scale and scope that could be realised in the various agencies.

5. What are the estimated costs and benefits of the proposed regulatory changes?

   We have by no means established a clear case that more or better regulation is the best option for improved fire safety in buildings, but for the purposes of this research we assume that it is certainly one of the major options for consideration.

In the following section we set out the main elements of a cost benefit analysis as would be applied to changes in the structure of fire safety regulations.

8.3 Cost benefit framework

In summary, cost benefit analysis involves estimating and, to the extent possible, quantifying the costs and the benefits of a proposal, such as a change in regulations, relative to an assumed ‘base case’. This enables us to

estimate the net cost (or net benefit) of the proposal. Where more than one option is being evaluated, CBA allows us to assess their relative merits to determine which option is preferred.

Cost-benefit analyses are usually core components of regulatory impact statements, which are required as of the case to Ministers for new regulations or significant changes

CBA involves the following basic steps:

1. Identifying relevant impacts (e.g. on other stakeholders in the regulatory structure) relative to a realistic 'base case' (i.e. the setting in the absence of the proposed changes to the regulations) over an appropriate period for the analysis.

2. Quantifying impacts (e.g. the effects on fire safety risks, and the benefits in terms of reduced number and severity of fires, and reduced insurance and other costs.)

3. Monetising impacts (based on the value and characteristics of the existing non-residential building stock and the projected growth in that stock, resulting from new construction.)

4. Discounting for time and risk

5. Choosing among alternatives.

We discuss each of these and data requirements in the following sections.

The analysis in the context of some (hypothetical) increase in the NZFS role in both the consent stages of new buildings and alterations to existing buildings, and in enforcement. Specific options we would propose would include:

- An increased role for the Fire Service (in conjunction with TLAs) in consent processes for buildings which because of their physical characteristics or uses, are judged to present above average risks to the Fire Service.

- An increased role for the Fire Service in enforcement through widening the range of situations in which the Service is consulted or involved in other ways, by the BIA or TLAs, in enforcement procedures.

These would obviously raise numerous practical questions about the resource implications for the NZFS, and changes to working relations with others stakeholder. These would need to be addressed at some later stage.

8.3.1 Impact identification and quantification

Impacts of an expansion of the NZFS role, as outlined in the previous section, are briefly described in the following table using the same stakeholder classification as in the regulatory structure table on page 17.

Agency/stakeholder	**Description of likely costs**	**Description of likely benefits**	**Quantification**
DIA or MED	Minor costs in revising regulations		Conceptually straightforward
TLAs	Possibly some extra compliance costs but maybe scope for savings in some TLA functions		Conceptually straightforward
BIA	Small additional policy design & administrative effort		Conceptually straightforward
Insurance companies		Possible reduction in number and cost of claims	Complex actuarial type estimation across all of the affected building stock
NZFS	Increased payroll & administrative costs		Conceptually straightforward
Fire engineers	Increased time and reporting effort in advising developers		Complex
Building owners	Increased compliance costs	Reduced fire risk	Complex actuarial type estimation across all of the affected building stock
Builders	Extra time and care in some processes		Complex
Building users		Reduced business continuity and health and safety risks	Complex actuarial type estimation across all of the affected building stock
OVERALL IMPACTS	Additional administrative costs to be recovered from taxpayers or through levies	Benefits that are difficult to estimate because of the uncertain link between regulation and fire safety outcomes	

In summary, given detailed specification of a regulatory change, it would be possible to generate reasonably robust estimates of the likely administrative and compliance costs imposed by the change.

However, estimating benefits is problematic because of the idiosyncratic nature of fire risk, and because the link between regulation and fire safety outcomes is highly uncertain.

We think the main case for change is likely to come from agreement among stakeholders about the key weaknesses in the current structure, based on a combination of principles-based analysis and practical experience, as presented in this report. Cost-benefit assessment could be a valuable tool in assessing alternative approaches to regulation, but uncertainty about benefits means that quantitative CBA results will not be the primary motivator of policy decisions.

9. Conclusions

The main conclusions we can draw out of our description and analysis of the regulatory structure for fire safety in buildings in New Zealand are:

1. There is scope for market failure in any regulatory structure, and these are mainly founded in information asymmetries or transaction costs. Fire service regulation is no exception, as evidenced, for example, by examples of determinations by the BIA summarised in this report.

2. Conventional building insurance, and the 'insurance' provided by the NZFS, are subject to the classic problems of information asymmetry leading to adverse selection and moral hazard. This leads to the potential for significant misalignment between payments for insurance (i.e. insurance premiums and fire service levies) and expected claims on those pools based on risk profiles.

