

# **New Zealand Building Regulations Five Years Later**

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This report was presented as an Interactive Qualifying Project Report for the Worcester Polytechnic Institute, carried out at the University of Canterbury, New Zealand

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# New Zealand Building Regulations

## Five Years Later

An Interactive Qualifying Project Report


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in partial fulfillment of the requirements for the

Degree of Bachelor of Science

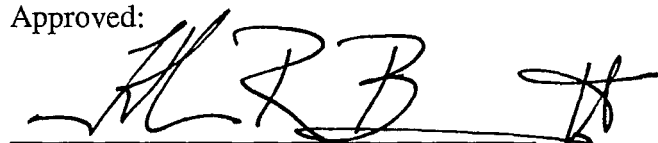
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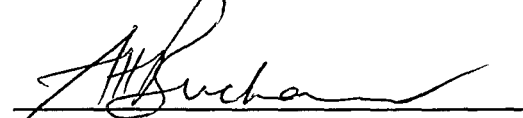
  
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## **ABSTRACT**

The objective of this Interactive Qualifying Project was to examine the educational system surrounding New Zealand's performance-based building code. This report addresses a basic history of the code and the associated educational system, as well as highlights major areas of discussion. The report describes areas of weakness in the present system and makes recommendations for improvement, including new mechanisms for information transfer and stronger qualification procedures.

# EXECUTIVE SUMMARY

## Background

In the late 1970s the New Zealand Government determined that there was a need to conduct a review of its building controls. The controls system at the time was becoming very complex and costly. After many committees and reviews, a performance-based national building code was legislated in 1991 and adopted in 1993. This code was presented to the building industry without as much educational support as needed. This lack of support created many problems in the building industry.<sup>1</sup>

In 1993, a group of students from Worcester Polytechnic Institute (WPI) came to New Zealand and conducted a study of the societal impacts of the new building code. This project team interviewed many people in the New Zealand building community. From these interviews, the team reported many themes that were generally felt throughout the building industry. After analysis of the themes, the team created recommendations to the New Zealand Government and other members of the building industry. One of these recommendation areas was a need for a system of educating the industry.<sup>2</sup>

## This Project

This paper is an Interactive Qualifying Project which is following up this education recommendation. Through many interviews and research, this project team

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<sup>1</sup> Building Industry Commission. Reform of Building Controls Vol. 1,2

<sup>2</sup> Anderson, Cox, Irelan, Woehner, The Societal Impact of the New Zealand Performance-Based Building Code, Worcester Polytechnic Institute, Interactive Qualifying Project # 93A009I

studied whether any improvements had been made since 1993 and whether there is a need for further education of the building industry members.

In the two months that the team was in New Zealand, thirty-six interviews were conducted. These interviews included:

- Educators
- Members of the New Zealand Fire Service
- Architects
- Fire Safety Engineers
- Contractors
- Project Managers
- Members of the Building Industry Authority
- Territorial Authorities
- Independent Qualified Persons

These interviewees were asked a series of questions related to the education surrounding the building code. Each of the questions was catered to the job of the interviewee. The majority of the questions dealt with the fire safety industry. A few dealt with the building owners. The interviews provided a crucial part of the information that was used in the body of this final report.

After finishing all of the interviews, the team divided the comments of the interviewees into sections. These sections created the chapters of this final paper. The major areas of discussion were:

- Information from the Building Industry Authority
- Building Owners
- Graduating Fire Safety Engineers
- Qualifications

The chapter on the information from Building Industry Authority (BIA) deals with the amount of information that the government agency has provided and is providing

to the building industry. The industry feelings toward these efforts are outlined. The actions of the agency are also described.

The chapter on building owners outlines the industry concern for this group. There is some discussion on whether the building owners understand their responsibilities and liabilities. This chapter deals with these feelings and lists the responsibilities of the owner.

The chapter dealing with the graduating fire safety engineers is a summary of the industry feelings toward the fire safety engineers graduating from the University of Canterbury in Christchurch, New Zealand. It also includes a description of the facilities, staff, and curriculum at the university. Lastly, the chapter discusses the possible need for an intern program.

The fifth chapter deals with qualifications. This is a large problem in New Zealand. There are many people in the country that do not have the necessary qualifications to be doing the job that they are. This includes all of the levels of industry. However, the levels that seem to be worst off are the Territorial Authorities (TAs) and the fire safety engineers. Many people in the industry feel that a qualification structure would help solve the many problems that hinder the smooth performance of New Zealand's building control system.

## **Recommendation Packages**

Based on the problems discussed in Part Two of the paper, a set of recommendations was constructed. These recommendations are broken down into three

groups; recommendations to the BIA, recommendations to the building industry, and recommendations to the educational institutions.

The first BIA package is the creation of an annual convention for TAs. This convention would foster communication between TAs, and between the TAs and the BIA. This package would address problems like under-educated TAs, TA discontinuity, and improperly qualified Independent Qualified Persons (IQPs). The convention would contain a guest lecturer to further the education of the TAs.

The second BIA package deals with the formation of the BIA web page. The BIA has announced that they plan to create a homepage sometime in 1997. This package is a list of recommended features for the homepage. This package would also deal with problems like TA discontinuity and communication problems.

The only recommendation to the building industry is the formation of a tiered qualification structure. This would be headed by the BIA and would assign a level of expertise to every person in the fire safety industry. This package would solve problems like abuse of the fire safety engineer title, and improper IQP inspections. The package outlines the role of each group in the industry

The first education package is the formation of a web page that contains tutorials and supporting information for computer modeling software packages. A student, as part of a degree requirement, would create this web page. The student would obviously not know everything needed, so the advice of educators and professionals would be needed. This web page would provide a source of information for people that are using computer models currently. This page would also list the many limitations of each software



package. This package would reduce the number of improper uses of fire modeling software.

The second educational package is the implementation of an intern program into the master's program at the University of Canterbury. This package deals with the lack of practical experience that the students are graduating with. This program would require students to apply early for the fire master's program and conduct their internship during the summer holiday between their undergraduate and postgraduate studies.

The third educational package is the formation of a qualification structure. This package is very similar to the recommendation to the building industry. The difference is that instead of the BIA heading the structure, the University of Canterbury would perform this function. Working with the regional polytechnic institutions, the university would develop education and certification for all members in the building industry.

The last educational package is the generation of a virtual classroom. This system would enable smaller colleges to offer a greater number of classes. The system would work by having an overseas professor post his/her class notes on the World Wide Web. The students would read the notes and e-mail the assignments back to the remote professor.

## **Conclusion**

The building industry of New Zealand has had to convert their ways of thinking to support their performance-based building code. Considering the size of this task, the industry has done remarkably well. This project is a study of how well the education to all the industry's members is progressing.

## **ACKNOWLEDGEMENTS**

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## LIST OF ABBREVIATIONS

|          |  |
|----------|--|
| BIA      | Building Industry Authority                        |
| BIC      | Building Industry Commission                       |
| BOINZ    | Building Owners Institute of New Zealand           |
| BOMA     | Building Owners and Managers Association           |
| BRANZ    | Building Research Association of New Zealand       |
| BRIG     | Building Regulations Impact Group                  |
| IPENZ    | Institute of Professional Engineers of New Zealand |
| IQP      | Independent Qualified Person                       |
| ITO      | Industry Training Organization                     |
| NFPA     | National Fire Protection Association               |
| NZBC     | New Zealand Building Code                          |
| NZS 1900 | New Zealand Standard 1900                          |
| SANZ     | Standards Association of New Zealand               |
| SFPE     | Society of Fire Protection Engineers               |
| TA       | Territorial Authority                              |
| WOF      | Warrant of Fitness                                 |
| WPI      | Worcester Polytechnic Institute                    |

## PREFACE

Worcester Polytechnic Institute (WPI) is a four year private college in Worcester, Massachusetts USA. WPI offers bachelor's, master's, and doctorate degrees. In an attempt to provide the technical profession with well rounded engineers, WPI has adopted a WPI Plan. This plan consists of three projects that each student must complete during their time at WPI.

The first of the projects is the Humanities Sufficiency. This project is designed to teach engineers about the arts. The intention here is to broaden the minds of the students. Typical Sufficiencies include five courses and a large research paper. Sufficiencies are completed by a single student.

The second of the projects is known as the Interactive Qualifying Project. This project is meant to teach students about the interactions of society and technology. Most Interactive Qualifying Projects are completed by two to four students. The projects usually consist of a study and a large research paper.

The last of the projects is known as the Major Qualifying Project. This project exposes the students to a typical engineering problem that they would encounter in the industry. The students may work with a company on solving a problem. The project usually contains extensive testing, construction, researching and writing. This project is usually completed in the student's last year of study.

WPI has a very active program named the Global Perspectives Program. In this program students travel abroad to complete their projects. The school has many sites

around the world where students and staff work on research projects. These sites are known as Project Centers. New Zealand is not a Project Center, but there are enough contacts and good relations between the University of Canterbury and WPI that the University of Canterbury served as a Project Center for this project.

The following report is an example of an Interactive Qualifying Project. The information it contains was obtained from the people and literature of New Zealand between the months of May and August of 1997. The project team consisted of Timothy Pastore and Dennis Hubbard under the supervision of WPI professor Dr. Jonathan Barnett. The professor who acted as the local Project Center adviser was Dr. Andy Buchanan, from the University of Canterbury.

# **PART I**

## **BACKGROUND OF BUILDING CODE**

# CHAPTER 1

## BACKGROUND

### 1.1 Origin and Definition of Building Codes

As countries become more industrialized they eventually reach a point where there is a need to establish some general laws to govern different aspects of life. One of these aspects is the construction of buildings. This is the basis of the building code.

Building codes have been used since 1700 BC when

King Hammurabi attempted to codify the many laws of the lands he had conquered. Article 229 of that code reads as follows: 'If a builder has built a house for a man, and his work is not strong, and if the house he has built falls in and kills the householder, that builder shall be slain.'<sup>3</sup>

This technique of controlling the construction of a building is a little harsh for today's standards, but the construction of buildings has improved greatly for sure. In most countries there are guidelines and rules that every person involved with the building industry must follow. Committees of all interested parties involved in the building industry create these codes. The purpose of these codes is to protect the general public from dangers associated with buildings. Fire, earthquake survival, and collapse are just a few examples of these dangers. A building code will not guarantee that a building will not burn or collapse, rather it ensures a reasonably safe exit for most occupants. Property damage is also kept to a minimum.

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<sup>3</sup> Sanderson, Richard. Codes and Code Administration, Building Officials Conference of America, Inc., 1969, Chicago, p. 12.

## 1.2 Fire Safety Engineering

As buildings grew larger and more people started to occupy smaller places, a new field of engineering began to emerge. This field was fire safety engineering.

With the emergence of fire safety science as a research field unto its own in the 1950s and 1960s, the knowledge base of fundamental fire science began to increase dramatically, and fire safety engineering tools started to be introduced. By the 1970s, a number of groups and individuals involved in fire safety design began to investigate engineering approaches to fire safety evaluation and design as an alternate to the prescribed approaches of the day.<sup>4</sup>

Today, the field of fire safety engineering has grown to a point where there are fire safety engineers all around the world. The field is working on understanding the quantitative aspects of fire engineering. Schools like Worcester Polytechnic Institute in the United States and the University of Canterbury in New Zealand are offering studies in fire safety engineering. The curriculum includes classes in Fire Dynamics, Fire Engineering, Fire Safety Systems, Fire Engineering Case Study, Uncertainty Analysis, and Heat and Mass Transfer. Many times the curriculum also includes research projects.<sup>5</sup>

During the growth of fire safety engineering, many professional societies were formed. The Society of Fire Protection Engineers (SFPE) and the National Fire Protection Association (NFPA) are a few examples. These societies were formed to create a forum where information could be passed from one engineer to another. They also provide educational seminars and keep the industry up to date on recent research. Many times they are involved in the development of fire documents and codes. These

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<sup>4</sup> Meacham, Brian J. Custer, Richard L.P. "Performance-Based Safety Engineering: *An Introduction of Basic Concepts*", *Journal of Fire Protection Engineering* Vol. 7 No. 2 1995, p. 35

<sup>5</sup> Buchanan, Andy. *Fire Engineering Web Pages*, p.2 ([www.civil.canterbury.ac.nz/Fire.html](http://www.civil.canterbury.ac.nz/Fire.html))

societies developed a group of goals for what they hoped fire safety engineering would provide. These goals include:

1. To provide life safety
2. To protect property and heritage
3. To provide for continuity of operations
4. To limit the environmental impact of fire protection measures<sup>6</sup>

These goals were formed to set a code of ethics for fire safety engineers. Without a code of ethics, there may be a dispute as to what is acceptable and what is not.

### 1.3 Performance Vs Prescriptive

At the time that many older building codes were formed, there was very little engineering incorporated into the codes. The codes were a form of recipe book. If the architect and builder followed the code step by step, they would have built a building that was in accordance with the building code. This recipe book was adequate for many buildings during the time, but as buildings became more elaborate and the fire safety engineering field developed, there were many times that the prescriptive solution to a design problem would either be inappropriate or impossible. The professional societies started to develop a new kind of code. This code, called performance-based, was more concerned with the performance of a building feature than the actual feature itself. The differences are:

The *specification* (prescriptive) code describes in detail exactly what materials are to be used, the size and spacing of units and the methods of assembly.

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<sup>6</sup> Meacham and Custer, p. 40



The *performance* code, on the other hand, prescribes the objective to be accomplished and allows broad leeway to the designers in selecting the materials and methods that will achieve the required results.<sup>7</sup>

Today, with the performance-based building code in hand, many engineers can start to provide significant money savings for their clients.

Performance-Based fire safety design can specifically address unique aspects or uses of a building, as well as specific client needs. A variety of tools are used in the analysis, bringing increased engineering rigor. Performance-based design results in a comprehensive fire protection strategy rather than designed isolation. This comprehensive engineering approach can often provide cost-effective fire protection and improved knowledge of loss potential.<sup>8</sup>

This code allows engineers to design a building specifically to the needs of the owner. A few examples of areas that the engineer will now be able to design around are:

1. Building Geometry and intended use
2. Location of adjacent properties
3. Probability of fire occurring
4. Fuel load and distribution
5. Number and location of occupants
6. Proximity and likely response of the Fire Service
7. Available water supply
8. Building management practices that affect fire safety<sup>9</sup>

Most performance-based codes and terms are based on the Nordic Committee's Regulations report NB 28.<sup>10</sup> These codes are broken down into five levels. The levels are:

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<sup>7</sup> Sanderson, p. 15

<sup>8</sup> Meacham and Custer, p. 38

<sup>9</sup> Buchanan, A. H. Fire Engineering Design Guide, Center for Advanced Engineering, Christchurch, 1994, p. 9

<sup>10</sup> NKB, The Nordic Committee on Building Regulations, Programme of Work for the NKB, Report No. 28, Stockholm 1976.

1. Objective
2. Functional Requirements
3. Performance Requirements
4. Verification Methods
5. Acceptable Solutions

The first level, the objectives, is designed to be the most vague. From there the levels give more definition to restrain the design. The first three levels are meant to outline the mandatory features that are legally required. The last two levels provide means for determining whether the proposed design is meeting all its requirements.<sup>11</sup>

In summary, a prescriptive building code is a design and construction recipe book. By following the specified steps, a building can be designed and built. However, the building may not fit the needs of the owner properly. In these cases, a performance-based building code allows engineers to design a building that fits the needs of the owner better. The engineer has the freedom to use alternative designs which provide equal or greater safety for the building's occupants.

## **1.4 New Zealand and the Building Industry Commission**

### **1.4.1 Introduction**

In the twentieth century the Standards Association of New Zealand (SANZ) developed model building bylaws. During this time, each New Zealand city had the task of adopting a building controls system. The city officials could adopt the model bylaws as they were, or they could add any provision they felt would better adapt the model to

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<sup>11</sup> Building Industry Commission. Reform of Building Controls Vol. 1,2, p. 45

their city. The New Zealand Standard, more commonly known as NZS 1900, was a set of model prescriptive building controls. The prescriptive natures of these controls were effective for much of the 1900's. In the mid 1970s, members of the building industry began to realize that the "Proliferation of building and planning controls had become a major factor in escalating building costs without providing commensurate benefits to building owners, users, the industry, or the public."<sup>12</sup> The government also recognized this trend and set about to address the problem facing the building industry.

#### **1.4.2 Victoria University**

The government decided that an audit of the economic impact of the existing building controls system was needed. In 1979, the Ministry of Works and Development employed the Industrial Research Group of the School of Architecture at Victoria University in Wellington to conduct the study.<sup>13</sup>

Upon completing its study, based on industry records, the Industrial Research Group submitted its findings to the New Zealand Government. The report contained the four key areas of concern listed below.

1. The lack of a common, consistent record and the massive volume of data about controls available from different sources.
2. The amount of effort expended by the industry and government on continuing revisions to individual controls, and the support for a review of the present system.

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<sup>12</sup> Building Industry Commission. Reform of Building Controls Vol. 1,2.

<sup>13</sup> Ibid.

3. The need for cost evaluation procedures and economic information on present and proposed controls.
4. The international nature of these problems.<sup>14</sup>

### 1.4.3 Building Regulations Impact Group

Faced with the serious nature of the building controls problem in New Zealand, the government decided that more action was needed. In October of 1980, the Prime Minister granted permission to a private sector committee to examine the rationalization and justification of the costs of controls in the building and property industry.<sup>15</sup> Named the Building Regulations Impact Group (BRIG), this committee consisted of a vast cross-section of the building and property industry. They ranged from engineers to building owners and worked in conjunction with several branches of the New Zealand Government.

BRIG made two submissions to the Prime Minister during its year and a half of existence. The first submission verified the results of the previous Industry Research Group study. The second, recommended the appointment of a Reviewer of Buildings and Planning Controls to undertake a major review and make recommendations to a Cabinet on methods to stem the proliferation of controls and reduce expenditures on their administration at all levels.<sup>16</sup>

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<sup>14</sup> Building Industry Commission. Reform of Building Controls Vol. 1,2, p.3

<sup>15</sup> Ibid.

<sup>16</sup> Ibid.p.4

#### **1.4.4 Reviewers**

In 1982, the Department of Internal affairs appointed a two man team to the task prescribed by BRIG. The team, known as the Reviewers, began to hold meetings with members throughout the building industry. Based on these interviews, the duo produced discussion documents. These they distributed to the building industry and the public. The purpose of these documents was to “stimulate response and further discussion before recommendations were made to the New Zealand Government.”<sup>17</sup>

Based on their findings from the interviews and the responses generated by the discussion documents, the team came to the general conclusion in 1983 that “the current plethora of bylaws, regulations and other control documents be replaced by a performance-oriented national building code.”<sup>18</sup>

The review team continued its study, and in 1984 it submitted a recommendation to the New Zealand Government on how to develop and implement a simple performance-oriented building code.<sup>19</sup>

#### **1.4.5 Building Industry Commission**

In response to the recommendations put forth by the Reviewers, the Ministry of Internal Affairs established a five-member commission in 1986.<sup>20</sup> This was the beginning

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<sup>17</sup> Building Industry Commission. Reform of Building Controls Vol. 1,2

<sup>18</sup> Building Industry Authority. Business Plan 1996&1997, p.13

<sup>19</sup> Building Industry Commission. Reform of Building Controls Vol. 1,2, p.5

<sup>20</sup> Building Industry Authority. Business Plan 1996&1997, p.13

of the Building Industry Commission (BIC). This new independent agency's objectives were to:

1. Determine within a suitable economic framework the most appropriate legal and regulatory provisions for buildings and building construction and maintenance consistent with the public interest (including health, safety, and amenity aspects).
2. In those areas where it is considered that such objectives are best achieved through minimum performance standards, prepare an appropriate, simplified, uniform performance-oriented national building code, which will bind the Crown.<sup>21</sup>

Like the previous committees, they maintained contact with all aspects of the building community. They did so through the production of a newsletter, and distribution of discussion documents.<sup>22</sup> They utilized the experience and expertise of each other, as well as input from exterior interest groups

In January of 1990, the BIC submitted its report to the New Zealand Government. The report contained proposed building reforms, whose key feature was the formation of a new national body, the Building Industry Authority (BIA). The BIA's purpose was "to be the one source of referral and review for the building control system."<sup>23</sup> These Building Reforms would come to be known as the New Zealand Building Act, and establish the present New Zealand Building code.

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<sup>21</sup> Building Industry Commission. Reform of Building Controls Vol. 1,2, p.6

<sup>22</sup> Ibid. p.8

<sup>23</sup> Building Industry Authority. Business Plan 1996&1997, p.13

### **1.4.6 New Zealand Building Act**

The New Zealand Building Act established a performance-based code structure that contained a five tier control system similar to the Nordic Committee's. It also contained 35 Approved Documents.<sup>24</sup>

The first three levels contain mandatory legal requirements for a buildings compliance. The last two levels provide additional information required by compilers and controllers to aid compliance and interpretation of the mandatory requirements.<sup>25</sup>

To coordinate and regulate compliance with the new code, the country was divided into districts. Local Councils were established, and then placed in charge of each territory. Under the Building Act, these Territorial Authorities (TAs) are responsible for enforcing building controls in its own territory.<sup>26</sup>

## **1.5 Problems With Implementing Performance-based Codes**

### **1.5.1 Introduction**

As with any new legislation there are many problems associated with the implementation of performance-based codes. Some of these problems include legal concerns, education and peer review.