3. The central policy objective in regulatory design, or changes to regulations, is 'economic efficiency' that is the society-wide benefits of any changes should at least equal the additional costs imposed by the changes.

4. The Fire Service has narrower objectives, and in terms of its core operations is mainly concerned with the trend in the frequency of fires, the aggregate costs of fighting them, and the trend in this relative to its income from the levy.

5. The potential for a misalignment between the risks represented by particular buildings and building owners, and their levy contributions, means that the Fire Service may be exposed to a

shortfall in funding, or may some lower risk buildings may be cross-subsidising higher risks. For high risk buildings, this negative externality should be internalised in the form of such building owners paying higher levy payments.

6. The New Zealand approach to regulation leans towards being 'light-handed' relative to approaches in some other comparable jurisdictions. While light is better than heavy in most respects, this approach may expose the system to significantly higher risks in some respects.

7. Our comparison with regulatory structures in the UK, Canada, and Australia indicates that fire authorities have more extensive enforcement roles than in New Zealand, but there is no easy way to calibrate these differences. If this is the case, and it can established that this contributes to better ongoing fire safety performance in those jurisdictions than in New Zealand, there may be a case for expanding the role of the NZFS. But, as with regulation more generally, this would need to be evaluated in terms of economic efficiency grounds i.e. using cost benefit analysis or related techniques.

8. Fully quantified cost benefit analysis does not seem possible, because of the difficulty of estimating the benefits (i.e. reduced fire risk) that should result from a more extensive role for the NZFS. However, a cost benefit assessment, combining quantification where possible with qualitative analysis would be an appropriate and informative approach to such an evaluation.

10. Recommendations

Based on these conclusions we would make the following recommendations:

1. The NZFS establish a small taskforce to review the regulatory structure and its performance, focusing initially on the structural weaknesses or potential weaknesses, highlighted in this report. The primary focus would be on implications for the NZFS but the review should also encompass the wider social and economic implications.

2. The review should also focus down on information flows, based on practical experience of failures in such flows that have contributed to unacceptable risks.

3. The review should also consider in detail the extent to which, based again on actual experience, the current levy structure is an effective and fair reflection of risk, and suggest a revised structure which sets

up clearer incentives for these types of building or building owners seen to be contributing disproportionately to the NZFS fire fighting costs.

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Appendix A : Regulatory structures – UK, Australia, Canada

Jurisdiction	Building legislation	Fire Safety Provisions	Fire Safety Legislation	Workplace fire regulations	Other
ENGLAND AND WALES	Building Regulations (applying to building work) are under the ambit of the Building Act 1984	Means of escape, fire 90 alarms, fire spread, and access and facilities for the fire service (Part B of Schedule 1 of the regulations)	Premises used as Hotels or boarding houses, factories, offices, shops, railway premises are designated and require a fire certificate under the Fire Precautions Act 1971	Apply to premises in which persons are employed. Most if not all buildings subject to the Fire Precautions Act, are also subject to the Workplace Fire Regulations	
Divisions of responsibility					
Building authority	Check on compliance with Building Regulations during design and construction phase. Consultation with the Fire Authority during the approvals process				
Fire authority	Contributing to mutually compatible views e.g. with local authorities on whether plans and building work are satisfactory.		Enforcing authority	Enforcing authority	Advice to designers, developers, and occupiers of buildings
Local Authority or licensing authority	Formal approval of plans, Enforcement of responsibilities (of owners, occupiers, employers)				
Owners, occupiers, employers				Carry out fire risk assessment of the workplace	

Jurisdiction	Building legislation	Fire Safety Provisions	Fire Safety Legislation	Workplace fire regulations	Other
NSW - AUSTRALIA	Building Code of Australia 1990 – with State or Territory building regulations referencing the BCA 1990. Performance based Building Code of Australia introduced 1996	Fire hose reels, hydrants, fire doors, fire extinguishers, exit signs, fire vehicle access, sprinkler installations, smoke hazard management, static water storage, etc.	State Legislation – Environmental Planning and Assessment Regulation 2000	Applies to Residential flat buildings, townhouses, shops and restaurants, offices, commercial buildings, nursing homes, public assembly buildings, places of shared accommodation and public entertainment.	
Divisions of responsibility					
Fire authority	Fire service has input into Building Code changes, with through Australasian Fire Authorities Council (AFAC) representation on the Building Codes Committee, the peak technical committee of the ABCB (Australian Building Codes Board)		Must be consulted but owners do not have to comply with recommendations, recommending authority only. Fire Service has no right to appeal. Receives copy of fire safety certificate	Must be consulted but owners do not have to comply with recommendations, recommending authority only. Fire Service has no right to appeal. Receives copy of fire safety certificate	Advice to designers, developers, and occupiers of buildings, can assess alternative solutions under BCA 1996
Local Authority					
Private certifiers			Authorised persons can issue fire safety certificates once assessment is done	Authorised persons can issue fire safety certificates once assessment is done	Can assess alternative solutions under BCA 1996
Owners, occupiers, employers			Must acquire a fire safety certificate before an occupation certificate can be granted Must submit an annual fire safety statement to the council	Must acquire a fire safety certificate before an occupation certificate can be granted Must submit an annual fire safety statement to the council	