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<sup>24</sup> Building Industry Commission. Reform of Building Controls Vol. 1,2, p.45

<sup>25</sup> Ibid.p.45-46

<sup>26</sup> Anderson, Cox, Irelan, Woehner.

## 1.5.2 Legal Concerns

In every country there is a certain amount of legal concern when it comes to building codes. If a person dies due to negligent construction or design of a building, everyone is concerned about whether they are responsible or not. In countries where performance-based codes have been implemented, there are two major divisions. One where the officials are responsible, and one where the owner is responsible.

The reason why liability is a major concern with the implementation of a performance-based code is because if the local officials are liable, they will usually not accept anything but an acceptable solution. This action completely defeats the purpose of having a performance-based code. In England there was a legal case that set the precedent for liability.

Murphy Vs Brentwood, gives rise to the notion that councils cannot be sued for economic loss that may be a by product of a tardy inspection. Furthermore English performance regulations provide that a building surveyor merely has to establish that a performance proposal reasonably complies with functional requirements. The English building surveyors are therefore in a low risk performance culture, as they cannot be held liable for economic loss that is occasioned by less than vigilant inspection practices, and they only have to satisfy a reasonable compliance criteria.<sup>27</sup>

This case in England created a legal shield for the local officials from liability lawsuits. With the knowledge that they are not liable, local officials are more relaxed about accepting innovative designs. The situation is similar in Sweden.

Councils do not employ the likes of building surveyors to check regulatory compliance. Rather the owner by law is responsible for ensuring that construction is carried out in accordance with the

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<sup>27</sup> Lovegrove, Kim. Holistic Considerations Concerning Performance-based Building Codes (<http://www.irc.nrc.ca/ccbfc/tgs/obc/legal/holistic.E.html>)



regulations. (The equivalent to a building surveyor in Sweden is the quality assurance engineer, a practitioner who is appointed by the owner to check to see that an inspection schedule that satisfies the council consultative committees is complied with). If per chance the practitioner fails to discharge his/her functions correctly then the practitioner is accountable to the owner, not the council. <sup>28</sup>

This means that the owner is the liable person. The practitioner only acts as the connection between what the council wants and what the owner has to do. This system keeps all liability away from the council. This is advantageous because, like in England, with less liability the building officials are much more likely to pass innovative designs. These designs, of course, can save money and please owners.

The country of New Zealand has been using a performance-based building code since the Building Act of 1991. As in England and Sweden, the liability is on the owner. However the country has had very few lawsuits related to building accidents. This along with a lack of education for building owners means that many of the building owners do not know what they are responsible and liable for.

### **1.5.3 Education**

Another place where the implementation of a performance-based code has been known to suffer is in education. In order for a performance-based code to run smoothly, all members involved in the building industry must completely understand the code. In New Zealand, many of the members of the building industry do not know enough about their building code. In 1993, four WPI students went to New Zealand to study the societal impact of the New Zealand building code. What they discovered was that:

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<sup>28</sup> Lovegrove.

Education is a concern of professionals throughout the working field. The problem is that technology rapidly changes and individuals must stay up-to-date to be efficient. Presently this has created a problem in society. Professionals are currently working beyond their qualifications and not realizing it. The Building Code was implemented in 1992, but there has been little educational transition for the work force. Consequently, people are left struggling on their own to decipher the Code.<sup>29</sup>

This problem of uneducated building industry members creates a very dangerous situation. It is feasible that an engineer may design a building that is not safe. When that design passes through the building officials, it is possible that they do not know whether something is acceptable or not. Also, when the inspector inspects the building and construction, it is possible that he/she does not know what to look for. In all instances, the same outcome, property damage or harming occupants, make the situation very serious.

The 1993 WPI Interactive Qualifying Project team noticed that the insurance agencies were also another group in New Zealand that suffered from a lack of education.

The majority of the insurance industry employees have little, or no knowledge of the enactment of the Building Code 1991. After many phone discussions with insurance companies and several personal interviews, no one felt comfortable concerning the new Building Code. Nick Gastrell opened his interview by stating he knew little about the Building Act 1991. It was expected the insurance industry to be fairly knowledgeable about the Code, since the industry deals with buildings every day. Two years after the enactment of the Building Act, the Insurance agencies seem ignorant of the legislation.<sup>30</sup>

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<sup>29</sup> Anderson, Cox, Irelan, Woehner, p. 45

<sup>30</sup> Ibid. p. 46

Having insurance agencies that are under-educated can be very dangerous for the building owner. Without knowing the building code, the insurance agency does not know what to look for and what should be pointed out to the owner as a possible high risk.

The skill level and expertise of the engineers is also critical to success of a performance-based code. In order to work correctly, a performance code must employ the cutting edge of technology. Thus, engineers must not only be fluent in the code itself but also in such devices as current software packages and revolutionary scientific advances. Without the proper expertise in these areas, an engineer could base his/her design on faulty empirical data. In the field of fire safety, the improper use of modeling software could result in lost lives.

#### **1.5.4 Review Systems**

Lastly, the review systems are another area that cause problems during the implementation of a performance-based code. Due to the complex nature of a performance-based design, it is important that the design and construction be reviewed for errors. This review should examine both the methodology and theory. For these reviews to be productive, an expert in the related field must perform them. This review system may be accomplished in several different ways, from the peer review system in New Zealand, to National Accredited Certifying Bodies as seen in Sweden and Holland.<sup>31</sup>

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<sup>31</sup> Lovegrove

Peer Review is a crucial aspect for the New Zealand Building Code because it assists the local authorities in monitoring ambitious designs<sup>32</sup>. Once a design has been submitted to the local authority, and deemed by them to be beyond their level of expertise, they can ask a fellow member of the building community, or peer, to review the plan for errors. If the reviewer feels that there are many areas that need to be improved they will call the designing engineer directly and discuss the design.

There are several drawbacks to this plan. First, there may be a shortage of qualified reviewers. This causes a problem because without the proper education, a thorough review cannot be accomplished, possibly resulting in either a rejection of a safe design or the acceptance of a dangerous design. Another problem is the possible lack of willing peer reviewers. This is usually due to the added risk involved in becoming a peer reviewer. Since they are giving the approval or disapproval recommendation to the local authorities, there is some concern that liability will therefore be transferred to them. A third possible problem, that was found to exist in New Zealand, was the possibility for a violation of design confidentiality.<sup>33</sup> There exists the possibility that a peer reviewer may take a design that they are reviewing and underbid the designer. Although a highly unethical practice, it is still a major concern to many designers.

Under Swedish law, the owner of a construction site is responsible for hiring a quality assurance engineer to supervise the construction and implementation of a design.<sup>34</sup>

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<sup>32</sup>Anderson, Cox, Irelan, Woehnker. p. 51

<sup>33</sup> Ibid. p. 54

<sup>34</sup> Lovegrove.

Although the building officials hold the owner accountable, the quality assurance engineer is held accountable to the owner. Unlike the peer review system, these practitioners are licensed by the local authorities in certain categories of engineering or other expertise fields.

The difference between a peer reviewer and a quality assurance engineer is that in order to be certified, a quality assurance engineer must be insured to a certain level to account for the possible losses that may occur. The quality assurance engineer is also more of a professional. Once certified, they no longer rely on another form of income. This allows them to worry less about the possibility of being held liable. It also makes the review process more appealing to the original designer. This is due to the fact that the possibility for a violation of design confidentiality is extremely remote.<sup>35</sup>

This form of review is more appealing to the authorities because it shifts risk and accountability from them onto the expert who furnishes the compliance certificate. Thus minimizing the local government exposure and vest the responsibility for performance-based solutions with experts who are trained to deal with performance-based proposals.<sup>36</sup>

### **1.5.5 Conclusion**

As shown there are many areas of concern when implementing a performance-based building code. In many cases, these concerns are remedied with time and effort by the building industry and building officials.

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<sup>35</sup> Lovegrove.

<sup>36</sup> Ibid.

## **1.6 Summary of the 1993 WPI Interactive Qualifying Project**

### **1.6.1 Introduction**

In 1993, a group of WPI students went to New Zealand to examine the new building code system and its effect on the New Zealand building community. The Interactive Qualifying Project investigated the effects on insurance agencies, building designers, contractors, suppliers, fire protection engineers, building owners, and local officials.<sup>37</sup>

After the interviews, the team noticed a few predominant themes. These themes included standardization of paperwork, flexibility of code compliance, increased technology, cost distribution, building certifiers, liability, education and peer review. The group took each of these topics and explained the code's intended purpose and the actual results. These themes were the basis for the Interactive Qualifying Project and the premise for the recommendations made to the New Zealand government, which fell into three categories; education, peer review, and fire safety engineering.<sup>38</sup>

### **1.6.2 Education**

The first area of recommendation was the educational system. The group made three education proposals. The first education package was more national in scope. It

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<sup>37</sup> Anderson, Cox, Irelan, Woehnker.

<sup>38</sup> Ibid.

used a trickle down system, where the BIA teaches the TAs, who then teach the local building community. The second education proposal was for a standardized paperwork system. A computerized form was created to help the users through the completion of the forms. The third educational proposal was similar to the first, except that it was more localized in nature. This package would use the TAs directly, to educate their respective local building communities.<sup>39</sup>

### **1.6.3 Peer Review**

The second area of recommendation was the peer review system. The group made four peer review proposals. The first of the proposals made by the project group was a method of education for the TAs. This method allowed for each building control officer in a TA to specialize in at least two areas of the building code. This would allow the TAs to use each other as qualified peer reviewers. The second proposal was for a national accreditation process. The BIA would run this accreditation process, and a national list of accredited reviewers would be produced. This list would then be made available to the TAs. The third proposal was similar to the second except that it put the TAs in charge of accrediting peer reviewers. A list of these locally accredited reviewers would then be sent to the BIA where a national list could be produced. The fourth proposal made by the group was a peer reviewers' association. This would allow for

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<sup>39</sup> Anderson, Cox, Irelan, Woehnker.

members of the association to have their work reviewed only by other members. This would help to secure confidentiality of the proposed design.<sup>40</sup>

#### **1.6.4 Fire Protection Engineering**

The third area of recommendation was the fire protection engineering educational system. This proposed a seminar package to address the lack of properly qualified fire protection engineers. The seminars would be held at night to avoid interfering with peoples' day jobs. These seminars would be required for all practicing fire protection engineers. They would consist of necessary fundamentals needed to be a practicing fire protection engineer.<sup>41</sup>

#### **1.6.5 Conclusion**

The 1993 Interactive Qualifying Project group identified many weaknesses in the implementation of the revised New Zealand building code. These weaknesses were encountered by interviewing many people in the building community. After reviewing these weaknesses, proposals were made to correct these shortcomings. The areas of correction included the educational system for all areas of the building community in regards to the building code, the peer reviewing system, and the fire protection engineering educational system.

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<sup>40</sup> Anderson, Cox, Irelan, Woehnker.

<sup>41</sup> Ibid.



## 1.7 Conclusion

The history of building codes has changed greatly since the days of King Hammurabi. They are a very structured set of guidelines for modern day builders to refer to. The building codes of yesterday are disappearing and a new type of building code is replacing the strict prescriptive codes. These performance-based codes allow building codes to fit the needs of the owners better than they did under prescriptive based codes.

Fire safety engineering is one of the areas where performance-based designs are used most often. These designs allow for an equal or greater amount of life safety for the building's occupants. This usually equates to a monetary savings for the owner.

In 1979, the New Zealand government determined that there was a need to review it's building controls. The system at the time was very inefficient and costly. After many different committees and reviews, a committee was formed to construct a performance-based national building code for New Zealand. In 1991 the act was passed. In 1992 and the next few years, there were many problems associated with the implementation of the building code.

In 1993, a team of four WPI students went to New Zealand and conducted a study to determine the societal impacts of the change in building codes. After interviewing many people in the building industry, the team found many areas of weakness. In a final report, the team listed the weaknesses and proposed many packages to possibly solve the problems they noted.

This document will concentrate on the changes made to the weak spots in education since the 1993 WPI team's recommendations. It will concentrate mainly on the fire safety industry.

## **PART II**

# **MAJOR POINTS OF DISCUSSION**

## CHAPTER 2

### THE BUILDING INDUSTRY AUTHORITY

#### 2.1 Introduction

In 1993, when the new building controls were officially implemented, the BIA was faced with the task of educating the industry on how to use the new building code correctly. This was a massive task.<sup>42</sup> In order for a performance-based building code to work properly, all people involved in the industry must have a strong understanding of the building code and their role in industry. In the BIC report, this education is stressed:

In developing the educational program, the individual needs of the various participants in the industry must be recognized. No one general approach will be appropriate to meet the specialist needs of the people who range from occasional house-builders and do-it-yourself operators through to Territorial Authority building controllers and manufacturers of building products. Coordination of a series of seminars prepared by the Commission and presented through the BIA will be necessary, structured in such a manner as to allow the multitude of industry organizations to be adequately briefed to adapt to the information for presentation to their members.<sup>43</sup>

The people in the building industry are divided on their feelings toward the education that the BIA has provided. There are many people in the building industry that feel that this education has not occurred, and there are others that feel that the BIA has done an adequate job of educating the industry.

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<sup>42</sup> Mellars, Leslie R. Interview by D. Hubbard T. Pastore, 6 June 1997. Interview 10-A, transcript. Waitemata Health, Auckland.

<sup>43</sup> Building Industry Commission. Reform of Building Controls Vol. 1,2, p. 116

## 2.2 Previous BIA Information

### 2.2.1 The BIA Did Not Provide the Needed Information

When the building code first came out, the BIA provided information to the building industry on how to use the building code. The fire safety industry has mixed feelings about these first few bits of information. Some members of the industry feel that the BIA did not provide enough information when the building code first came out.<sup>44,45,46,47,48,49,50</sup> These people have sometimes given their thoughts as to why the BIA did not provide enough information when the building code was first implemented. These reasons include:

- The BIA ran out of money during the writing of the Building Act and then had no money to provide education<sup>51</sup>

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<sup>44</sup> Barnett, Clifford. Interview by D. Hubbard T. Pastore, 11 June 1997. Interview 16-A, transcript. Macdonald Barnett Partners Limited, Auckland.

<sup>45</sup> Gibson, Tony. Interview by D. Hubbard T. Pastore, 5 June 1997. Interview 9-A, transcript. Gibson Consultants, Auckland.

<sup>46</sup> MacLennan, Hamish. Interview by D. Hubbard T. Pastore, 25 June 1997. Interview 3-C, transcript. Holmes Fire and Safety, Christchurch.

<sup>47</sup> Mellars, Leslie R.

<sup>48</sup> Caldwell, Carol A. Parkes, Tony. Interview by D. Hubbard T. Pastore, 25 June 1997. Interview 1-C, transcript. Caldwell Consulting LTD, Christchurch.

<sup>49</sup> Clarke, Jim. Godfrey, Ian. Interview by D. Hubbard T. Pastore, 10 June 1997. Interview 14-A, transcript. Fraser Thomas Ltd, Auckland.

<sup>50</sup> Budvietas, Arthur. Lapish, Ernest B. Interview by D. Hubbard T. Pastore, 10 June 1997. Interview 13-A, transcript. CLC Consulting Group LTD, Auckland.

<sup>51</sup> Brand, Richard. Davis, Simon. Interview by D. Hubbard T. Pastore, 4 June 1997. Interview 4-A, transcript. Beca Carter Hollings & Ferner LTD, Auckland.

- The BIA was overloaded with work at the time<sup>52</sup>
- The lack of education may not be the fault of the BIA,<sup>53</sup>
- The information is bewildering for many people in the industry,<sup>54</sup>
- The task of educating the industry is massive.<sup>55</sup>

### 2.2.2 The BIA Did Provide the Needed Information

Just as there is a group that feels that the BIA did not provide the needed education, there is a group that feels that the BIA did an adequate job.<sup>56,57,58,59</sup> These people generally feel that considering their resources, the BIA made a satisfactory effort. They commented on the shortages of money and staff in the BIA during the time when the building code was being implemented. One thing that some members of the fire safety industry feel helped the BIA significantly, was the amount of outside help that the private sectors of the industry provided. SFPE and Building Research Association of New Zealand (BRANZ) were mentioned as providing educational seminars for the

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<sup>52</sup> Gibson, Tony.

<sup>53</sup> MacLennan, Hamish.

<sup>54</sup> Budvietas, Arthur. Lapish, Ernest B.

<sup>55</sup> Mellars, Leslie R.

<sup>56</sup> Chester, Gary. Interview by D. Hubbard T. Pastore, 5 June 1997. Interview 7-A, transcript. Gary Chester Consultants, Auckland.

<sup>57</sup> Makgill, Ian. Interview by D. Hubbard T. Pastore, 3 June 1997. Interview 2-A, transcript. Fire Risk Consultants, Auckland.

<sup>58</sup> Van der Pol, Steven. Interview by D. Hubbard T. Pastore, 27 June 1997. Interview 5-C, transcript. Arrow International Limited, Christchurch.

<sup>59</sup> Roden, Wayne. Roff, Brian. Interview by D. Hubbard T. Pastore, 27 June 1997. Interview 6-C, transcript. Christchurch City Council, Christchurch.

industry.<sup>60,61</sup> These seminars generally helped the fire safety engineers more. The information was a little over the heads of the rest of the industry.<sup>62</sup> This is reinforced by one member of the industry who mentioned that there has been enough information for the engineers but he felt that the builders and contractors have not received enough education.<sup>63</sup>

### 2.2.3 Conclusion

It is safe to say that the majority of the people that the team interviewed felt that the amount of information and education that the BIA provided was less than they would have liked. On the same note, the majority of the people feel that the building community is much better off than it was a few years ago. The following chart outlines the overall industry feelings.

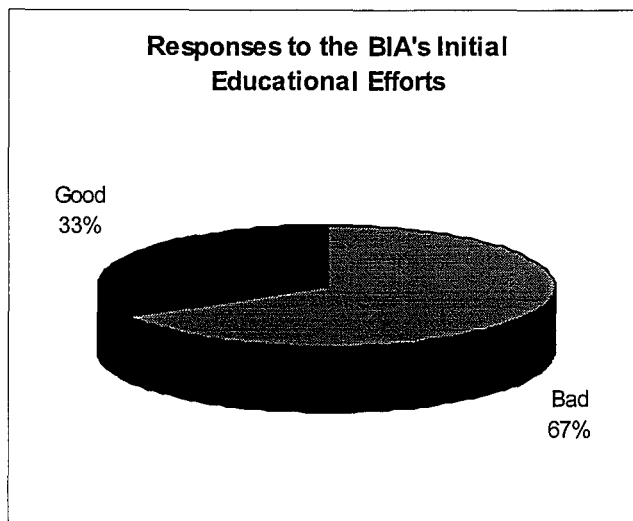
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<sup>60</sup> Barnett, Clifford.

<sup>61</sup> Chester, Gary.

<sup>62</sup> Roden, Wayne. Roff, Brian.

<sup>63</sup> Eaton, Dave. Interview by D. Hubbard T. Pastore, 25 June 1997. Interview 2-C, transcript. Buchanan and Fletcher Limited, Christchurch.



**Figure 2-1**  
**Sample Size<sup>64</sup>: 15**

### **2.3 Current Feelings and Actions**

The fire safety industry commented on the current systems of education available. As with their opinions of the BIA's effort during the implementation of the code, they were split in their feelings toward this education. In most cases the people who felt that the education was bad at first, now feel that the education is improving or is at least good. Likewise, the people that felt that the education was good at first feel that the education is worse now.

Since 1991, the BIA has received constant input about how they can improve their methods of getting information and education to the building industry. The BIA does not deny that there is a lack of education in the building industry. In the last three years they have hired an information officer and education officer. These people are in charge of

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<sup>64</sup> In all charts, each member of a group interview is counted separately.



getting all forms of information to the industry. They have undertaken a large three-year education strategy to help get all people in the building industry to the same level of understanding the building code. The summary of events for the BIA from 1995 to 1997 has been included in Appendix E. In their 1997 annual report, the BIA wrote:

- Education will continue to be a high priority of the Authority. We will hold the gains made in the initial year of the 3-year education strategy and will capitalize on the partnerships which have been forged with key organizations.
- Education of key target groups will be ongoing, and the Authority will also review the education delivery mechanism to owners and their advisers.
- The Authority will explore opportunities to provide self-directed learning packages and computer-aided training for use in tertiary institutions.<sup>65</sup>

In recent years, the added staff has been making information more readily available. This has helped in many of the building fields, including fire safety engineering. However there is still a general feeling that the local authorities need more training in the fire safety discipline. These feelings will be outlined in Chapter 5.

## **2.4 Miscellaneous Comments**

During the first month of this project, the team held many interviews with members of the fire safety industry. During the interviews there were some comments about the BIA that did not fit into the previous sections. One comment that the team

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<sup>65</sup> Building Industry Authority. Business Plan 1996-1997, p.6

received was that the BIA has a very good “open door” policy.<sup>66</sup> Another, that the newsletter was very useful and that it should be expanded.<sup>67, 68, 69, 70, 71</sup> The team confronted Mr. MacGregor at the BIA about the possibility of the increasing the amount of information that was provided in the newsletter. Mr. MacGregor told us that with current resources and the on-going review of the code, it would be difficult to increase the amount of information available at this time.<sup>72</sup> One last comment was that there needs to be more information on the acceptable solutions and the fire modeling software.<sup>73</sup> Mr. MacGregor commented on this saying that it is not the responsibility of the BIA to provide education for computer software packages.<sup>74</sup>

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<sup>66</sup> Clarke, Jim. Godfrey, Ian.

<sup>67</sup> Micallef, Frank. Interview by D. Hubbard T. Pastore, 9 June 1997. Interview 11-A, transcript. Auckland City Council, Auckland.

<sup>68</sup> Maddox, Jack. Interview by D. Hubbard T. Pastore, 4 June 1997. Interview 6-A, transcript. Fire Risk Consultants, Auckland.

<sup>69</sup> Eaton, Dave.

<sup>70</sup> Feeney, Martin. Interview by D. Hubbard T. Pastore, 9 June 1997. Interview 12-A, transcript. Holmes Fire and Safety, Auckland.

<sup>71</sup> MacGregor, John. Interview by D. Hubbard T. Pastore, 13 June 1997. Interview 2-W, transcript. Building Industry Authority, Wellington.

<sup>72</sup> Ibid.

<sup>73</sup> Naylor, Doug, Interview by D. Hubbard T. Pastore, 5 June 1997. Interview 8-A, transcript. North Shore City Council, Auckland.

<sup>74</sup> MacGregor, John.

## 2.5 Conclusion

One of the key functions of the Building Industry Authority is to disseminate information and provide educational programs on matters related to building control as provided for in section 12 (g) of the Building Act.<sup>75</sup> The BIA has improved its efforts to get information to the building industry. However the New Zealand fire safety industry has mixed feelings on whether the BIA has and is actually providing the information that they are required to provide. After conducting interviews with thirty-six members of the fire safety industry, it is the general opinion of the team that the majority of the fire safety industry is unhappy with the extent of the efforts made by the BIA towards education.

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<sup>75</sup> Killip, Rosemary. McMillan, Christl. Interview by D. Hubbard T. Pastore, 13 June 1997. Interview 3-W, transcript. Building Industry Authority, Wellington.

## CHAPTER 3

### BUILDING OWNERS

#### 3.1 Introduction

One of the topics that many of the interviewees brought up was how the building owners do not know their responsibilities and liabilities. “While owner responsibility and liability has changed little, the Building Act 1991 does more clearly emphasize the duties of owners.”<sup>76</sup> If a person is injured within a building, the building owner may be liable. After talking to people in the building industry, it was noticed that there is a concern that the building owners do not know as much as they may need to about the building code. The 1993 WPI Interactive Qualifying Project team noted that the:

Building regulations mandate life and neighbor property protection to be incorporated within design. With this being the case, cost can be cut neglecting the adequate owner’s property fire protection. Owners now have some flexibility as to the extent of fire protection in their buildings. Engineers foresee this to be a problem if professional consultation is not considered because owners may make uneducated decisions while trying to cut costs.<sup>77</sup>

#### 3.2 Owner Responsibilities

The BIA has outlined the responsibilities of the building owner as follows:

It is the owner’s responsibility to:

- Notify the Council of any proposed building or alteration work
- Notify the Council of a change of use

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<sup>76</sup> Building Industry Authority. Responsibility and Liability of Building Owners Guide No. 6, p. 2

<sup>77</sup> Anderson, Cox, Irelan, Woehnker.

- Apply for a building consent, and provide the necessary information to confirm compliance with the New Zealand Building Code
- Notify the Council on completion of building work
- Ensure that inspection, maintenance, and reporting procedures are carried out where required by any compliance schedule
- Maintain the building at all times in a safe and sanitary condition<sup>78</sup>

If these responsibilities are not fulfilled, the building owner may be liable for any accidents on his or her property.

### **3.3 Industry Feelings on Building Owners**

#### **3.3.1 Introduction**

During the interviews, many people had an opinion on whether the building owners had a good understanding of their responsibilities and liabilities. These people can be broken into two groups, those people that feel the building owners do not know enough, and those that think the owners do know enough. There were also people that had miscellaneous comments about the subject.

#### **3.3.2 Building Owners Are Not Well Informed**

There are people in the industry that feel that the building owners do not understand their responsibilities and liabilities.<sup>79</sup> The majority of these people who feel

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<sup>78</sup>Building Industry Authority. Responsibility and Liability of Building Owners Guide No. 6, p. 2

<sup>79</sup> Braggins, Ian. Trevarton, Neville. Parish, Gavin. Interview by D. Hubbard T. Pastore, 4 June 1997. Interview 5-A, transcript. New Zealand Fire Service, Auckland.

that the building owners do not know about their responsibilities and liabilities are referring to the building owners they considered “small size.”<sup>80, 81</sup> This means that the owner does not own many buildings and may not make a living of leasing buildings. These owners are difficult for the BIA to contact because they are usually not members of the Building Owners and Managers Association (BOMA) or Building Owners Institute of New Zealand (BOINZ). These two organizations are key areas that the BIA targets for distribution of building owner literature. Some of the interviewees mentioned that if the building owner has just entered the market or if the building owner is overseas, they may not get the information from the BIA.<sup>82, 83</sup>

### 3.3.3 Building Owners are well informed

Many people in the building industry feel that the majority of building owners know their responsibilities and liabilities.<sup>84, 85, 86, 87, 88, 89</sup> The majority of these people feel

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<sup>80</sup> Van der Pol, Steven.

<sup>81</sup> Clarke, Jim. Godfrey, Ian.

<sup>82</sup> Van der Pol, Steven. (Note: It is possible for a person to be on both lists. These people quantified their answers by describing which building owners do and which ones do not understand their responsibilities and liabilities. These people are noted as “Some” on the pie chart)

<sup>83</sup> Caldwell, Carol. Parkes, Tony.

<sup>84</sup> Van der Pol, Steven.

<sup>85</sup> Byrne, Peter. Interview by D. Hubbard T. Pastore, 13 June 1997. Interview 1-W, transcript. New Zealand Fire Service, Wellington.

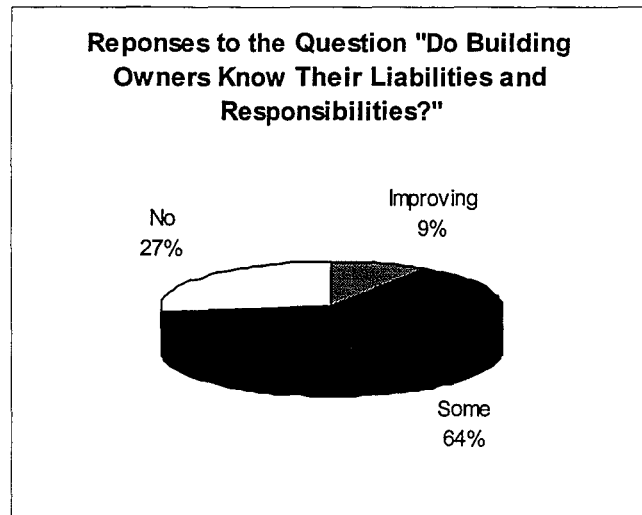
<sup>86</sup> MacLennan, Hamish.

<sup>87</sup> Eaton, Dave.

<sup>88</sup> Gregory, Russell A. Interview by D. Hubbard T. Pastore, 27 June 1997. Interview 4-C, transcript. Wormald, Christchurch.

<sup>89</sup> Caldwell, Carol A. Parkes, Tony.

that the building owners are either fine or that they are improving. A portion of these interviewees feels that the BIA has been doing an adequate job of educating the building owners.<sup>90,91</sup> The following chart is an outline of the responses the team received.



**Figure 3-1**  
**Sample Size: 11**

### 3.3.4 Miscellaneous Comments

During the interviews, a few other comments about the building owners arose. One of the comments was that the compliance schedule has mandated that the building owners learn about their responsibilities.<sup>92</sup> Another comment that came up a couple times was money. Owners are obviously in the industry to make money. They would like to keep their costs down to increase their profit. However, in a performance-based building

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<sup>90</sup> MacLennan, Hamish.

<sup>91</sup> Gregory, Russell A.

<sup>92</sup> Eaton, Dave.

industry the owner may need to spend more money during the construction of a building. This additional money at the beginning of the building's life will usually save the building owner more in the total life of the building. The building owners too often misunderstand this very important fact. They see only see the added costs, and not the benefits.<sup>93, 94, 95</sup> Lastly, people have commented on how some of the building owners try to ignore the building code:

Some building owners have tried to ignore the changes in the new code environment, but many have looked at fire safety more seriously, as their designers have identified risks and provided them with a choice between alternative solutions with different costs and different potential outcomes. Building owners have new responsibilities which require them to maintain fire protection systems with regular inspections and reporting. This has helped to make them more conscious of fire safety.<sup>96</sup>

### **3.4 Conclusion**

The building owners in New Zealand can be broken down into three major groups; those who know their responsibilities and liabilities, those who do not, and those who do not care. It is very important that all building owners know these things. If they do not, they may be unknowingly exposing themselves to a large lawsuit.

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<sup>93</sup> Byrne, Peter.

<sup>94</sup> MacLennan, Hamish.

<sup>95</sup> Clarke, Jim. Godfrey, Ian.

<sup>96</sup> Buchanan, A. H. The "Culture" of Performance-based Fire Codes, Proceedings, SFPE International Conference on Performance-based Codes, Ottawa, Canada. 1996. p. 6



## CHAPTER 4

### GRADUATING FIRE SAFETY ENGINEERS

#### 4.1 Introduction

As outlined in Chapter 1, the fire safety discipline of engineering has been developing since the 1950's and 1960s. Today, the University of Canterbury offers the only New Zealand master's degree in the field of fire safety engineering. This section looks at the curriculum of the program and the industry's reactions to it.

#### 4.2 University of Canterbury Curriculum and Facilities

The fire safety engineering master's degree has been offered at the University of Canterbury officially for four years. Since that time, sixteen students have graduated from the university with a master's degree in fire engineering. The program admits students with a bachelor's degree in any undergraduate field of study, but a background in chemical, civil, mechanical, or electrical engineering is recommended.<sup>97</sup>

Dr. Andy Buchanan established this program with help from colleagues in the department of civil engineering. Dr. Charley Fleischmann joined the staff in 1994, and is the only full time staff member in fire engineering. Dr. Buchanan's and Dr.

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<sup>97</sup> Department of Civil Engineering, University of Canterbury Fire Engineering Lectureship Annual Report 1995-96.

Fleischmann's main areas of expertise are structural behavior and fire behavior respectively. Other members of staff teach courses that overlap with other disciplines.<sup>98</sup>

In 1993, the New Zealand Fire Service Commission began a five-year contract with the University of Canterbury. This contract provided the university with NZ\$150,000<sup>99</sup> per year, for five years. This money has been used to pay the salary of the full time staff member. Other portions have gone towards research, seminars, and research facilities. The following is a list of the progress on laboratory equipment.

1993-94

Full size container fires outdoors at Woolston Fire Station.

Small fire chamber constructed.

1994-95

Small fire chamber developed for experiments.

Detailed planning for laboratory at University of Canterbury.

Discussions with New Zealand Fire Service regarding Woolston Fire Station.

1995-96

University of Canterbury laboratory under construction (for teaching and furniture calorimetry experiments).

Funding obtained for equipment laboratory and fitout from the University of Canterbury research grant and the Department of Civil Engineering.

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<sup>98</sup> Dr. Buchanan, Development Strategy 1997, p. 1

<sup>99</sup> All dollar figures are in New Zealand currency (NZ\$1.00 = US\$.666; 15-July-97)

Agreement with the New Zealand Fire Service for lease of the redundant vehicle servicing building at Woolston Fire Station for a full scale experimental fire facility.

1996-97

University of Canterbury laboratory completed.

Construction on four room-size burn chambers started.

Purchase of cone calorimeter and furniture calorimeter.<sup>100</sup>

The university offers their students two ways to earn their master's degree. One way is through course work, the other is through a thesis. The master's with course work is usually twelve months long. A master's by thesis is generally between eighteen and twenty-four months long. The doctorate degree that the school offers is usually three years in length. All of the students that have graduated thus far have qualified for a master's degree by course work.

Typical classes include:

- Fire Dynamics
- Fire Engineering
- Fire Safety Systems
- Fire Engineering Case Study
- Heat and Mass Transfer
- Uncertainty Analysis

The first four classes are compulsory. The other two are strongly recommended, but may be replaced by other relevant courses if those topics have already been studied. The

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<sup>100</sup> Department of Civil Engineering, University of Canterbury, p. 2

courses each have three to four hours of lecture per week, for ten to twelve weeks.<sup>101</sup>

The courses are structured so that the first half of the degree is coursework, the second half is an individual research project.<sup>102</sup>

There is a new part-time distance learning program that has nodes in Wellington and Auckland. This program is intended to provide master's degrees in fire engineering to members of the building industry who have previously graduated from a tertiary institution and entered the work force.

### 4.3 Industry Impressions

Overall, the industry is very impressed with the quality of the fire engineering program at the University of Canterbury. This includes the local and distance learning programs<sup>103, 104, 105, 106, 107, 108, 109, 110, 111</sup>

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<sup>101</sup> University of Canterbury Fire Engineering, Fire Engineering Web Pages ([www.civil.canterbury.ac.nz/Fire.html](http://www.civil.canterbury.ac.nz/Fire.html)).

<sup>102</sup> Ibid.

<sup>103</sup> Boyes, James. Interview by D. Hubbard T. Pastore, 11 June 1997. Interview 15-A, transcript. Macdonald Barnett Partners Limited, Auckland.

<sup>104</sup> Chester, Gary.

<sup>105</sup> Feeney, Martin.

<sup>106</sup> Gibson, J.A. (Tony).

<sup>107</sup> Gregory, Russell A.

<sup>108</sup> MacGregor, John.

<sup>109</sup> MacLennan, Hamish.

<sup>110</sup> Naylor, Doug.

<sup>111</sup> Roden, Wayne. Roff, Brian.

Many of the people in the industry feel that the students that are graduating from the university, who come straight from an undergraduate background, are graduating without enough practical experience.<sup>112, 113, 114, 115, 116, 117</sup> This problem is typical for many disciplines of engineering. Practical experience is usually gained by spending time in the industry. Most universities concentrate on teaching students the theoretical concepts of engineering and letting the students learn how to apply this theory on their own when they graduate. Some universities in the United States are trying to overcome this with mandatory internships and/or classes that teach how to apply the theory. The fire safety industry is especially concerned with this lack of experience because they are worried that students will graduate and start consulting without knowing everything they need to. This could result in an unsafe design or building. A few people mentioned that they felt that the master's program needs to be longer.<sup>118, 119</sup> Dr. Buchanan at the University of Canterbury mentioned he felt that if the course was longer that the number of enrolling

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<sup>112</sup> Boyes, James.

<sup>113</sup> Feeney, Martin.

<sup>114</sup> MacGregor, John.

<sup>115</sup> Maddox, Jack.

<sup>116</sup> Naylor, Doug.

<sup>117</sup> Gillespie, Dick. Clements, Paul. Interview by D. Hubbard T. Pastore, 30 May 1997. Interview 1-A, transcript. Fire Risk Consultants, Auckland.

<sup>118</sup> Wade, Colleen. Interview by D. Hubbard T. Pastore, 13 June 1997. Interview 4-W, transcript. Building Research Association of New Zealand, Wellington.

<sup>119</sup> Roden, Wayne. Roff, Brian.

students would drop.<sup>120</sup> The following chart outlines the industry feelings on the graduating fire safety engineers.



**Figure 4-1**  
**Sample Size: 16**

## **4.4 Internship**

### **4.4.1 Introduction**

As with any other field of study, a student will only be able to apply his or her theoretical knowledge if they have a course which teaches it or they spend time in the industry they plan to enter. Unfortunately, the majority of students graduate from college and enter a work force that is looking for experience. The students are caught in a cycle where they can not get a job without experience, and they cannot get experience without a job. Some colleges in the United States have seen how their students need practical

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<sup>120</sup> Interpretation taken from an informal interview with Dr. Buchanan on June 30.

experience and they have created intern programs which allow students to get practical experience. This is sometimes known as Cooperative Education (Co-Op).

These intern programs allow students to enter the work force with experience and practical knowledge. With its large size, the United States have been able to implement intern programs at many colleges and universities. At WPI, the graduate students studying fire protection can participate in intern programs.

A unique graduate internship program is available to fire protection engineering students, enabling them to earn income and gain important clinical experience. Under the internship program, the master's degree is usually earned in about 24 months. During this time, students follow a program of internship employment off campus in professional practice or research environment, and take part in classroom and laboratory activities on the WPI campus.

This clinical exposure helps students integrate theory and practice and enhances the practical significance of textbook offerings; helps students build confidence, shape individual goals, and make career choices; provides an environment for identifying and developing topics for the thesis or graduate project; and greatly reduces the financial burden of an engineering education.<sup>121</sup>

As this quote shows, the internship program has many benefits. It is difficult to start a system in internships. There is research that needs to be done to determine whether the industry feels it is necessary, if the industry could handle it, and if the colleges would support it. The following sections hit many of these points.

#### **4.4.2 Industry Feelings**

As the team noticed that many of the people in the industry felt that the graduating fire safety engineers did not have the practical experience they needed, another question

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<sup>121</sup> Worcester Polytechnic Institute Graduate Fire Program, ([www.wpi.edu/Academics/Depts/Fire/cfs/node8.html](http://www.wpi.edu/Academics/Depts/Fire/cfs/node8.html)).

was added to the standard list. This question was whether the interviewee felt that there was a need for the students to complete a study of internship. The interviewee was also asked if they thought that the New Zealand building industry would be able to handle such a program.

The overall response to the suggestion of an internship was that the internship would most definitely benefit the students.<sup>122, 123, 124, 125, 126, 127, 128, 129, 130, 131</sup> One group mentioned that they thought that an internship would benefit the companies as well.<sup>132</sup>

The plausibility of such a program was questioned. Members of the industry felt that the added burden of an intern would bog down some companies. They also added that the industry was too small.<sup>133, 134</sup> Other groups felt it was plausible and suggested possible companies that may be able to handle an intern program.

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<sup>122</sup> Boyes, James.

<sup>123</sup> Feeney, Martin.

<sup>124</sup> Gregory, Russell A.

<sup>125</sup> MacLennan, Hamish.

<sup>126</sup> Mellars, Leslie R.

<sup>127</sup> Naylor, Doug.

<sup>128</sup> Wade, Colleen.

<sup>129</sup> Braggins, Ian. Trevarton, Neville. Parish, Gavin.

<sup>130</sup> Budvietas, Arthur. Lapish, Ernest B.

<sup>131</sup> Clements, Paul. Gillespie, Dick.

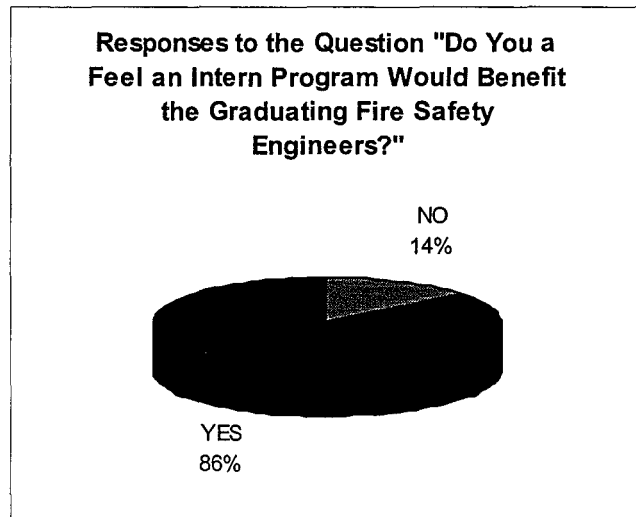
<sup>132</sup> Braggins, Ian. Trevarton, Neville. Parish, Gavin.

<sup>133</sup> Feeney, Martin

<sup>134</sup> MacLennan, Hamish.



The following chart displays the feelings of the industry toward an intern program.



**Figure 4-2**  
**Sample Size: 12**

#### **4.4.3 Conclusion**

A large majority of the people asked about an intern program felt that it would be a very useful tool for the students graduating from the University of Canterbury. There are some concerns about the feasibility of such a program in the small industry of New Zealand. With five to ten graduates a year the industry may be able to handle it. Dr. Buchanan, from the University of Canterbury mentioned that he felt an intern program would be beneficial, however he mentioned the problems of feasibility and that that he has not researched an intern program.<sup>135</sup>

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<sup>135</sup> Interpretation taken from an informal interview with Dr. Buchanan on June 30.