Source: www.nswfb.gov.au, www.randwick.nsw.gov.au

Jurisdiction	Building legislation	Fire Safety Provisions	Fire Safety Legislation	Workplace fire regulations	Other
ACT - AUSTRALIA	Building Code of Australia 1990 – with State or Territory building regulations referencing the BCA 1990. Performance based Building Code of Australia introduced 1996	Fire hose reels, hydrants, fire doors, fire extinguishers, exit signs, fire vehicle access sprinkler installations, smoke hazard management, static water storage, etc.	State Legislation – ACT Building Regulations 1998	Any building proponent with a floor area in excess of 500 square metres or includes and engineered alternative solution under the Performance Based BCA 1996.	
Divisions of responsibility					
Fire authority	Fire service has input into Building Code changes, through Australasian Fire Authorities Council (AFAC) representation on the Building Codes Committee, the peak technical committee of the ABCB (Australian Building Codes Board)		Regulatory authority – must be consulted prior to the issuing of a Building Approval	Regulatory authority – must be consulted prior to the issuing of a Building Approval	Assessment of alternative solutions under BCA 1996, post occupancy inspections.
Local Authority					
Private certifiers			Can issue Certificates of Occupancy	Can issue Certificates of Occupancy	Can assess alternative solutions under BCA 1996
Owners, occupiers, employers			Must consult Fire Safety Section to obtain Building Approval, and prior to being occupied, a favourable Fire Safety Clearance Certificate	Must consult Fire Safety Section to obtain Building Approval, and prior to being occupied, a favourable Fire Safety Clearance Certificate	

Source: www.esb.act.gov.au

Jurisdiction	Building legislation	Fire Safety Provisions	Fire Safety Legislation	Workplace fire regulations	Other
Northern Territory - AUSTRALIA	Building Code of Australia 1990 – with State or Territory building regulations referencing the BCA 1990. Performance based Building Code of Australia introduced 1996	Emergency vehicle access, fire fighting equipment, smoke control, lighting, exit signs, testing of fire equipment sprinkler installations, smoke hazard management, static water storage, etc.	Territory Legislation – Northern Territory Building Act 1993	All buildings apart from private dwellings, boarding/guest houses with a floor area under 300 square metres, non habitable buildings or structures.	
Divisions of responsibility					
Fire authority	Fire service has input into Building Code changes, with through Australasian Fire Authorities Council (AFAC) representation on ABCB (Australian Building Codes Board)		Compiles reports for building certifiers, must be consulted, Fire Service have right to appeal.	Compiles reports for building certifiers, must be consulted, Fire Service have right to appeal.	Assessment of alternative solutions under BCA 1996, other inspections
Local Authority					
Private certifiers			Must obtain report from Fire Protection Division	Must obtain report from Fire Protection Division	
Owners, occupiers, employers			Must consult Fire Protection Division and gain report before certification.	Must consult Fire Protection Division and gain report before certification	

Source: www.nt.gov.au

Jurisdiction	Building legislation	Fire Safety Provisions	Fire Safety Legislation	Workplace fire regulations	Other
Queensland - AUSTRALIA	Building Code of Australia 1990 – with State or Territory building regulations referencing the BCA 1990. Performance based Building Code of Australia introduced 1996	Emergency vehicle access, fire protection systems, fire fighting equipment, occupancy safety features, sprinkler installations, smoke hazard management, static water storage etc.	State Legislation – Fire and Rescue Service Act 1990, Building Fire Safety Regulations 1991	All building except single dwelling houses, or a building treated as part of a coal mine, or buildings prescribed under section 104D.	
Divisions of responsibility					
Fire authority	Fire service has input into Building Code changes, with through Australasian Fire Authorities Council (AFAC) representation on ABCB (Australian Building Codes Board)		Must be consulted by building owner, owner must comply with notice of Fire Officer to get certificate of compliance	Must be consulted by building owner, owner must comply with notice of Fire Officer to get certificate of compliance.	Assessment of alternative solutions under BCA 1996
Local Authority					
Private certifiers			Can issue certificate	Can issue certificate	
Owners, occupiers, employers			Must consult Fire Authority	Must maintain escape plan, evacuation procedure etc. Must consult Fire Authority	