## **4.5 Conclusion**

The University of Canterbury has been graduating students with master's degrees in fire safety engineering for three years. The industry has generally been impressed with the quality of the students. There are also concerns that the students are graduating without the crucial element of practical experience. An intern program may help solve this problem. The feasibility of an intern program is also questioned.

# CHAPTER 5

## QUALIFICATIONS

### 5.1 Introduction

In a building industry where the building code is performance-based, it is important for all parties to have a minimal level of education, experience, and background. If this is not the case, there is a need for a way of determining whether a person is suitably educated to be performing their specific job. Since the building code and the field of fire safety engineering are new in New Zealand, there are many different levels of education throughout the industry. This difference in education can cause problems like under-qualified practicing fire safety engineers, a discontinuity between TAs, and more determinations for the BIA.

### 5.2 Current Conditions

#### 5.2.1 Territorial Authorities

During interviews, people in the industry commented on how they generally saw their colleagues. Out of all the groups involved with the building industry, the TAs seem to be the group that is struggling the most. The general feeling is that TAs that are in cities or near universities are better off than those in rural areas. The Christchurch TAs told the team that the University of Canterbury has helped them greatly.<sup>136</sup>

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<sup>136</sup> Roden, Wayne. Roff, Brian.

The Approving authorities have had to change the way that they think about fire safety. They have had to develop a whole new approach to the problem of fire, with the realization that they need to educate themselves in order to be able to process the routine jobs and call in expert advice for the major jobs. Re-education within the approving authorities is particularly important because they shoulder the main burden of responsibility for fire safety in buildings.

The larger cities appear to have accepted their responsibilities and adapted to the changes. Some smaller localities have not yet woken up to the size of the changes required. The new system is working best for approving authorities who know enough to start the process, and also know when they need assistance. The authorities who have easy access to local consultants or universities find the whole process much easier. Communication between interested parties appears to be a catalyst for increased education within the approving and more consistent review of designs.<sup>137</sup>

In most cases, the TAs understand that they do not have the education that they need to be accepting innovative designs. These TAs are actively sending designs out for peer review.

The BIA has responded to the requests of the TAs and has held seminars to train the TAs better. Rosemary Killip, the education officer at the BIA, sent the team a schedule of all the seminars that the BIA has provided in the last couple of years. TA training is included.<sup>138</sup> However, all of the TAs that the team interviewed, felt that more information needs to be provided by the BIA.<sup>139, 140, 141, 142</sup>

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<sup>137</sup> Buchanan, A. H. The “Culture” of Performance-based Fire Codes, p. 5

<sup>138</sup> See appendix E1 & E2 for schedule.

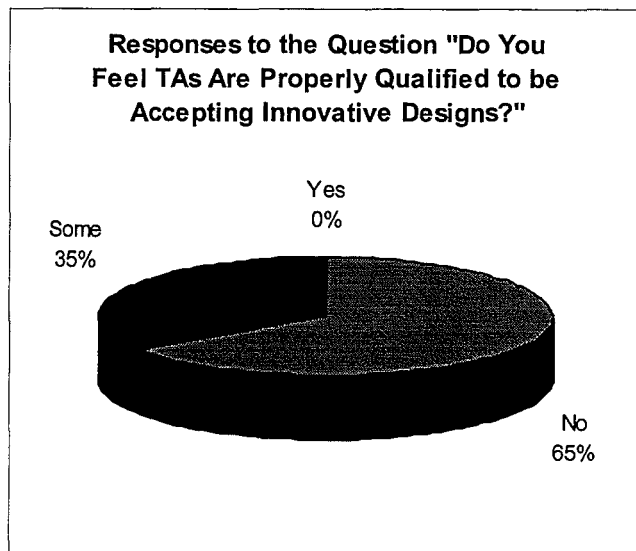
<sup>139</sup> Micallef, Frank.

<sup>140</sup> Naylor, Doug.

<sup>141</sup> Clarke, Jim. Godfrey, Ian.

<sup>142</sup> Roden, Wayne. Roff, Brian.

The following chart shows the opinions of the industry toward the qualifications of the TAs.



**Figure 5-1**  
**Sample Size: 23**

### 5.2.2 Fire Safety Engineers

In New Zealand, the University of Canterbury has been graduating fire safety engineers for only three years. Before that, there were no schools that offered a degree in fire safety engineering. However, there are engineers that have been practicing fire safety engineering for many years. There are also people that call themselves fire protection engineers that do not have the qualifications to be one. In 1993, a group of students from WPI found:

The fire protection engineer has been greatly affected by the new Code. During design, many fire engineers are working beyond their qualifications. Fire protection engineering designs may be approved that are not suitable for construction. Many engineers are currently practicing fire protection engineering with as little as a two hour seminar or a few correspondence courses which form the basis of their fire safety engineering education. Presently, fire protection engineers and other

members of the building control process are taking on work which they are not qualified to do.<sup>143</sup>

During this study, there was still a feeling that there are some members of the community that call themselves engineers, who do not deserve the title, especially for peer reviewers. However, the majority of the engineers are either taking classes in fire safety through the distance learning program or they have been in the industry long enough to understand most of the necessary concepts

### **5.2.3 Independent Qualified Person**

A final group that the industry was concerned about was the Independent Qualified Persons (IQPs). The general feeling was that the IQPs are often inspecting systems that they do not understand.<sup>144, 145</sup>

The role of the IQP is to inspect features of a building to determine whether they are in compliance with the building code and the compliance schedule. The team was told that there has been a time when an IQP has inspected heat detectors and thought they were sprinkler heads. This is a perfect example of how an IQP can inspect systems outside their specialties. In the Auckland area, the city councils have a system of determining the qualifications of their IQPs. This system may or may not be similar to the systems used in more rural areas.<sup>146</sup> The Building Act 1991:

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<sup>143</sup> Anderson, Cox, Irelan, Woehnker.

<sup>144</sup> Makgill, Ian.

<sup>145</sup> Gregory, Russell A.

<sup>146</sup> Clarke, Jim. Godfrey, Ian.

left the Territorial Authorities with the unenviable task of judging individuals suitable for approval as an IQP, based on their declared relevant trade experience. Many non-fire protection contractors were approved as IQPs only to embarrass themselves and others by getting simple procedures wrong.<sup>147</sup>

#### **5.2.4 Conclusion**

The industry as a whole has improved in its level of education. However, the TAs are still in need of more education. There are two reasons why the number of practicing fire safety engineers that do not have the necessary qualifications is decreasing. First is due to the distance learning program and the seminars conducted by professional societies such as BRANZ and SFPE. The second is that the under-qualified people have started to leave the fire safety industry to return to an industry they understand better. Lastly, poor IQP education may be causing them to inspecting building features that they do not understand.

### **5.3 Resulting Problems**

#### **5.3.1 Introduction**

The lack of qualifications of the previously mentioned groups can cause many problems. The following sections will outline some of the current problems.

#### **5.3.2 Discontinuity of TA Decisions**

One of the reasons why the BIC recommended a national building code was because there was no continuity of building controls from one town to another.

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<sup>147</sup> Latimer, Brent. The Effect of the Building Act/Building Code on the Fire Protection Contracting Industry, p. 10

Designers had to know the differences between each local authority and design around their requirements. This is a grossly inefficient system. The Building Act 1991 combined 200 or so separate documents and made one all-encompassing building code.<sup>148</sup> This way, the designers could design the same thing from town to town. However, this problem of regional variation still occurs in New Zealand today. Due to a lack of communication and education, many of the rural TAs will differ from each other and from the urban TAs.<sup>149, 150</sup> This frustrates the engineers and architects because they have to go to the BIA for a determination if the TA does not feel that a design complies with the building code.

Initially there was extreme variability in the interpretation of the Building Code in the areas of IQP proposals, Producer Statements, and Consents. This has been a major disadvantage to contractors who spent time and effort developing systems only to find they could not be universally acceptable to Territorial Authorities.<sup>151</sup>

Mr. Roff and Mr. Roden from the Christchurch City Council told the team that they would like the BIA to be more active in providing communication between TAs. They added that they feel that the BIA has a “just watch out for your own patch” attitude toward TAs. They do not provide information to TAs about previous determinations.<sup>152</sup>

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<sup>148</sup> Brand, Richard. Davis, Simon.

<sup>149</sup> Van der Pol, Steven.

<sup>150</sup> Roden, Wayne. Roff, Brian.

<sup>151</sup> Latimer, Brent.

<sup>152</sup> Roden, Wayne. Roff, Brian.



### 5.3.3 Fire Modeling Software

In the field of fire safety engineering the computer is being used more and more as a design tool. Computers can make work very easy and can, in the right hands, model a fire very accurately. However, without the proper education, a fire modeler can give inaccurate data to the engineer or person using it. Without knowing anything about fire, a person can run a complete simulation and get the computer to print graphs, charts, and data that are completely wrong.

During the interviews, the topic of the misuse and abuse of computer modelers was brought up many times. These people warned of the dangers of under-educated users.<sup>153, 154, 155, 156</sup> There are warnings during seminars and in design guides:

Simulations have great intuitive appeal because they can be designed to be almost identical to the thought process and knowledge base of the designer. For this same reason, simulations and their results must be carefully scrutinized.<sup>157</sup>

Fire modeling with computers is only at an early stage of development and therefore all the computer programs for modeling fire growth must be used carefully and by persons experienced with fire behavior.<sup>158</sup>

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<sup>153</sup> Barnett, Clifford.

<sup>154</sup> Naylor, Doug.

<sup>155</sup> Wade, Colleen.

<sup>156</sup> Clarke, Jim. Godfrey, Ian.

<sup>157</sup> Society of Fire Protection Engineers. The SFPE Handbook of Fire Protection Engineering, Quincy, Massachusetts: National Fire Protection Association, 1988, p. 4-88

<sup>158</sup> Barnett, C.R. Fire Engineering Building Design and the New National Building Code, Day 1 afternoon, p. E-2

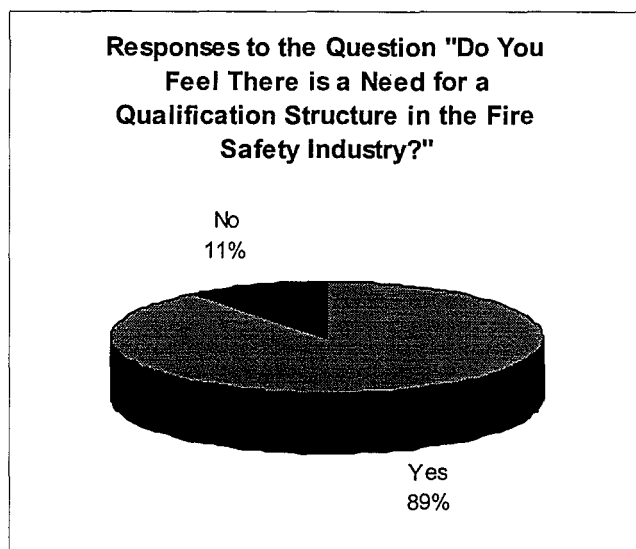
Mr. MacGregor mentioned that the education of the industry concerning the correct use of these computer modeling software packages is not the responsibility of the BIA. Unfortunately, the majority of the software packages do not have much, or any, supporting documentation on their limitations and uses.

#### **5.3.4 Conclusion**

The problems associated with the lack of qualifications are evident. One of the major reasons for writing the Building Act 1991 is still burdening the building industry. The lack of qualifications in the fire safety engineers can have catastrophic results if the engineer relies on fire models that have been used incorrectly. These problems are all due to a lack of education.

#### **5.4 Qualification Structure**

In the majority of the interviews that the team conducted, the topic of a qualification structure was addressed. Many felt that the system would need to be structured to start from technicians and finish at scientists. Such a system would address many problems in the industry. The following chart describes the industry's feelings toward a qualification structure.



**Figure 5-2**  
**Sample Size: 19**

The first problem that the structure would alleviate is the uncertainty that TAs have about the qualifications of the engineers they deal with. The TAs would also know whom they could use as peer reviewers. They also would know if the designs they receive were from a qualified person or not. "The advantage of the Building Act is that it will enable the Territorial Authorities to set minimum standards, based on recognized qualifications for specific functions."<sup>159</sup>

Another problem that a qualification structure would help is the under-qualification of IQPs. If all IQPs are listed by their specialization, then the amount of incorrect inspections will decrease.

These education programs coupled with the industry specific qualifications, and the evolving performance-based standards for fire safety systems, means that within a short time period, building professionals and Territorial Authorities will be able to require contractors

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<sup>159</sup> Latimer, Brent. p. 10

to identify which of their staff hold appropriate qualifications for the job in hand (particularly IQPs)<sup>160</sup>

Lastly, the qualifications structure would ensure that the practicing fire protection engineers are doing the work that they are qualified to do. This means that if an engineer only has the qualifications to work with acceptable solutions, then he or she can only submit designs based on acceptable solutions to the local authority. This will also include a qualification for the proper use of computer modeling software.

There are mixed feelings on who should create this qualification structure. In most cases the industry feels that SFPE should create it. The Institute of Professional Engineers of New Zealand (IPENZ) was another group that was mentioned.

## **5.5 Conclusion**

The New Zealand building industry has an unavoidable problem. There are people in the industry from different experience backgrounds and education. This has especially affected the fire safety engineers and the TAs. These groups create problems like discontinuity of the determinations made by TAs and dangerous use of computer software. Many people in the industry feel that a qualification structure will solve these problems. Professional societies like IPENZ and SFPE have been named as the parties that should set up such a qualification structure.

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<sup>160</sup> Latimer, Brent. p. 9

**PART III**

**BACKGROUND TO**

**RECOMMENDATIONS**

## **CHAPTER 6**

### **BIA RECOMMENDATIONS**

#### **6.1 Introduction**

In every interview conducted, the role that the BIA has played in the building industry was brought up. In some cases people were happy with what the BIA has done in the past and in some cases they were pleased with what the BIA is doing now. However, the majority of people wish that the BIA would provide more support. They would like to see more information in the BIA newsletter and more seminars. This group of proposals is designed to address the following problems:

- Discontinuity between TAs
- Acceptances of unsafe designs by TAs
- Under-qualified IQPs
- Under-educated building owners

#### **6.2 Discontinuity Between TAs**

The BIC was formed to create a building code that would unify the many building codes of the time. When you have TAs that are making decisions that differ greatly, you have the same effect. In New Zealand, the TAs are not totally unified in their responses to the designs that engineers and designers create. This frustrates engineers and designers. Now as well as the building code, they need to know what every local

authority will accept. The engineers and designers generally win this battle by sending a design to the BIA for a determination. If the design complies with the code, it passes, otherwise it is denied. The BIA does not publish all of the determinations. If they did, they may have fewer repetitive determinations. Instead, the BIA seems to have a “just watch out for your own patch” attitude with the TAs.

### **6.3 Acceptances of Unsafe Designs**

The under-education of the TAs is a very serious problem. If a TA does not understand a design, they have two options. One is that they can accept the design without knowing everything they need to, the second is that they can send the design out for peer review. The first option does not occur frequently, however a TA may falsely think that he/she understands a design. This creates the possibility of an unsafe building and a possible death. The BIA should keep constant contact with its TAs to be sure that they are properly qualified to be accepting the designs that they are.

### **6.4 Under-qualified IQPs**

During the interviews and the research conducted for this project, there were two noted times when IQPs had inspected a building completely incorrectly. The problem with the IQPs is that there is no way for building owners or TAs to know what the IQP is properly suited to inspect. If the TAs had a universal means of determining the qualifications of IQPs, they could pass that information on to the building owners. They could also only accept a compliance schedule from an IQP who is qualified to inspect the listed items.

## **6.5 Under-educated Building Owners**

Under the Building Act 1991 the person liable for any injury due to the failure of a building is the building owner. During many of the interviews, people mentioned that building owners do not understand that they are liable and responsible for everything that happens in their building. This problem is very serious. If the building owner does not know that he/she is liable, then he/she may be unknowingly vulnerable for a lawsuit. The BIA has been doing a decent job of getting information to the building owners, however there is a need for more information to get to the owners.

## **6.6 BIA Recommendations**

The Appendix A is dedicated to recommendations to the BIA. The packages were created to deal with the problems of TA discontinuity, unsafe design acceptances, under-qualified IQPs, and under-educated building owners. There are two major packages and one smaller recommendation.

The first BIA package is the formation of a convention for TAs. The BIA would hold this convention and the attendees would be solely TAs. The goals of this convention would be to raise the level of communication between TAs and the BIA, to raise levels of communication between TAs, to provide feedback to the BIA about the TA qualifications, and lastly to provide educational lectures to raise the level of education among TAs.

The second BIA package is the formation of a World Wide Web page. The Web is a very easy form of getting massive amounts of information out to a very diverse group of people. The BIA is planning to create a web page in the near future. This



recommendation is a list of features that would be helpful for the BIA to implement. The features would open channels of communication between all members of the building industry. They would also allow the BIA homepage to be a quick reference point for past issues of the BIA newsletter.

Lastly the third set of recommendations are for the BIA to extend its three-year seminar plan and for a larger newsletter. The seminars that the BIA are holding should continue indefinitely. The BIA should keep constant contact with the industry to determine whether the necessary people are well enough informed. If they find that the industry still needs more information, they should provide it. Many people in the industry feel that the BIA newsletter is very useful. More determinations and worked examples were a few of the things that the industry would like to see more of.

## **6.7 Conclusion**

The BIA has been very busy since it's formation. It has the very difficult task of ensuring that an entire building industry correctly understands how to use their building code. Considering the size of the project and the resources they had, the BIA has made significant progress in making sure that the code is used correctly. Appendix A contains two recommendations to the BIA that the team has developed based on the interviews conducted.

The following is a grading system based on metals. The platinum scenario would be the best, gold would be next best, then silver, then bronze.

|          |  |
|----------|--|
| PLATINUM | Continue seminars + Expand newsletter + Web page + Conventions |
| GOLD     | Continue seminars + Expand newsletter + Conventions            |
| SILVER   | Continue seminars + Expand newsletter + Web Page               |
| BRONZE   | Continue seminars + Expand newsletter                          |

## **CHAPTER 7**

### **INDUSTRY RECOMMENDATIONS**

#### **7.1 Introduction**

Appendix B is directed to the fire safety industry. This appendix was created to deal directly with the issues outlined in Chapter 5. This recommendation package is to create an industry qualification structure. This qualification structure would address problems like:

- Improper IQP inspections
- Under-qualified fire safety engineers
- Improper acceptance or denials of designs

#### **7.2 Qualification Structure**

This package would require every person in the industry to have a form of certification to show that they are qualified to be conducting the jobs they are performing.

This would include:

- Technicians
- Contractors
- IQPs
- TAs
- Designers

- Engineers

The list of people and their certifications would be held at the BIA and provided on demand to people in the industry. For example, if a building owner needs an IQP who is qualified to inspect sprinklers, he/she could call the BIA and get a list of certified IQPs that have proven their knowledge in sprinkler systems.

### **7.3 Conclusion**

After interviewing many people in the New Zealand building industry, it is clear that many people feel that there are people that are working above the level they are qualified to. The suggested way of stopping this is the creation of a universal qualifications standard. This standard would attach a level of qualification to each person in the industry. It is in the interest of the industry to consider the recommendations in Appendix B.

## **CHAPTER 8**

### **RECOMMENDATIONS TO EDUCATIONAL INSTITUTES**

#### **8.1 Introduction**

The recommendations in Appendix C are directed to the educational facilities in New Zealand. In most cases, the appendix is referring directly to the University of Canterbury in Christchurch, New Zealand. These packages would deal with the following problems:

- Lack of practical experience in graduating fire safety engineers
- Improper use of computer modeling software
- Need for a qualification structure
- Limited resources at the University of Canterbury

#### **8.2 Practical Experience**

During the interviews, the industry mentioned a concern that the students graduating from the master's fire safety program at the University of Canterbury may not have enough practical experience. This concerns the industry because they are afraid that students will graduate and start private consulting practices. This is dangerous because the student would not have enough experience to correctly design fire safety systems.

### **8.3 Modeling Software**

The computer modeling software packages that fire safety engineers use have very large limitations in what they can accurately model. If a person does not know these limitations it is possible for that person to design a dangerous building. Many of the software packages come with little or no supporting literature. In many interviews, books, and journals there were very strict warnings about the incorrect use of computer models. Appendix C1 proposes a remedy to the lack of supporting information by creating a web page full of tutorials and limitations.

### **8.4 Qualification Structure**

The need for a qualification structure has been echoed throughout this project. The dangers of a person working above their qualification level are very obvious. If a person, with no formal education or experience, is producing innovative designs they may be unsafe. A qualification structure is a means of determining who is qualified to do a specific level of work.

### **8.5 University Resources**

The University of Canterbury's fire safety program consists of two faculty members. The department would like to expand but the added costs may make expansion impossible. A main source of funding, the Fire Service Commission, is slowly diminishing its funding to the university. If the university wishes to expand the program, they may need to look to the global opportunities the World Wide Web produces.

## 8.6 Recommendations

The first of the recommendation packages addresses the problems associated with improper use of computer modeling software. This package proposes to have a student create a World Wide Web page that provides tutorials for the many fire modeling software packages available. It is possible for this project to be an Interactive or Major Qualifying Project for a student at WPI. This student would require the help of graduate students and professionals in the creation of the web page. The project may also be done by a graduate student as part of their studies. Worked examples and lists of limitations would be imperative.

The second of the recommendation packages is the proposal of an intern program for the students at the University of Canterbury. Many of the interviewees felt that an intern program would be highly beneficial to the students and the industry. Appendix C2 outlines how this program would be conducted and how it would save the industry money.

The third package is the creation of a continuing education program. This program, controlled by the University of Canterbury, would use the help of regional polytechnic schools to create an education and certification program for people in the fire safety industry. This proposal is very similar to the qualification structure outlined in Appendix B. However, this proposal would be maintained by the educating facilities.

The last recommendation package is the formation of a virtual classroom. Using web pages, a professor from a college overseas can post class notes and assignments. Then students can then either post their work or e-mail the assignment to the professor.

This system will allow smaller schools to be able to offer classes that they normally would not be able to. The added costs of paying a professor overseas would be less than paying the full time salary of another staff member.

## 8.7 Conclusion

The educational facilities of New Zealand have done a very good job of providing education to the people involved in the building industry. Overall the opinions of the industry toward the educational facilities have been positive. However, there are areas that the industry would like to see improved. Support for computer modeling software, practical experience, qualification structures, and more resources for the University of Canterbury were the major areas that the industry focused on.

The following chart is a grading system for the educational packages. It is similar to the one at the end of Chapter Six. In this case, copper is the least effective course of action.

|          |  |
|----------|--|
| PLATINUM | Web Page + Intern Program + Continuing Education + Virtual Classroom |
| GOLD     | Web Page + Intern Program + Continuing Education                     |
| SILVER   | Web Page + Intern Program  |
| BRONZE   | Web Page + Continuing Education                                      |
| COPPER   | Web Page   |



**PART IV**

**CONCLUSION**

## **CHAPTER 9**

### **CONCLUSION**

#### **9.1 Introduction**

In 1991, New Zealand passed the Building Act 1991. This act created the country's first nation-wide performance-based building code. The code was officially implemented in 1993. Through seminars and pamphlets, the BIA provided information to the industry on the correct use of the code. However, the conversion of an entire industry is a massive task that required more resources than the BIA had available. In 1993, a team of four WPI students traveled to New Zealand to conduct a study of the effects that the new building code had on the building industry. What they found was that there were many weak areas in the building controls system. They created recommendations in three areas. These areas included education, peer review, and fire protection engineering. The previous project is a follow up study to the educational recommendations. The 1993 project served as a model for this project.

#### **9.2 Major Points of Discussion**

This project was a compilation of data that the team received during the many interviews conducted. These interviews spanned the building industry. From these interviews, the team was able to pick out four major themes. These themes are the basis for the chapters in Part Two of the report.

*Information from the BIA* - The BIA is faced with the task of educating the building industry on the correct and safe use of the building code. There are mixed feelings about both the efforts of the BIA when the building code was released, and their current efforts. Some people feel that the BIA has provided sufficient information to the industry, however, the majority of the industry would like to see a more proactive BIA.

*Building Owners* - Within the building industry there is much concern that the building owners do not know their responsibilities and liabilities. This is a potentially dangerous situation. If the building owners do not know their responsibilities they may not follow the necessary procedure for code compliance. If the building owners do not know about their liabilities, they may be exposing themselves to a lawsuit.

*Fire Safety Engineers* - The University of Canterbury has been graduating students with master's degrees in fire engineering for three years. The industry as a whole feels that the master's program is very successful. The only thing that the industry feels could be improved is the amount of practical experience that the students receive. The industry feels that an intern program would benefit the students and the industry. There are concerns, however, about the feasibility of such a program in a small industry.

*Qualifications* - Throughout the New Zealand building industry, there are groups that need to be further educated to safely and correctly perform their job. In the case of TAs, they need further education and communication. This will eliminate the discontinuity between TAs. The fire safety engineers and the IQPs need to develop a tiered system of qualifications to determine who is qualified to do what. If not, people will continue to work at a level they have not been properly trained for.

### **9.3 Comparison to the 1993 WPI Interactive Qualifying Project**

In 1993, a group of WPI students traveled to New Zealand. This team conducted a study of the societal impacts the New Zealand Building Code had on the country's building industry. This team listed education as one of their important themes. This section will compare the findings of the two teams.

#### **9.3.1 Territorial Authorities**

In the 1993 project one of the areas that the team noticed problems was the education of TAs. The team wrote:

Education begins with communication between all parties involved. This communication creates cooperation and brings problems out to the open and alleviates wasted time. Some TAs feel that communication should be improved with other TAs as well as the BIA. The BIA, upon recognizing this communication gap, has attempted to bridge it with a monthly newsletter and BIA educational guides. Other than this monthly correspondence and the distribution of BIA guides, little effort has been made to aid the professional. The TA wishes that, in addition to the monthly newsletter, training be initiated by the BIA. This lack of training has caused the TAs to become inundated with assignments and rely heavily on peer review. Peer review is presently acting as an approval process in which a TA can consult if the decision is beyond the TA's knowledge.<sup>161</sup>

In this project, the team noticed many of the same problems. The TAs in Christchurch mentioned there is a need for better communication between the TAs and between the TAs and the BIA. The BIA has continued to publish the monthly newsletter. However, many people would like to see the newsletter expanded. The BIA has improved its involvement in the education of the TAs. Since 1993, the BIA has hired an

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<sup>161</sup> Anderson, Cox, Irelan, Woehnker. p. 46

information officer and an educational officer. This added staff has helped the BIA in its efforts to offer more education.

### **9.3.2 Fire Safety Engineer**

The fire safety engineers were another group that the 1993 team found to be suffering. The team wrote:

The fire protection engineer has been greatly affected by the new code. During design, many fire engineers are working beyond their qualifications. Fire Protection engineering designs may be approved that are not suitable for construction. Many engineers are currently practicing fire protection engineering with as little as a two hour seminar or a few correspondence courses which form the basis of their fire safety engineering education. Presently, fire protection engineers and other members of the building control process are taking on work which they are not qualified to do.<sup>162</sup>

During this project the team found that the industry still feels that there are engineers that are not properly qualified to be doing the work that they are. They feel that a qualification structure will help solve this problem. However, the problem is getting better as more engineers are enrolling in the distance learning program and they are getting more experience.

### **9.3.3 Building Owners**

Another group that the 1993 team mentioned was the building owners. The building owners may or may not understand all of their liabilities and responsibilities.

The team found that:

Building regulations mandate life safety and neighbor property protection to be incorporated within design. With this being the case, cost can be cut neglecting adequate owner's property fire protection. Owners now have

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<sup>162</sup> Anderson, Cox, Irelan, Woehnker. p. 48

some flexibility as to the extent of fire protection in their building. Engineers foresee this to be a problem if professional consultation is not considered because owners may make uneducated decisions while trying to cut costs.<sup>163</sup>

There are still members of the building community that still feel that the building owners do not know everything they need to. There are, however, many people that feel that the education of building owners as a whole is improving.

## **9.4 Recommendations**

As part of this project a set of recommendations were constructed. These recommendations are broken down into three groups; recommendations to the BIA, recommendations to the building industry, and lastly, recommendations to the educational institutions.

The first BIA package is the creation of an annual convention for TAs. This convention would foster communication between TAs, and between the TAs and the BIA. This package would address problems like under-educated TAs, TA discontinuity, and improperly qualified IQPs. The convention would contain a guest lecturer to further the education of the TAs.

The second BIA package deals with the formation of the BIA web page. The BIA has announced that they plan to create a homepage sometime in 1997. This package is a list of recommended features for the homepage. This package would also deal with problems like TA discontinuity and communication problems.

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<sup>163</sup> Anderson, Cox, Irelan, Woehnker. p. 49

The only recommendation to the building industry is the formation of a tiered qualification structure. This would be headed by the BIA and would assign a level of expertise to every person in the fire safety industry. This package would solve problems like abuse of the fire safety engineer title, and improper IQP inspections. The package outlines the role of each group in the industry

The first education package is the formation of a web page that contains tutorials and supporting information for computer modeling software packages. A student, as part of a degree requirement, would create this web page. The student would obviously not know everything needed, so the advice of educators and professionals would be needed. This web page would provide a source of information for people that are using computer models currently. This page would also list the many limitations of each software package. This package would reduce the number of improper uses of fire modeling software.

The second educational package is the implementation of an intern program into the master's program at the University of Canterbury. This package deals with the lack of practical experience that the students are graduating with. This program would require students to apply early for the fire master's program and conduct their internship during the summer holiday between their undergraduate and postgraduate studies.

The third educational package is the formation of a qualification structure. This package is very similar to the recommendation to the building industry. The difference is that instead of the BIA heading the structure, the University of Canterbury would perform this function. Working with the regional polytechnic institutions, the university would develop education and certification for all members in the building industry.

The last educational package is the generation of a virtual classroom. This system will enable smaller colleges to offer a greater number of classes. The system would work by having an overseas professor post his/her class notes on the World Wide Web. The students would read the notes and e-mail the assignments back to the remote professor.

## **9.5 Future**

In 1991, New Zealand successfully implemented a performance-based code. Since then the building industry has been constantly providing education to itself to raise its overall education level. Given time, many of the problems noticed in this project may disappear. However, the recommendations may be helpful in speeding up the process. It is quite possible that in the near future New Zealand's building control systems will be working as smoothly as intended.



# **APPENDIX A**

## **BUILDING INDUSTRY AUTHORITY**

### **RECOMMENDATIONS**

# APPENDIX A1

## Conventions for Territorial Authorities

### A1.1 Introduction

This recommendation package is related to the problems with TAs. There were two major problems found with the TAs. The first was that the TAs did not have enough communication between the BIA and each other. This problem causes discontinuity between the TAs. The second problem with the TAs was the lack of education. This causes improper acceptances or denials of designs.

This recommendation is for the BIA to create a program of conventions to be attended by TAs only. These conventions would promote communications between the BIA and the TAs, as well as between the TAs themselves.

### A1.2 Goals

This recommendation has six goals:

1. Create uniformity between TA determinations
2. Help relations between TAs and the BIA
3. Help relations between the TAs
4. Introduce new literature and forms of communication
5. Provide feedback to the BIA about TA progress levels
6. Develop universal IQP qualification structure (first convention)

These goals are the framework for an annual regional TA convention. This convention would be held in a central location so as to lessen the traveling expenses of the TAs. The

convention would require a full day. The convention would follow a standard format.

The following is a sample itinerary:

- Opening Comments
- Comments from the BIA
- Feedback to the BIA
- Guest Speaker Lecture
- Community Development
- Closing Comments

This format would allow for free conversation periods between the members of the BIA and the TAs and between the TAs themselves. The time period for comments from the BIA would be for the BIA to introduce new programs or pieces of literature for the TAs. In the first seminar a suggested topic might include an introduction to the BIA web page.<sup>164</sup> At this time any new literature would also be discussed.

The feedback to the BIA section of the convention would be very important to the BIA. This would be a very useful tool for measuring what areas of education and communication have worked best. The BIA could then take that information and apply themselves better.

The guest speaker would be a person from the building industry that would prepare a lecture for the TAs on some area that the TAs are having difficulty. The BIA, to determine what area of the industry the speaker should be from, should use comments from the previous convention.

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<sup>164</sup> See Appendix A2.

The community development should be designed to have TAs work as small groups. They should be broken up into groups of people that are not familiar with each other. This would create better relations between the TAs. A suggested project for the first convention would be for the TAs to determine a universal method of determining the qualifications of IQPs<sup>165</sup>. After each group has worked on its project, for example, they have determined what are acceptable qualifications for an IQP, they would present it to the general convention. This is a method of getting work done and building inter-TA relations.

### **A1.3 Advantages**

The advantages to this package are as listed:

- Could be implemented into the BIA's 3-year seminar program
- Over time the number of determinations will drop
- The number of repetitive questions asked to the BIA from different TAs would decrease
- The TAs would require peer review less
- Safer building approval

### **A1.4 Disadvantages**

The disadvantages to this package are as listed:

- Added costs to BIA
- Travel expenses for TAs

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<sup>165</sup> See Appendix B1.

- Time out of work for TAs
- Difficulty of coordinating so many people

## **A1.5 Conclusion**

Of all the packages recommended to the BIA, this package would have the most benefit. The package eliminates many problems simply by creating better education and communication. After a few years, it is very possible that these conventions would not be necessary. However, at the present time the TAs need to be brought to a higher level of education. If the BIA was active in this process they would find that in the long run it may save them time and money by eliminating repetitious determinations and questions. It would also allow the TAs to develop the confidence to use each other as a resource.

## **APPENDIX A2**

### **World Wide Web Page**

#### **A2.1 Introduction**

In today's society the use of the World Wide Web as a tool for sharing information is becoming commonplace. The web is a very inexpensive, easy means of getting information to millions of people instantly. The easy updating and modifying capabilities make it very easy to keep web pages up to date with current information. The education and information officer at the BIA mentioned that the BIA plans to develop a web page in the near future. This recommendation package is a list of features that the industry would like to see on the BIA web page.

#### **A2.2 Goals**

This recommendation has three goals:

1. Create uniformity between TA determinations
2. Help relations between TAs and the BIA
3. Help relations between the TAs

For the BIA to fulfill these goals, there are objects which they should incorporate into their web page. These features include:

- Current and backlogged issues of the monthly newsletter
- List of frequently asked questions
- Current annual report

- Usenet<sup>166</sup>
- Links to building related web pages
- Link to administrator e-mail

Each of these features will provide a specific benefit to the building industry. The newsletters will be a quick reference for all members of the building industry. This will lower the number of determinations. The TAs or designer will be able to reference determinations that were published in past newsletters. Backlogging newsletters will not be a difficult or costly task. Scanning a past newsletter and using a character recognition software program will allow the BIA to backlog all newsletters in a very short amount of time.

The list of frequently asked questions will help lower the number of phone calls to the BIA. This will allow any member of the building industry to research the web page before calling the BIA.

The current annual report will notify the industry about upcoming events. It will also allow people to see where the money in the BIA is going.

Usenet will create an open forum for members of the building industry. If anyone in the industry has a question they can post it on a “cyber-bulletin board”. Then other members of the community can answer the question and respond to each other’s comments. This tool will increase the communication between the members of the building community. This will also decrease the number of questions directed to the BIA.

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<sup>166</sup> Usenet is bulletin board based web feature that allows users to have a forum for questions and comments.

It is not the responsibility of the BIA to provide education on matters outside of the direct use of the building code. However, it would help the building industry if the BIA would include a list of building related sites on its web page. This will allow people to go to pages where they can find useful information related to their field. For example, a page pointing to SFPE's home page would be useful for fire safety engineers.

A link to the administrator's e-mail is also necessary so that if any person reading the web page, who wants more information, can e-mail the administrator to request it.

A very good article has been written about the World Wide Web and fire engineering. It was written by William E. Pucci. It is in the 1996 November/December NFPA Journal, page 45-51. The name of the journal is A Guide to Navigating the 'Net. The journal outlines many of the features that have been discussed in this recommendation package

### **A2.3 Advantages**

This recommendation package has the following advantages:

- Inexpensive
- Relatively easy
- Fast updating time
- Provides forum for conversation
- Good reference tool



## **A2.4 Disadvantages**

This recommendation package has the following disadvantages:

- Not all people have access to World Wide Web
- Not all people are comfortable with computers

## **A2.5 Conclusion**

A World Wide Web page is a very useful tool. It allows companies to get information out to many people very easily. The BIA has plans to create a web page sometime in 1997. This recommendation package is a list of features that would greatly benefit the industry. If there is a good acceptance from the industry and most of the suggested features are used, this package may be the highest “bang for the buck” package offered.

# **APPENDIX B**

## **INDUSTRY RECOMMENDATIONS**

## **APPENDIX B1**

### **Industry Qualification Structure**

#### **B1.1 Introduction**

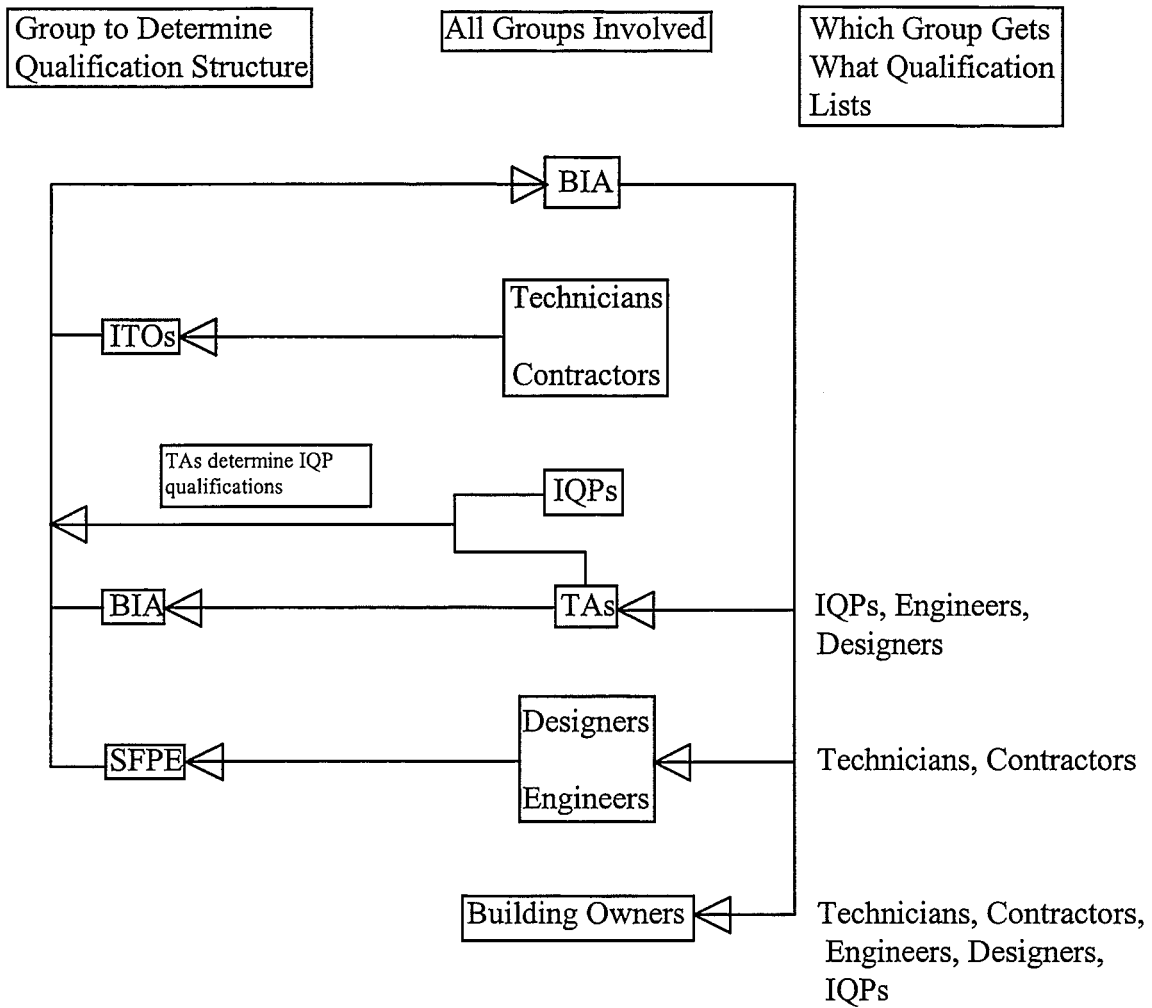
Chapter 5 outlined a need for a universal qualification structure for people involved with the fire discipline of buildings. This qualification structure would enable all members of the building industry to know the qualifications of the person they are working with. The groups involved would be the TAs, IQPs, contractors, architects, engineers, and technicians. This recommendation package is addressed to the fire safety industry. The industry needs to determine a method of creating acceptable tiers of qualifications.

#### **B1.2 Goals**

This recommendation package has six goals:

1. Create a tiered qualification structure for the fire safety industry
2. Eliminate improper IQP inspections
3. Reduce the number of under-qualified practicing fire safety engineers
4. Reduce the number of improper acceptances or denials by TAs
5. Create confidence among TAs about properly qualified peer review candidates
6. Create confidence among building owners about properly qualified IQPs

The following figure is a description of the qualification structure tree:



**Figure B-1**  
**Qualification Structure Tree**

The BIA's responsibilities in this structure would be to receive constantly updated lists of the people in the industry and their qualifications. They then would provide this information to the TAs, designers, engineers, and building owners.

The information for the TAs would include the names of IQPs, engineers, and designers. This would help TAs in two ways. It would enable them to know what IQPs are acceptable for a specific inspection. The other way this would help the TAs is that they would have a list of all the designers and engineers. This would allow them to know who is properly qualified to do what level of design. This would also aid the TAs in their choice of peer reviewers.

The list of technicians and contractors would help the designers and engineers know what companies they can rely on for correct construction and installation of their designs.