Source: www.fire.qld.gov.au

Jurisdiction	Building legislation	Fire Safety Provisions	Fire Safety Legislation	Workplace fire regulations	Other
Tasmania - AUSTRALIA	Building Code of Australia 1990 – with State or Territory building regulations referencing the BCA 1990. Performance based Building Code of Australia introduced 1996	Extinguishers, fire hoses, hydrants, valves, fire blankets, fire protection systems, sprinklers etc.	General Fire Regulations 2000		
Divisions of responsibility					
Fire authority	Fire service has input into Building Code changes, with through Australasian Fire Authorities Council (AFAC) representation on ABCB (Australian Building Codes Board)		Chief Officer issues permits	Chief Officer issues permits	Routinely audits permit holders
Local Authority					
Private certifiers					
Owners, occupiers, employers			Must have a permit, and for permit holders to test, maintain and repair this equipment.	Must have a permit, and for permit holders to test, maintain and repair this equipment.	

Source: www.fire.tas.gov.au

Jurisdiction	Building legislation	Fire Safety Provisions	Fire Safety Legislation	Workplace fire regulations	Other
Victoria - AUSTRALIA	Building Code of Australia 1990 – with State or Territory building regulations referencing the BCA 1990. Performance based Building Code of Australia introduced 1996	Fire hydrants, fire hose reels, fire control centres or rooms, fire precautions during construction, fire mains, control valves, booster assemblies, emergency vehicle access, fire indicator panels, or proscenium curtain drencher systems	Building Act 1993, Building Regulations 1994, Metropolitan Fire Brigades Act 1958, County Fire Authority Act 1958		
Divisions of responsibility					
Fire authority	Fire service has input into Building Code changes, with through Australasian Fire Authorities Council (AFAC) representation on ABCB (Australian Building Codes Board)		The consent and report of the chief officer must be obtained to an application for a building permit which involves any of the fire safety matters listed under fire safety provisions, if those matters do not meet the deemed-to-satisfy provisions of the BCA. Must be consulted for BCA 1996 alternative solutions, must get evidence of solution suitability	The consent and report of the chief officer must be obtained to an application for a building permit which involves any of the fire safety matters listed under fire safety provisions, if those matters do not meet the deemed-to-satisfy provisions of the BCA. Must be consulted for BCA 1996 alternative solutions, must get evidence of solution suitability	Can evidence alternative solution
Local Authority			Can evidence alternative solution	Can evidence alternative solution	
Private certifiers			Can evidence alternative solution	Can evidence alternative solution	
Owners, occupiers, employers			Only require consent from fire brigade if using an alternative solution under BCA 1996. Can use private certifiers for deemed-to-satisfy provisions	Only require consent from fire brigade if using an alternative solution under BCA 1996. Can use private certifiers for deemed-to-satisfy provisions	

Source: www.dms.dpc.vic.gov.au

Jurisdiction	Building legislation	Fire Safety Provisions	Fire Safety Legislation	Workplace fire regulations	Other
CANADA	Fire Protection and Prevention Act 1997	Exits, emergency lighting, exit signs, fire systems, pumps, sprinklers etc.		Places of public assembly, educational institutions, mercantile, business, industrial, manufacturing, storage and special hazard structures.	
Divisions of responsibility					
National Authority		Dominion Fire Commissioner responsible for fire safety enforcement in all non-military properties			
Provincial Fire authority		Involved in reviewing plans and specifications prior to construction, site plan reviews, and occupancy certificate provision.	Responsible for code enforcement. Involved in reviewing plans and specifications prior to construction, site plan reviews, and occupancy certificate provision.	Responsible for code enforcement. Involved in reviewing plans and specifications prior to construction, site plan reviews, and occupancy certificate provision.	Conducts voluntary fire inspections
Local Authority					
Owners, occupiers, employers			Must obtain a certificate of fitness and a license to engage in business or occupation	Must obtain a certificate of fitness and a license to engage in business or occupation. Specific permits must be issued for particular fire related activities and specific hazardous operations and conditions.	

Source: www.nassaufire-rescue.com