The building owners may be the group that would benefit the most from this information. They would receive a list of technicians, contractors, IQPs, designers, and engineers. This would help them choose people to design, build, and inspect their buildings.

The groups that would determine the qualifications of the different segments of the building industry should be a combination of Industry Training Organizations (ITOs), the TAs, the BIA, and SFPE. The ITOs would give certification to the contractors and technicians. The TAs would certify the IQPs. The BIA would determine the qualifications of the TAs through the seminars suggested in Appendix A1. And lastly, the local chapter of SFPE would create qualifications for designers and engineers.

This would include three levels of proficiency; acceptable solutions only, acceptable solutions and simple performance-based designs, and totally performance-based design.

### **B1.3 Advantages**

The advantages to this recommendation package are:

- Encourages industry to further themselves
- Reduces unsafe buildings
- Promotes better inspections, designs, and peer reviews.

### **B1.4 Disadvantages**

This recommendation has the following disadvantages:

- More paperwork for the BIA
- May offend members of the industry to be required to prove their qualifications
- Difficult task of agreeing on what qualifications are acceptable

### **B1.5 Conclusion**

This recommendation package should be looked at seriously by the BIA, ITOs, TAs, and SFPE. If these groups feel that they can handle such a task it would benefit the industry and themselves. The only people that would not like this package would be the people that are currently working above their qualifications. The majority of the people interviewed felt that there was a need for a qualification structure. This leads one to believe that currently there are people that are working above their qualifications. This package would eliminate this threat to the building industry and general public.

# **APPENDIX C**

## **UNIVERSITY RECOMMENDATIONS**

# APPENDIX C1

## World Wide Web Page Tutorials

### C1.1 Introduction

Chapter 5 discussed a very serious problem. This is the improper use of computer modeling software. In this package this problem will be addressed. The suggestion is to have fire safety engineering students create a web page that is a set of tutorials for the correct use of fire modeling software. This project can be incorporated as part of the degree requirements of the students.

### C1.2 Goals

This recommendation has five goals

1. Provide information for the proper use of computer modeling software to anyone who wants it
2. Decrease the number of improper uses of computer models
3. Provide links to other fire related sites

One suggestion would be for a student planning to study fire protection engineering at WPI, to create the tutorial as an Interactive or Major Qualifying Project with the help of the industry and colleges. This student may not be completely familiar with the software packages, but rather he/she would be the person who compiles many smaller tutorials created by the industry. A better suggestion would be for a fire protection graduate student to create the tutorials as part of their studies.



### **C1.3 Advantages**

This recommendation package has the following advantages:

- Very inexpensive
- Provides information that the industry feels is critical
- Reduces the number of incorrect uses of computer models

### **C1.4 Disadvantages**

This package has the following disadvantages:

- Time consuming
- Student may need to rely on work done by professionals
- May falsely lead more people into feeling comfortable with use of computer models
- May be copyright problems

### **C1.5 Conclusion**

This package is fairly simple for a student to do as part of a degree requirement.

It would provide a means of learning for the student. While the student is working on the project he/she would learn how to correctly use computer modeling software packages.

There is one difficulty with this project. The student either needs to understand the software packages perfectly or rely heavily on people who do. This is very difficult to do, as the professionals who use fire modeling software are generally very busy. It also may be necessary for a qualification structure to be in place before this web page is

created. If not, the number of people who falsely believe that they can use computer models correctly may rise.

## **APPENDIX C2**

### **Intern Program**

#### **C2.1 Introduction**

In Chapter 4 the industry's feelings toward the graduating fire safety engineers are described. In most cases, the industry members had very good things to say about the graduates from the University of Canterbury. There was only one thing that the industry was concerned about. It was the amount of practical experience that the graduates have as they enter the work force.

#### **C2.2 Goals**

This recommendation has five goals:

1. Provide practical experience for graduating fire safety engineers
2. Provide theoretical information to the industry members
3. Develop better industry/university relations
4. Help students with tuition fees
5. Lower costs for industry

In many colleges in the United States, the intern program has been created to provide students with an opportunity to gain some practical experience before graduating. In many cases, the company that the student conducted their internship at will hire the student.

When asked about the feasibility of the intern program, there were several concerns. First was that there would not be enough companies to absorb the interns.

When these students graduate they will have to be absorbed into the industry anyway, so if there is not enough room for six to ten students a year to have an internship, then the university is graduating too many students. Another concern was that the intern would cost the companies money. In the long run, the companies would save money. The companies would be paying the student less money when they are inefficient and more when they graduate and are more efficient. If the student does not have any intern experience the company will be paying him/her the full engineer salary while they are still inefficient.

This recommendation would help the college know what the industry wants in its graduating engineers. It would also allow the industry to have a more active involvement in the education of its future employees.

This package also allows the students to teach the theoretical information, that they have been learning, to their employers. For example, if a student went to the New Zealand Fire Service he/she would be able to gain great practical experience. However, the fire service would also have the opportunity to learn about how to use fire models correctly.

This package would help students with the costs of tuition. Working as an intern would allow students to earn money that they can apply toward the ever-increasing cost of tuition.

One concern with the intern program would be that there needs to be a time for the students to work. If the University of Canterbury required applications into the fire master's program at the beginning of the student's fourth year, the department could possibly find employment for the student for the upcoming summer holiday.

### **C2.3 Advantages**

This recommendation package has the following advantages:

- Saves money for the industry
- Creates better fire safety students
- Helps educate the industry
- Helps students afford college tuition

### **C2.4 Disadvantages**

This package has the following disadvantages:

- Added work for the university
- Difficulty finding willing companies
- May turn students off to the master's program

### **C2.5 Conclusion**

This package is a very useful package to graduating students. They would be able to say they have practical experience. This is a very valuable thing for a student to have on their resume. This package may also save the industry and the students money. Lastly the package would create a better industry/college relationship.

## **APPENDIX C3**

### **Continuing Education**

#### **C3.1 Introduction**

In Chapter 5, the problems associated with a lack of a qualification structure were discussed. In Appendix B, a method of determining these qualifications was outlined. This package is assuming that nothing suggested in Appendix B has taken place. This package is leaving the education and certification of all members of the building industry up to the universities.

#### **C3.2 Goals**

This proposal has the same goals as Appendix B. The only difference in this proposal is that instead of using the BIA, TAs, SPFE, and ITOs to develop a means of determining the qualifications of a person, the college would do it. The college would provide education programs that would certify a member of the industry. The university would then retain all records of who is properly qualified to what level of work. From there the college would distribute the information in the same way that the BIA would in Appendix B. This recommendation would most likely require the University of Canterbury to work with local polytechnic universities across the country.

### **C3.3 Advantages**

This package has all the benefits of Appendix B and:

- The BIA does not have an added work load
- There may be financial benefit for the colleges

### **C3.4 Disadvantages**

This package has the following disadvantages:

- The BIA does not have any control of certification
- Added work load for universities

### **C3.5 Conclusion**

The need for a qualifications structure in the building industry is obvious. If the government does not want to control this qualifications structure, this package may be a better option. When the university is providing information to TAs, it may be in the interest of the BIA to fund the education. The more education they fund, the fewer seminars they need to hold to educate the building community.

## **APPENDIX C4**

### **Virtual Classroom**

#### **C4.1 Introduction**

The World Wide Web is constantly growing in its uses. One of the areas that the web is being used is as a teaching tool. The web allows teachers to post assignments and papers for all the students to see. This recommendation package is for the University of Canterbury to work with other colleges in developing a network of virtual classrooms. These classrooms would allow the university to offer more classes without hiring more full-time staff. Instead, the university would pay a certain fee to the remote professor for the use of the information.

#### **C4.2 Goals**

This recommendation has four goals

1. Allow all universities to offer more classes
2. Ease the workload of the current staff
3. Allow professors to teach classes to students overseas
4. Expand the research capabilities of all universities by networking them.

This recommendation package is a very good way for many universities to broaden their offered course list. The system would work by having the professor create a web page that contains a Microsoft PowerPoint (or equivalent) slideshow of the class notes for the day. The students could then view the slideshow and take notes as needed. One of the slides would be an assignment sheet. The student could then complete their



assignment and either post it on the web or e-mail it to the professor. These classes would be project classes. Conducting an exam over the net may be difficult.

### **C4.3 Advantages**

This recommendation has the following advantages:

- More classes for universities to offer
- Cheaper than adding staff
- May reduce workload of smaller universities
- Students create relationship with overseas colleagues

### **C4.3 Disadvantages**

This recommendation package has the following disadvantages:

- Little contact between professor and student
- Academic honesty
- Startup costs
- People without computers at a disadvantage

### **C4.5 Conclusion**

This package has many advantages. It is fairly simple for all people involved, and it can help the fire safety industry as a whole. Many professors create their overhead slides on a computer already. If they take those files and paste them into a web page they have just taught a lecture. Comments that would be added during a lecture, would be added to the bottom of each page. This recommendation package is a simple fix for

smaller colleges with limited funds and staff. This would allow them to offer a larger choice of classes.

**APPENDIX D**

**INTERVIEWS**

## **APPENDIX D**

### **INTERVIEW SUMMARIES**

In order to gather information on how the building industry felt about the NZBC educational system, the team held many interviews. These interviews included fire safety engineers, civil engineers, architects, TAs, IQPs, fire service members, contractors, educators, researchers, and developers. These interviews were the main source of information for the recommendations in appendices A-C. They allowed the interviewee to tell the team how they have been affected by the education surrounding the NZBC.

The interviews would start with the interviewee giving the team an overview of their educational and experience backgrounds. The interviewee was then asked a series of predetermined questions. The questions changed from person to person. This enabled the team to ask questions appropriate for each interviewee.

The interviews were usually taped. This allowed the team to recall information and properly quote information from its source. The tapes were destroyed at the end of the summaries.

This appendix is a compilation of the interview summaries. These summaries are not the exact words of the interviewee, but rather a summary of what the interviewee said or implied.

Once the summaries were written they were sent to the interviewees for editing. If the interviewee did not return any changes, the original summary was used.

We would like to thank all of the people that were extremely cooperative in taking the time to answer our questions.

## **APPENDIX D.1**

Clifford Barnett  
Macdonald Barnett Partners Limited  
Fire Safety Engineer

Mr. Barnett has a bachelors degree in civil engineering. He is a Fellow of IPENZ, a Member of the Institution of Civil Engineers, International Association of Arson Investigators, and International Association of Fire Safety Science. He is also a Member of NFPA, SFPE. He is also involved with fire investigation.

Mr. Barnett has had a strong impact on the fire engineering industry of New Zealand for over twenty-five years. As early as 1978, he formed seminars and committees to spread information about fire safety engineering. Among others, he convinced Dr. Buchanan to create a master's curriculum in fire safety engineering. He has worked with the BIA in the formation of the fire documents.

Mr. Barnett feels that the BIA takes only a general proactive position in the education of the building industry. He feels that SFPE fills in where the BIA does not provide detailed information.

Mr. Barnett told us that the BIA has just finished a five year review of the building code. The BIA paid members of the building industry to work on the revision. Mr. Barnett was involved in this revision along with other practicing fire safety engineers.

We asked Mr. Barnett if he feels that there is a need for a way of determining the qualifications of a fire safety engineer. He told us that full Membership in the local SFPE

Chapter is a good judge of the engineer's qualifications. He said that the BIA should be able to recognize a membership in SFPE as a starting point. Mr. Barnett added that he was concerned that at the present time technicians involved in the fire safety of buildings are inadequately educated. He suggested a new trade known as "firestoppers"

In conclusion, Mr. Barnett said that he feels that all software used for engineering purposes should be transparent. There is a need to include the computer code with the fire modeling software. He also said that there needs to be more information on the proper use of the software, especially on the limits to which software can be used in buildings.

## **APPENDIX D.2**

James Boyes  
Macdonald Barnett Partners Limited  
Fire Safety Engineer

Mr. Boyes has a bachelors of civil engineering and has a master's in fire safety engineering from the University of Canterbury. He has been working for Macdonald Barnett Partners Limited for three months.

We asked Mr. Boyes his opinion of the master's course he took at the University of Canterbury. He said that the course contained plenty of theory. He said that it did not really contain as much practical experience as he would have liked.

Mr. Boyes feels that an intern program would be beneficial. He noticed that if a student had some experience before taking the master's fire course they had an easier time understanding the concepts.

We asked Mr. Boyes his opinion of how the world wide web is being accepted as a learning tool. He said that some engineers would not use the web as a means of education unless they knew what was going to be offered.



## **APPENDIX D.3**

Ian Braggins  
New Zealand Fire Service  
Fire Safety Department

See Appendix D.37<sup>167</sup>

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<sup>167</sup> A group interview with Ian Braggins, Gavin Parish, and Neville Tevarton.

## **APPENDIX D.4**

Richard Brand  
Beca Carter Hollings & Ferner LTD  
Associate

See Appendix D.38<sup>168</sup>

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<sup>168</sup> A group interview with Richard Brand and Simon Davis.

## **APPENDIX D.5**

Andy Buchanan  
University of Canterbury  
Associate Professor Civil Engineering

Dr. Buchanan is in charge of the fire safety department at the University of Canterbury. He holds a BE(Hons.), MS(Calif.), and a Ph.D.(UBC) in civil engineering. He is a member of IPENZ and SFPE.

It is difficult to document all that Dr. Buchanan informed us on because it was over the span of several informal meetings. The information gathered from Dr. Buchanan was invaluable to our project. His assistance ranged from assisting us with our background research to giving us names of possible interview candidates. All in all, Dr. Buchanan seemed happy with the way the education system was working at the university. He holds a very positive view for the future of both the master's degree fire safety program and the fire safety industry as a whole.

## **APPENDIX D.6**

Arthur Budvietas  
CLC Consulting Group LTD  
Fire Safety Engineer

See Appendix D.39<sup>169</sup>

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<sup>169</sup> A group interview with Arthur Budvietas and Ernest Lapish.

## **APPENDIX D.7**

Peter Byrne  
New Zealand Fire Service  
Fire Hazard Management Engineer

Mr. Byrne has a bachelors degree in mechanical engineering. He has worked with a building services company, and a few consulting companies doing fire safety designs. He then went to the New Zealand Fire Service five years ago. His work now includes reviewing fire safety designs, providing fire safety engineering advice to the Fire Service, and fire modeling for major fire investigations.

Mr. Byrne described the role that the Fire Service plays in the building industry. He told us that the amount of involvement that the fire service has had in the building industry has declined since the implementation of the NZBC. There are no regulatory requirements for TAs to seek advice from the Fire Service on building matters. He continued to tell us that the Fire Service Fire Safety Department have been concentrating on evacuation schemes. He added that there are some consultants who know what they are doing, and they provide a good service to the TAs.

We asked Mr. Byrne about whether the TAs are properly educated to be approving innovative designs. He told us that the small town TAs are using peer reviews and the fire service more often than the larger city TAs. He feels that there needs to be a circle of communication between the TAs, the fire service, the consultants, the University of Canterbury, and other stakeholders with an interest in fire safety.

Mr. Byrne feels that there is not a need for a universal qualification for fire engineers, but that they must have sufficient experience. He feels that the designs that the engineers create should be the medium on which peer reviewers base their opinion.

Mr. Byrne told us that some building owners are improving in their awareness of their responsibilities and liabilities. He mentioned that many building owners do not see the advantages to spending a little more money on fire safety in the construction of a building. They just see added dollars.

In conclusion Mr. Byrne said that there needs to be a combination of the building fire safety requirements of the Fire Safety and Evacuation of Buildings Regulations with building act requirements. He feels that many of the designers do not know about what they are required to do under the fire safety regulations. He added that fire alarms required for evacuation schemes should be incorporated into the acceptable solutions of the Building Act.

## **APPENDIX D.8**

Carol A. Caldwell  
Caldwell Consulting LTD  
Registered Fire Engineer

See Appendix D. 40<sup>170</sup>

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<sup>170</sup> A group interview with Carol Caldwell and Tony Parkes.

## **APPENDIX D.9**

Gary Chester  
Gary Chester Consultants  
Designer

Gary Chester has a Bachelors degree in civil engineering from Auckland University. He is currently enrolled in the University of Canterbury's distance learning program for his master's degree in fire protection engineering.

Mr. Chester told us that there is a need for more education in areas outside fire. He said that the education provided by the BIA was acceptable for the first couple of years after the building act was put in place. He said that the majority of the fire education has been provided by BRANZ.

When asked about the qualifications of the TAs Mr. Chester said that the TAs are not adequately educated to be accepting innovative designs. He continued to say that some TAs have rejected innovative designs because they are not covered under the acceptable solutions. He feels that the performance-based code is an advantage but usually only large firms use the innovative designs.

Mr. Chester feels that the fire safety class that the University of Canterbury provides is a good course. He said that taking the class enables him to provide additional services for his clients.

In conclusion, Mr. Chester thinks that the BIA or some other organization should implement more. He feels that it is important that the right people attend the seminars.



## **APPENDIX D.10**

Jim Clarke  
Fraser Thomas Ltd  
Fire Safety Engineer

See Appendix D.41<sup>171</sup>

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<sup>171</sup> A group interview with Jim Clarke and Ian Godfrey.

## **APPENDIX D.11**

Paul Clements  
Fire Risk Consultants  
Fire Safety Engineer

See Appendix D.42<sup>172</sup>

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<sup>172</sup> A group interview with Paul Clements and Dick Gillespie.

## **APPENDIX D.12**

Grant Coupland  
Design Generation  
Fire Safety Engineer

Grant Coupland is a fire safety engineer by practice, but is a qualified architect by education. He is a member of the SFPE. He became involved with fire safety engineering while sitting on standards committees dealing with fire safety legislation that were related to architecture.

He began the interview by explaining that the New Zealand government started the acceptable solutions to the NZBC before any verification methods were established. This “chin first” approach may have been unorthodox, but it has been effective. This has been a major point of criticism of the NZBC by other countries. He supports this pragmatic approach, and believes that it will only take time for the verification process to be achieved due to the continuous review of the code itself.

He believes that his architecture background allows him to effectively resolve the complex problems involved in the interpretation of the building code.

He has written and published two handbooks that serve as a step by step guide for those who work with code.

He feels that the TAs are inadequately educated to deal with unique solutions. He does on the other hand think that they can handle the acceptable solutions. He also stated that due to their inexperience and the fact that they are understaffed, the TAs frequently turn to the use of peer reviews.

He feels that there is a continuing need to educate all people using the building code. He continues to present courses to educate people on the correct interpretation of the code.

The BIA has identified the problem of a lack of education, and they are taking measures to remedy it. Mr. Coupland gave us John MacGregor's name as a contact in the BIA who is helping to take steps towards a better understandable code.

## **APPENDIX D.13**

Simon Davis  
Beca Carter Hollings & Ferner LTD  
Senior Engineer

See Appendix D.38<sup>173</sup>

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<sup>173</sup> A group interview with Richard Brand and Simon Davis.

## **APPENDIX D.14**

Dave Eaton  
Buchanan and Fletcher Limited  
Director

Mr. Eaton graduated with a bachelors degree in civil engineering. He has been working as a consulting structural engineer since that time.

We asked Mr. Eaton whether he feels that enough information has been provided to the building industry since the implementation of the NZBC. Mr. Eaton felt that the engineers, designers, and the TAs have received enough information, but that the builders and contractors do not know enough about the use of the building code. He also said that he feels that it is very difficult to get information to that area of the building industry.

Mr. Eaton has been happy with the quality of the information that has been provided to date. He mentioned the BIA newsletter, the BRANZ guidelines, the building facsimile line, and the seminars that have been provided by various groups.

Mr. Eaton told us that the BIA has not provided the majority of information that has been provided to the Building Industry. He commented on the BIA newsletter. He said that he felt it was reasonable. He added that he does not know of any actions that the BIA is currently doing to provide any more information to the industry.

We asked Mr. Eaton if he felt that the building owners know their responsibilities and liabilities. He told us that the owners are more informed now due to the compliance schedules. He concluded by saying that there are still building owners who still do not know everything they should.

## **APPENDIX D.15**

Martin Feeney  
Holmes Fire and Safety  
Fire Engineer

Mr. Feeney has a bachelors degree in civil engineering. He is a member of IPENZ and SFPE. He is the head of the Auckland Holmes Fire and Safety office.

We started the interview by asking Mr. Feeney what he felt was the weak link in the building code educational system. He replied by saying that the exact legal interpretation is very difficult. He added that the building code is good, but that it is just vague.

Mr. Feeney feels that the TAs are not adequately educated to be approving innovative designs. He also told us that the TAs are sending plans out for peer review.

Mr. Feeney told us that the BIA has been doing an adequate job of providing information to the industry. He would like to see the newsletter expanded.

Mr. Feeney is a student of the University of Canterbury's distance learning program. He feels that the class is good but that students coming straight from an undergraduate background may be graduating without enough practical experience.

We asked Mr. Feeney if he felt an intern program would be plausible. He said that the quality of graduates would be better, but that the costs to the industry are a factor to watch.

When asked about the necessity of a structured qualification for fire safety engineers, Mr. Feeney believes that such a qualification is necessary, but at present

IPENZ may not be an adequate judge of a fire safety engineer's qualifications. He added that IPENZ needs to add a fire competency.



## **APPENDIX D.16**

J.A. (Tony) Gibson  
Gibson Consultants  
Fire Safety Engineer

Mr. Gibson is a registered engineer, has a bachelors degree in civil engineering and has a master's of science. He is a board member of IPENZ and a member of SFPE. He has worked with housing companies and done structural design. He became involved with fire when he was invited to help Grant Coupland and John Fraser conduct seminars on the implementation of the building code. Now he mostly works with fire safety designs.

We asked Mr. Gibson whether he thought the BIA has provided enough information for the people using the building code. He told us that he felt that the BIA did not provide enough information when the building code first came out. He continued by telling us that it was probably due to the overload that the BIA was trying to deal with at the time. He also said that he feels that the current education program is fairly good.

Our next question was what his opinion was of the graduating fire safety engineers. He was very impressed with the program. He has had a graduating fire safety engineer do a peer review of his work and the questions that the new engineer brought up were very well thought out.

We also asked Mr. Gibson whether he feels the TAs have the necessary education to be approving the performance-based fire designs. He told us that the TAs do not have

the necessary education or staff. He told us that they send most fire designs out for peer review.

We asked Mr. Gibson to give us an overview of the role of IPENZ. He told us that the organization is set up to encourage good professional engineering service, to create a good code of ethics, and to set standards.

## **APPENDIX D.17**

Dick Gillespie  
Fire Risk Consultants  
Fire Safety Engineer

See Appendix D.42<sup>174</sup>

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<sup>174</sup> A group interview with Paul Clements and Dick Gillespie.

## **APPENDIX D.18**

Ian Godfrey  
Manukau City Council  
Territorial Authority

See Appendix D.41<sup>175</sup>

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<sup>175</sup> A group interview with Jim Clarke and Ian Godfrey.

## **APPENDIX D.19**

Russell A. Gregory  
Wormald  
Fire Engineer  
Special Projects Engineer

Mr. Gregory has been working with Wormald for thirty-three years. He has a qualification by examination from the Institution of Fire Engineers. He is a special hazards and special projects engineer at Wormald. Wormald has provided the industry with fixed and portable fire safety systems, fire brigade equipment, and passive fire safety products for over 100 years.

Mr. Gregory feels that only a portion of the building owners understand their responsibilities and liabilities. He said that many of the owners hand everything to the consultants and tell them to take care of it. He told us that the BIA has provided information for the building owners but they are limited by costs.

We asked Mr. Gregory for his opinion of the master's program at the University of Canterbury. He told us that the curriculum seems to be very good. He does feel that more contact with the industry would benefit the students.

Mr. Gregory mentioned that the IQPs need more training. He mentioned the New Zealand Qualifications Authority. He said that this group is being set up to determine the qualifications of all aspects of the industry.

In conclusion, Mr. Gregory said that he would like to see the TAs take a more proactive stance on providing education to the industry.

## **APPENDIX D.20**

Rosemary Killip  
Building Industry Authority  
Education Officer

See Appendix D.43<sup>176</sup>

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<sup>176</sup> A group interview with Rosemary Killip and Christl McMillan.

## **APPENDIX D.21**

Ernest B. Lapish  
CLC Consulting Group LTD  
Director

See Appendix D.39<sup>177</sup>

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<sup>177</sup> A group interview with Arthur Budvietas and Ernest Lapish.

## **APPENDIX D.22**

John MacGregor  
Building Industry Authority  
Architect

Mr. MacGregor's background is architecture. He has worked with multi-disciplinary firms and has done hospital, commercial, and also housing design. At the Authority he works mainly with the NZBC fire safety approved documents in the building code.

We asked Mr. MacGregor his opinion of the graduating fire safety students. He told us that he does not have anything to compare the students against. He knows that they have experience with the theoretical side of fire safety engineering, but that the younger graduates lack practical experience.

When we asked Mr. MacGregor about whether he feels that TAs are adequately educated to be dealing with performance-based fire designs, he told us that they generally do not have the formal education in the area of fire engineering, but that they may have the education in other areas.

Mr. MacGregor explained that the BIA has an education officer and an information officer. These people were added to the BIA two years ago and three years ago, respectively. He told us that this new staff has increased the amount of education that the BIA has been providing. He continued to say that other organizations have also provided information to the industry. He mentioned Grant Coupland, BRANZ, and professional societies. For seminars explaining the building code and approved



documents, he cautioned that there needs to be a way of being sure that the information being provided at the private seminars is accurate and clearly separated from any personal philosophy held by the lecturer.

Mr. MacGregor feels that there is a need for a way to determine acceptable qualifications for a fire safety engineer, but he feels that it is the responsibility of the profession to do this.

We asked Mr. MacGregor about his feelings on a universal IQP qualification and the universal use of an IQP across the entire country. He told us that under the Building Act section 44 compliance schedules an IQP is a person accepted by the TA as being appropriately qualified to undertake inspection and maintenance procedures required by compliance schedule for the system of feature concerned. Therefore it is the TA's responsibility who they accept. If the TAs want to get together and form a universal set of qualifications, it may be beneficial. However, under the NZBC the BIA would not be required to be involved with that effort.

We told Mr. MacGregor that fire safety engineers feel the information that they are getting in the monthly newsletter is beneficial. We asked if the staff was available to increase the amount of information that was provided in the newsletter. Mr. MacGregor told us that with current resources and the review, it would be difficult to increase the amount of information available at this time.

## **APPENDIX D.23**

Hamish MacLennan  
Holmes Fire and Safety  
Director

Mr. MacLennan has a bachelors degree in building services and a master's degree in building science. He is in the process of finishing his Ph.D. Mr. MacLennan was the co-author of a chapter in the SFPE handbook. He has worked mostly in academic areas. In 1993 he started working for Holmes Fire and Safety.

Mr. MacLennan does not feel that enough information has been provided to the building industry since the implementation of the building code. He said that this lack of information may not be the fault of the BIA. He continued to say that New Zealand has managed to get information and education to it's building industry better than other countries that have changed to performance-based building codes.

We asked Mr. MacLennan about his impressions of the quality of the information provided to the industry to date. He said that the local chapter of SFPE has been doing a very good job of providing as much information as they can to the industry. He also said that the BIA has been doing a good job considering their resources. He was happy to see that the BIA has paid groups reviewing the building code. He feels that the seminars have been useful.

When we asked Mr. MacLennan about whether he thought that the TAs have the proper qualifications to be approving the fire designs that they do, he said that the TAs

vary greatly. In the major cities the TAs are attempting to get better educated. He still feels that there are not enough courses for TAs.

We asked whether Mr. MacLennan felt that the building owners understand their responsibilities and liabilities. He told us that the BIA has sent out plenty of information to the building owners. He continued to say that there are landlords that look after their tenants and they keep their buildings in accordance with the building code, but like in any society there are landlords that only see the monetary side of owning a building.

We asked Mr. MacLennan for his opinions of the master's fire program at the University of Canterbury. He said that all he had was praise for the program. He said that the distance program seems to be doing well too. We asked whether he thought there was a need for an intern program. He told us that there have been students that have done their professional year of study at Holmes Fire and Safety. He feels that this definitely improves the quality of the student, however he mentioned that there are not many places in the industry that could handle the added costs involved with an intern.

Mr. MacLennan feels that there is a need for a universal qualification for fire engineers. He feels that there needs to be levels of qualifications that match the levels that the person is working at. This would limit people that are properly qualified to be doing performance-based design.

In his final recommendations Mr. MacLennan told us that he feels there needs to be a tiered education program that includes people from the technicians all the way to the scientists involved with fire design and safety.

## **APPENDIX D.24**

Jack Maddox  
Fire Risk Consultants  
Fire Safety Engineer  
Independent Qualified Person

Jack Maddox is a registered IQP for the Auckland City Council. He has forty-two years experience with the New Zealand Fire Service. He has a diploma from the Institution of Fire Engineers.

He feels that the graduating fire safety engineers are lacking any practical experience.

He has had no problems with TAs lacking experience. This is limited only to the TAs in the Auckland area.

When asked about the BIA, he mentioned that he would like more information in the monthly newsletter.

## **APPENDIX D.25**

Ian Makgill  
Fire Risk Consultants  
Fire Safety Engineer

Ian Makgill has a bachelors degree in mechanical engineering. He is a member of SFPE and IPENZ. He began as an assistant engineer at Wormald. He has worked with building regulations and standards since 1978. Since then he has sat on many committees dealing with fire protection standards.

He feels that the weakest link in the building code educational system is the fact that existing qualifications did not cater to performance-based design. This included the BIA, the local government officials, and the consulting engineers.

He told us that there is a need for a formal qualifications system in fire engineering and fire protection engineering. He said that the industry is confused as to who is properly qualified to be calling themselves a fire safety engineer.

Ian mentioned that if the TAs are submitted a performance design, they are sending them out for peer review.

He feels that the BIA did enough to get information concerning the code to the industry.

In his final recommendations he restated the need for a qualifications system and he added that the IQPs, the TAs, and the consultants should be linked to a common level of knowledge.

## **APPENDIX D.26**

Christl McMillan  
Building Industry Authority  
Information Officer

See Appendix D.42<sup>178</sup>

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<sup>178</sup> A group interview with Rosemary Killip and Christl McMillan.

## **APPENDIX D.27**

Leslie R. Mellars  
Waitemata Health  
Fire Protection Officer  
Independent Qualified Person

Les Mellars has a Fellow Diploma from the New Zealand Fire Brigades Institute. He has worked with the New Zealand Fire Service (20yrs) as a volunteer and full time fire fighter/station officer and is also a qualified electrical specialist, having completed his studies at the Auckland Institute of Technology.

He left the Fire Service to work in the fire protection industry, doing work mostly with active fire and gas detection systems. Later He started working with the Ministry of Works as a fire protection officer inspecting and reporting on safety systems in Government buildings and then moved to a sole charge position responsible for fire safety in all the city's public hospitals. He now works from the North Shore Hospital.

We asked Mr. Mellars for his opinion of the BIA's job of educating the building industry. He told us that so far, the BIA had not provided enough information (training). He continued to say that the job is massive. He mentioned that although there are now various seminars these only scratch the surface, and there is still a wide lack of understanding of the code. Many consider the approved documents (prescriptive codes) to be and in fact refer to these documents as being the NZBC.

Mr. Mellars feels that most staff at the TAs do not have an adequate understanding of fire engineering to be approving performance-based designs. He added

that he understood that the majority of the TAs are sending the fire designs out for peer review. He stated that some TAs are starting to read the documents of the designers and they are starting to be more educated in some areas of fire design. Mr. Mellars told us that he thought there is a need to have an acceptable means of determining the qualifications and proven experience for existing engineers and technicians. He also said that setting up such a means of determining these qualifications would be difficult because the framework is not yet in place. He feels that at times people use the work of others as a basis for their own work, without full understanding. Although we have a very good performance-based code most refer to the prescriptive code as a means of compliance. Accordingly, the prescriptive documents are constantly being changed, improved and added to. Confusion reigns and he thinks that cost effective fire protection design gives way to compliance with the latest version of the prescriptive documents, just to get the job done on time.

Our next question was whether Mr. Mellars felt an intern program is important and plausible. He told us that an intern program is essential. He added that there needs to be some kind of control (recognition of prior learning) as an interim measure and also on the number of students graduating. If not, the industry could continue as is and then be flooded with graduating students.

He feels that existing and future designers must be encouraged to become more responsible for their own designs and move away from just the prescriptive means of compliance presently used by the fire service and TA's.

In his final recommendations Mr. Mellars mentioned the necessity for good design by specification, to make sure that the owner is getting what the owner wants.



He feels that it is very important to specify all aspects of fire safety at the onset of contract negotiations. He concluded by saying that it is very important for the designer to be sure that what he designed is actually built. Like any other area of building construction, the fire protection designer should be in a position to regularly monitor the fire protection aspects of the project, through all stages from start to finish and be present at commissioning to ensure that the design intent has been met.

## **APPENDIX D.28**

Frank Micallef  
Auckland City Council  
Territorial Authority

Mr. Micallef was educated to be a building inspector. After his schooling he started to work for the council. He has worked there for twenty years.

We asked Mr. Micallef for his opinion of what is the weakest link in the building code educational system. He told us that the lack of education is the weakest link. He continued to tell us that the BIA newsletter is good but that the information is not in depth enough. He feels that there is a need to educate people when to do what part of the building process. He added that the seminars have been decent, but that they need to be longer.

In conclusion, he said that the fire engineers that he has had contact with, have been fairly well educated. He feels that people who are not engineers may need more education before they can make correct fire designs.

## **APPENDIX D.29**

Doug Naylor  
North Shore City Council  
Fire Protection Officer

Mr. Naylor has a bachelors of science. He has been an associate member of SFPE for two years. He has been a member of BOINZ for five years. Before becoming a member of the council he was a carpenter for fifteen years.

Mr. Naylor feels that the lack of structure in the education is the weak link in the education process. He told us that in the area of fire, SFPE has provided forms of education. He added that there has been some education from BRANZ and the BIA.

We asked Mr. Naylor about his feelings on the graduating fire safety engineers. He told us that the students are getting a good general knowledge of theory and that they are lacking field experience. He mentioned that SFPE mandates the field experience of its members. He feels that membership in SFPE is an adequate judge of the qualifications of a fire engineer.

Regarding the BIA, Mr. Naylor feels that it is not providing enough education in the areas of acceptable solutions and the use of fire modeling software. He also feels that the BIA has only provided information when the industry demands it.

Mr. Naylor feels that the industry would be able to handle an intern program. He told us that the industry has to absorb the graduating fire safety engineers anyway. He also mentioned that the industry would benefit.

Summing up, Mr. Naylor said that he feels that the fire modeling software packages should be nationally accepted. He also feels that the fire safety engineers should have to sign off plans.

## **APPENDIX D.30**

Gavin Parish  
New Zealand Fire Service  
Fire Safety Department

See Appendix D.37<sup>179</sup>

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<sup>179</sup> A group interview with Ian Braggins, Gavin Parish, Neville Trevarton.

## **APPENDIX D.31**

Tony Parkes  
Caldwell Consulting LTD  
Fire Engineer

See Appendix D.40<sup>180</sup>

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<sup>180</sup> A group interview with Carol Caldwell and Tony Parkes.

## **APPENDIX D.32**

Wayne Roden  
Christchurch City Council  
Building Control Officer - Fire Safety

See Appendix D.44<sup>181</sup>

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<sup>181</sup> A group interview with Wayne Roden and Brian Roff.

## **APPENDIX D.33**

Brian Roff  
Christchurch City Council  
Senior Fire Safety Officer

See Appendix D.44<sup>182</sup>

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<sup>182</sup> A group interview with Wayne Roden and Brian Roff.



## **APPENDIX D.34**

Neville Trevarton  
New Zealand Fire Service  
Fire Safety Department

See Appendix D.37<sup>183</sup>

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<sup>183</sup> A group interview with Ian Braggins, Gavin Parish, and Neville Trevarton.

## **APPENDIX D.35**

Steven Van der Pol  
Arrow International Limited  
South Island Regional Manager

Mr. Van der Pol works at Arrow International Limited, a project management and construction company, dealing mainly with client relations. He has a New Zealand Certificate in Building. Before working at Arrow, Mr. Van der Pol was a cadet in a construction company.

Mr. Van der Pol described to us Arrow's position in the building industry. He detailed the three main areas of work that Arrow does. They were development planning, project management, and construction management. He told us how Arrow provides service to the client to the point where the building is finished. Then they hand the client a packet of information including drawings, contacts, and contracts.

Mr. Van der Pol feels that the existing building owners understand their responsibilities and liabilities. He continued to say that the building owners that are just entering the market do not understand everything involved in being a building owner. He also mentioned that BOMA has provided information to the building owners.

Mr. Van der Pol told us how his company is on the mailing list of the BIA and they receive information from the BIA fairly regularly. He said that the seminars that have been put on to date have been fairly good. He added that the seminars were better when the building code was first implemented.

In his final comments Mr. Van der Pol mentioned that there needs to be better uniformity between the TAs. He told us that the rulings that the TAs make differ greatly. He compared this to the system of building codes used before 1991.

## **APPENDIX D.36**

Colleen Wade  
Building Research Association of New Zealand  
Fire Research Manager

Ms. Wade has a master's in fire protection engineering. She is a member of SFPE. At BRANZ she does research, testing and consulting. She also works with the BIA review committee.

We asked Ms. Wade what role BRANZ plays in the building industry. She told us that BRANZ is a technical consultant of the BIA. BRANZ also provides information to the industry through seminars and a telephone service. They also do consulting work.

Ms. Wade told us that the TAs are not adequately educated to be approving innovative fire safety designs, but that most of them are sending plans out for peer review. She mentioned that the TAs might be accepting things that they do not understand.

She feels that there is a need for some form of determining the qualifications of a fire safety engineer. She said that any person can call themselves a fire safety engineer. She feels that the engineers need to have a minimum amount of experience and qualifications. She added that the TAs should work with SFPE to determine the qualifications of engineers.

We asked Ms. Wade about the amount of information that has been provided for the proper use of the fire modeling software. She mentioned that there is not enough

support information, tutorials, and seminars. She also said that many people using the software do not know the limitations of the software.

Ms. Wade received her master's at WPI. We asked her opinion on the fire safety class at the University of Canterbury. She told us that she thinks that the course may be a little rushed. She feels that it may need to be longer or increase course/teaching component and reduce project size.

We asked Ms. Wade if she felt that the industry would be able to handle an intern program if the University of Canterbury was to provide one. She told us that if the internship was added to the one year length of the master's course, it may be useful. She felt that the larger firms would be able to handle a few intern students.

In conclusion Ms. Wade added that the industry could use BRANZ more in specialized areas.

## **APPENDIX D.37**

Ian Braggins, and Gavin Parish, Neville Trevarton  
New Zealand Fire Service

Mr. Parish has worked for the fire safety department of the New Zealand Fire Service for twenty-five years. Mr. Trevarton has worked with the New Zealand Fire Service for twenty-eight years, ten of which are in the fire safety department. Mr. Braggins has twenty-five years experience with the New Zealand Fire Service. He is currently enrolled in a Business Management course at Auckland University.

All three feel that the councils do not have the staff to be accepting innovative designs. They said that the peer review system is good as long as the peer reviewer is not using the same computer program. They mentioned that the TAs need a basic understanding of the software available to fire safety engineers.

Their opinion of the graduating fire safety engineers is that theory can cloud the facts, but it depends greatly on the individual. They also feel that the current fire safety engineers do not have enough education to understand the limits of the software packages they are using. They feel that many of the calculations involved are incorrect.

When we asked about the possibility of an intern program they said that they were unsure if the industry would be able to handle it. They believe that it would be a win-win situation for the students and companies if it was possible.

They felt that the BIA has not taken a proactive stance in the education of the people using the code. They said that the BIA needs to create more seminars directed

towards the local authorities and councils. They continued to say that the seminars that have been conducted have been effective, but that most of them have not been sponsored by the BIA.

Finally they feel that some program must be implemented to educate the building owners about their liability.

## **APPENDIX D.38**

Richard Brand, Simon Davis  
Beca Carter Hollings & Ferner LTD  
Consulting Engineers

Both Mr. Brand and Mr. Davis have bachelors degrees. Simon Davis has a master's degree in building services. He is currently enrolled in the distance learning fire engineering program with the University of Canterbury. Mr. Brand has twenty-seven years experience in fire consulting.

When asked about the weak link in the building code educational system, they said that the BIA has not done enough to promote innovative design. They feel that engineers and officials will only use acceptable solutions, and that the entire point of the act has been missed. They continued to say that there is not enough of an understanding of the law.

Both gentlemen feel that without a doubt the TAs are not qualified to be approving innovative designs. They also mentioned that the TAs know that they are under-qualified and they are actively sending out designs for peer review.

Their comments about the graduating fire safety engineers are that the curriculum is very theoretical. They add that this is a criticism of all graduating engineers.



## **APPENDIX D.39**

Arthur Budvietas  
CLC Consulting Group LTD  
Fire Safety Engineer

Ernest B. Lapish  
CLC Consulting Group LTD  
Director

Mr. Lapish has an institutional education in a civil discipline. He has been associated with the building codes since 1969. He has been a consulting engineer for twenty seven years. He has been active in research and publishing papers.

Mr. Budvietas has a university background in civil engineering fluids. He has worked as a structural engineer and started his work with fire after attending educational seminars. He is a friend of SFPE.

We asked the gentlemen their opinions of the graduating fire safety engineers. Mr. Budvietas had heard that the program needs to teach the students how to properly apply the theory that they are learning.

We asked whether they felt the industry would be able to handle an intern program. They felt that if the interns were willing to take a lower salary, if the economy stays good, and if there is not a flood of engineers in the field there may be a possibility for an intern program.

The gentlemen mentioned that they feel that the TAs are not qualified to be approving innovative designs. They added that the TAs are actively sending plans out for peer review.

We asked if they felt there was a need for a universal set of fire safety engineering qualifications. They believed that IPENZ needs to have “competencies” in fire engineering.

The gentlemen felt that the BIA is not providing enough information for the building owners and the builders. They feel that the technology is bewildering for these groups.

In conclusion the gentlemen recommended that there be more five day seminars. They also said that the local bodies should require fire reports with all building consent plans.

## **APPENDIX D.40**

Carol A. Caldwell  
Caldwell Consulting LTD  
Registered Fire Engineer

Tony Parkes  
Caldwell Consulting LTD  
Fire Engineer

Ms. Caldwell has completed a bachelors of engineering in fire protection from the University of Maryland. She has also completed a master's degree in safety. She is a member of IPENZ, SFPE, and NFPA. Ms. Caldwell is a professional fire protection engineer in the United States and is a registered fire engineer in New Zealand.

Mr. Parkes has completed a bachelors in civil engineering. He has also graduated from the fire engineering master's program at the University of Canterbury. His experience includes working for the New Zealand Fire Service and Caldwell Consulting Ltd.

We asked whether Ms. Caldwell and Mr. Parkes felt that there was sufficient education provided since the adoption of the NZBC. They both said no. Ms. Caldwell expanded by saying that the BIA has been working on it. She said that the architects are learning that the fire engineers are necessary in the design process. She added that the TAs still need more information to bring them to the appropriate level to be approving fire designs. Mr. Parkes added that the Fire Service needs to be educated as well, to continue to approve fire designs. He continued to say that the Fire Service is performing

peer reviews in more rural areas. They both mentioned that they feel that the TAs in Christchurch are more thorough than in other areas. This results in safer designs.

We asked about the quality of the seminars that have been conducted in the past. Mr. Parkes said that it is difficult to get people to go to the seminars. Ms. Caldwell replied by saying that the emphasis has been taken off of the fire documents and is now on the disabled persons area of design. The emphasis has shifted because the practitioners are more comfortable with it.

We asked if the TAs have adequate education to be approving innovative designs. Mr. Parkes told us how the local TAs have been attending classes and making an effort to educate themselves. Ms. Caldwell added that the local TAs are good with the acceptable solutions but that they know that they are not knowledgeable in innovative fire design. Therefore, they have been sending most performance designs out for peer review. Ms. Caldwell continued to say they there is a need to match an engineer's qualification level to the level of work that he/she can review. This would mean that people not educated in performance design should not peer review such designs.

When we asked about the need for a universal set of qualifications for fire engineers, Ms. Caldwell said that she feels that being a SFPE Member may not be enough of a qualification to call a person a fire engineer. She added that determining minimum acceptable qualifications is a difficult subject to address.

Both engineers felt that there are building owners that know their liabilities and responsibilities. They also added that there are many owners who either do not care or do not know their responsibilities or liabilities. They told us that many building owners who are overseas rely on the property managers for the information they need.

In conclusion, they felt there needs to be a better way of appointing the members of the working groups that are revising the BIA prescriptive solutions. A more formal system based on qualifications and experience may be appropriate.

## **APPENDIX D.41**

Jim Clarke  
Fraser Thomas Ltd  
Fire Safety Engineer

Ian Godfrey  
Manukau City Council  
Territorial Authority

Mr. Godfrey has worked with the council for fifteen years. He works in the fire safety area of the council. Mr. Clarke is currently enrolled in the distance learning program conducted by the University of Canterbury.

We asked the gentlemen their opinions on the efforts the BIA have made to provide information on how to use the building code correctly. Mr. Godfrey told us that he feels that there was very little information available to the TAs at the beginning. He feels that the TAs have suffered the most with the new building code. He added that he is happy with how the BIA has an “open door” policy. Mr. Clarke agreed with Mr. Godfrey and added that the seminars need to be conducted for all people in the building industry at the same time. He feels that the separation of consultants from TAs and contractors in the seminars is detrimental to the educational process. Mr. Clarke also said that the job of educating the industry on performance design is not the BIA's.

We asked whether they thought that the building owners know their responsibilities and liabilities. They both said no. They said that the BIA needs to work with BOMA to get information out to all the building owners. They added that there

needs to be a push to educate building owners on how a little more money during the initial construction of a building will save the owner more money in the long run.

Mr. Godfrey feels that there is a need to provide more information on the fire modeling software to the TAs. Mr. Clarke mentioned that he thinks that a five day course every three years should do a good job of providing enough information. He added that there should be seminars when there are any new changes to the building code.

In conclusion Mr. Godfrey said that the BIA needs to provide a reason beside the requirements they make in the building code. He feels that this will show the people using the code why the BIA has included the requirement.

## **APPENDIX D.42**

Paul Clements  
Fire Risk Consultants  
Fire Safety Engineer

Dick Gillespie  
Fire Risk Consultants  
Fire Safety Engineer

Paul Clements and Dick Gillespie are both fire protection engineers at Fire Risk Consultants. They are both members of the local SFPE chapter. Neither one of them have any formal degrees in engineering. Dick's background is special hazards. Paul's background is electrical.

They feel that the weak link in the building code educational system is that there is a complete lack of one. They feel that there is a small amount of education available to the building community. This is mainly being supplied by organizations such as SFPE. The available education is strictly philanthropic.

They mentioned that the improvements to the educational system have been slow since 1993. The improvement in the education related to fire safety has been the most significant.

When asked about the qualifications of the graduating fire safety engineers, they felt that the students coming directly from an undergraduate background are entering the work force without any practical experience. They did, however, mention that many members of the industry are seeking further education through a distance learning program run by the University of Canterbury.



We asked whether there was any form of an internship program available to the students. Dick mentioned that he believed that Wormald and contractors use interns. Dick and Paul both feel that an intern program would benefit the students and the industry.

Both feel that the TAs are not adequately educated to be approving innovative designs. They also pointed out that the TAs are aware of this and that they commonly send out designs for peer review.

They feel that it is not the job of the BIA to educate the industry on the proper use of the building code. They said that there is nothing in the building code that requires the BIA to provide any such education.

Their final recommendations included a need for some form of fire safety engineer qualification structure.

## APPENDIX D.43

Rosemary Killip  
Building Industry Authority  
Education Officer

Christl McMillan  
Building Industry Authority  
Information Officer

Ms Killip is the Education Officer for BIA. She was appointed to the position when it was established almost two years ago. Ms Killip has overall responsibility for the design, development, and implementation of the educational program. This includes the provision of workshops, seminars, speaking engagements, etc.

Ms McMillan is the Information Officer for BIA. She has held the position since it was established some three years ago. Ms McMillan has overall responsibility for public relations. This currently includes the following activities:

- BIA image and profile
- external BIA communications such as the annual report and business plan, speech notes
- BIA publicity
- a monthly newsletter titled *Building Industry Authority News*
- registers of accreditation's, determinations, and building certifiers
- information leaflets, handouts, posters, display boards, videos, flyers, and other written literature
- press releases
- correspondence (stationary and house style).

One of the key functions of the Building Industry Authority is to disseminate information and provide educational programs on matters related to building control as provided for in section 12 (g) of the Building Act. The information and education officers have prepared and work from an education and public relations strategy which

spans a three year period. The main objective of the strategy is to improve understanding of the building controls through effective education and communication.

Their target audiences are varied:

- territorial authorities (managers, inspectors, counter staff)
- building certifiers
- designers (architects, architectural designers, engineers)
- contractors (builders, plumbers, roofers, glaziers)
- suppliers (manufacturers, importers, distributors)
- exporters
- home owners
- owners, commercial buildings, building managers, developers
- occupiers of buildings
- educators, tertiary institutions
- researchers and associated groups (e.g., BRANZ, Standards New Zealand)
- Government departments and agencies (e.g., Health Department, Labour Department, Ministry for the Environment, Energy Efficiency and Conservation Authority, Fire Service)
- professional institutions and interest groups (e.g., Planning Institute, Barrier Free Trust, Disabled Persons Assembly, New Zealand Institute of Architects (NZIA))
- Minister, Department of Internal Affairs
- international administrations
- media

To complete this task, BIA provides five nation-wide seminars per year on a range of different building topics. These are either half day or single day seminars held at 12 or 13 locations. Ms Killip mentioned that there will be another round of seminars after the release of the revised fire documents.

In addition, BIA works on joint education projects with other organizations, such as Building Owners and Managers Association, Property and Land Economy Institute of New Zealand, territorial authority training ( the last of which was a fire safety forum).

BIA also provides speakers to events hosted by other organizations, such as Institution of Professional Engineers of New Zealand and the NZIA conferences. They have also produced and written educational materials and have a budget to prepare interactive computer generated tutorials.

We asked whether there is a possibility of BIA creating a world wide web homepage. They both told us that within six months, they hope to have one up and running. This homepage would include newsletter articles, registers, education events and information about the building code.

Ms Killip says that the building owners are a very difficult group to contact because of their diversity. She told us that BIA is trying to provide information to the building owners, but only a small percentage of the owners really have any idea of what they are responsible and liable for. She later sent us a facsimile containing summaries of the education activities of the BIA from 1996 to 1997. Copies of these are included in Appendix E.

## **APPENDIX D.44**

Wayne Roden  
Christchurch City Council  
Building Control Officer - Fire Safety

Brian Roff  
Christchurch City Council  
Senior Fire Safety Officer

Mr. Roff is the Senior Fire Safety Officer for Christchurch. He worked with both architectural firms, and construction companies before starting work at the Christchurch City Council in 1991. Mr. Roden works as a Building Control Officer specializing in fire. He was doing architectural design for twenty-two years before starting work at Christchurch City Council. Both men have worked with the University of Canterbury in furthering their understanding of fire engineering.

We asked if they thought that there has been enough information made available since the implementation of the building code. They responded by telling us that the BIA provided reasonable information when the new building code was first implemented. They said that the seminars that BRANZ put on were too complicated for many people.

Both felt that the majority of the TAs do not have the proper education to be approving innovative designs. They mentioned how they have talked to other TAs at seminars and other gatherings. They said the other TAs do not have the same interpretation of the code, and they can not understand the concepts of fire engineering without relevant education.

One of the points that came back many times in the conversation was how the TAs each have a different interpretation of the building code. This has created a very disjointed understanding of the national building code. The BIA has taken a “just look after your own patch” attitude. Both gentlemen told us that they have asked the BIA to publish the answers that they give TAs when one calls with a question. If they do this the TAs will slowly have a more unified response to the judgment calls that they have to make. Mr. Roff and Mr. Roden both would like to have a form of teaching all TAs about the building code. This would include everything from worked examples to the definition of reasonable and practical.

We asked what they thought of the master’s program at the University of Canterbury. They mentioned that the curriculum was very good but they thought that it was too short. Mr. Roden added that he thought that the students did not know enough about the acceptable solutions to implement them when they entered the workplace.

We asked if there was a need to have a qualification structure for fire safety engineers. They told us that there is a need for such a structure. They only use a very specific group of engineers that have either graduated as a fire safety engineer or have been in the industry for a very long time for their peer reviews. They feel that SFPE would be the appropriate group to set up such a qualification structure.

# **APPENDIX E**

## **AUXILIARY DOCUMENTS**

## APPENDIX E1

### SUMMARY OF EDUCATION ACTIVITIES 1995/96 FOR THE BUILDING INDUSTRY AUTHORITY<sup>184</sup>

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|                      |           |
|----------------------|-----------|
| Total one-off events | 40        |
| Total seminar series | 50        |
| <b>Overall total</b> | <b>90</b> |

#### Seminar Series Completed

##### **1995 Amendments to the Approved Documents**

Aimed at TA officers, some Fire Service and design personnel.

Total attendance: 294. Held at 14 locations, hosted by regional TAs.

##### **Building Warrant of Fitness Seminars**

Aimed at building owners, property managers, IQPs and other interested in this topic (e.g. TAs, Fire Service)

Building Owners and Managers Association, Auckland, Wellington (2), Christchurch, and Dunedin

New Zealand Hospitals Association - Auckland

Hospitality Association- Palmerston North

Total attendance: 145

##### **Overcoming the Hurdles**

Aimed at the industry as a whole. BIA answers to frequently asked questions concerning building consents, alterations, change of use, building warrants of fitness, compliance schedules etc.

Total attendance of 893. Held at 14 locations throughout the country.

##### **Durability and Accreditation**

Aimed at manufacturers and suppliers to assist them to understand the durability requirements of the building code and the process of accreditation.

Construction Marketing Services - Auckland.

Total attendance: 40. Ongoing.

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<sup>184</sup> Copy of a facsimile received July 2, 1997 from the BIA, sent by Rosemary Killip, Education Officer.



### **Building Consents in Today's Environment - How to assess alternative solutions - TA Training**

Aimed at building control officers specifically and their advisers/consultants  
Wayne Stewart is presenting these workshops on behalf of the Authority. Held at 14 locations.

Total attendance 314 nationwide.

### **Innovations and Adaptations**

Aimed at the industry at a whole with specific interest to designers, architects, engineers, owners and TAs.

Looking at how to make use of alternative solutions. Held at 13 locations.

Total attendance 471 nationwide.

### **Projects**

#### **Customer Focus Group**

Completed 6 focus groups with "Regulators", "Designers", "Constructors".  
Findings will assist in refining the information and education strategy.

#### **Trainers and Educators**

Aimed at lecturers and tutors of building and construction related courses within tertiary institutions.

As part the strategy and within the endorsement of ITOs within the building and construction sector, workshops have been held with lecturers and tutors of building and construction related courses to assess at what stage and to what degree building controls is being taught and how BIA can assist in provision of information and training resources packs.

Taranaki Polytechnic

Christchurch Polytechnic

Otago Polytechnic

Hutt Valley Polytechnic

UNITEC

#### **Presentation delivered at conferences or training sessions in 1995-96**

- NZ Institute of Building members & architects - future directions
- NZ Institute of Building / CIB Taskgroup 11 members & architects - International building controls systems
- Standards Australia - Building Regulations in NZ
- NZ Society of Master Plumbers and Gasfitters - Plumbing Performance and Progress
- Nelson City Council, Marlborough, Buller and Tasman D.C, & Mike Hislop - General interpretation matters and Building Certifiers

- Manawatu District Council Lawyers, Real Estate agents & building professionals - Project Information Memorandum, Building Warrants of Fitness and Compliance Schedules
- Association of Bursars School Bursars - Panel discussion - Building Act
- Chief Building Inspectors Training Seminar - Building Act interpretations
- Institute of International Research: building industry - Property Law Update (Two sessions)
- Ministry of Health - Hamilton - Building Act and Building Code
- Ministry of Health - Christchurch - Building Act and Building Code
- Construction Marketing Service manufacturers and suppliers- Durability/ Substitution/ Accreditation
- The Claddings Institute of New Zealand - Durability
- Draughting Association - Building Act and Building Code
- BOINZ - D2 Durability
- BOINZ - (Wellington region) H1
- Master Builders Association - Wairarapa - Building Act
- Hamilton City Council - IQP responsibilities
- Hamilton City Council - TA Officers and Hamilton Master Plumbers - Building code, IQP responsibilities
- NZ Fire Protection Association - IQPs and BWOFF
- NZ Collage of Design - Senior design students
- Workshop for TAs and IQPs - IQP responsibilities
- Institution of Refrigeration Heating and Air-conditioning Engineers - Building Act and compliance schedules
- Institution of Plumbing and Drainage Inspectors - Conference paper
- BOINZ conference - two papers - Current Building Act interpretations, determinations, building certifiers and life cycle of the approved documents
- NZ Free Kindergarten Association Inc. - Compliance schedules and BWOFF
- Lift Association Lift IQPs, M&I, SGS, senior lift industry personnel & Consultants - Review of D2, NZS 4332P:1994 certification and testing of new lift and escalator installation
- Building Officials Institute of NZ: Canterbury-Westland- Building Act interpretations
- NZ Architectural Designers - D1
- Christchurch Polytechnic - graduates of the third cross-skills training course - future training opportunities
- Aged Care Service Ltd. Hospital managers & principal nurses - building warrants of fitness
- New Zealand Fire Service - Northern region - Building Act, interface with other legislation.

## APPENDIX E2

### SUMMARY OF EDUCATION ACTIVITIES 1996/97 FOR THE BUILDING INDUSTRY AUTHORITY<sup>185</sup>

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|                      |           |
|----------------------|-----------|
| Total one-off events | 37        |
| Total seminar series | 55        |
| <b>Overall total</b> | <b>92</b> |

#### Seminar Series Completed

##### **Building controls education for builders**

An invitation to host a guest speaker from the Authority was sent to the Masters Builders Federation and all of the Master Builder Associations nationwide. Out of the twenty two associations twelve have taken up the offer as of April 1997. A presentation was delivered by Claire Benge, technical adviser to the Authority covering "The Building Act and building code - implementation for builders" as well as a question and answer session.

Total attendance: 361

##### **Property and Land Economy Institute of New Zealand (PLEINZ) and Building Industry Authority - Joint seminars series titled "Don't Get Caught in the Act"**

Aimed at anyone involved in the management or ownership of buildings. Topics included alterations and change of use, and building warrants of fitness. Held at 4 locations nationwide. Total attendance: 181

##### **Universally Useable Buildings**

Aimed at everyone involved in or interested in access requirements. The seminar series presented practical ways of achieving compliance with the access requirements of the New Zealand Building Code, including user requirements, owner responsibilities, and design and inspection considerations. Held at 12 locations nationwide.

Total attendance: 474

##### **Fire Safety Forum**

Aimed at territorial authorities and fire advisers. This question and answer forum was designed to answer questions from building control officers on matters relating to fire safety. Held at 7 locations nationwide. Total attendance: 112

##### **Building Certifiers**

Aimed at existing and prospective building certifiers as well as those who interact with them. Held at five locations: Auckland (2), Wellington, Christchurch, and Dunedin. The main Objective of the series was to cover the administrative matters to do with the

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<sup>185</sup> Copy of a facsimile received July 2, 1997 from the BIA, sent by Rosemary Killip, Education Officer.

function of building certifiers. Tony Marshall of the Authority led the series with assistance from Rose MacLauchlan and Mike Hislop. Total Attendance: 183

### **Building Warrants of Fitness**

Two building warrants of fitness sessions, aimed at building owners, held in the Waikato region in conjunction with the territorial authorities in the area. Bruce Klein from the Authority lead these sessions along with a local Independent Qualified Person, and territorial authority representative. Total attendance: 60

### **Independent Qualified Persons**

This seminar series is being facilitated by Wayne Stewart of Opus (previously Works Consultancy) on behalf of the Authority. The series, which will commence in late May, will cover thirteen locations nation-wide. The objective is to present practical ways of complying with sections 44 and 45 of the Building Act as it relates to the work of IQPs. Total attendance: This is still running in June 1997. Estimated at 600

### **Projects**

#### **• Education Pack**

In 1996 the Building Industry Authority held a series of workshops with tutors and lecturers of building and construction related courses in tertiary institutions.

The intention was:

- to find out what was currently happening in the teaching of building controls
- to obtain opinions about the learning requirements for each discipline
- to identify the needs of the tutors and lecturers in regard to teaching building controls effectively throughout New Zealand.

As a result of this and education package has been designed to assist tutors and lecturers of building-related courses to inform their students of the building control requirements and apply it to their discipline.

#### **• Sponsorship**

The Authority provided sponsorship to the following conferences:

- Institute of Professional Engineers
- New Zealand Institute of Architects
- Building Officials Institute of NZ Inc.
- Association of Local Government Engineers

and also to a seminar series run by the Structural Engineers Society and the National Society for Earthquake Engineering

### **Presentations delivered at conferences or training sessions in 1996-97**

- CIB Performance Building Codes and Society for Fire Protection Engineers
- Australian Building Codes Board
- Institute of Professional Engineers of NZ - annual conference
- BRANZ - Accredited Advisers

- Building Officials Institute of NZ (BOINZ) - Waikato/Bay of Plenty
- Pacific Rim Real Estate Society - Annual Conference
- Building Officials of NZ (BOINZ) - Southern Branch
- Log Builders “Gettogether”
- Institute of Heating and Ventilation Engineers
- Electrical Development Association - building Ventilation & Indoor Air Quality Seminar
- New Zealand Microbiology Society - Legionella Symposium
- Institute of Plumbing and Draining Inspectors - annual conference
- Lower South Island Territorial Authorities - blackflow seminar
- Association of Local Government Engineers Conference
- Canterbury Territorial Authorities
- Institute of Safety and Security - Fire Safety Conference on Performance-Based Concepts
- Building Officials Institute of NZ (BOINZ) - Wellington
- Building Officials Institute of NZ (BOINZ) Training Seminar
- International Energy Agency
- UNITEC Second year architecture students
- Eastern Institute of Technology carpentry students

**APPENDIX F**

**PROCEDURE**

## **F1 Introduction**

This Interactive Qualifying Project was conducted over a time period of seven weeks. This appendix is a background on the project team members and the schedule of how the work completed.

## **F2 Group Members**

Tim Pastore has completed three years at Worcester Polytechnic Institute (WPI). He is a mechanical engineering student with an interest in design. Upon graduation, he will pursue a job in automation design.

Dennis Hubbard has completed three years of mechanical engineering at WPI. His concentration is bio-mechanics. Upon graduation, he plans on furthering his education with a master's degree.

## **F3 Pre-Qualifying Project**

Before leaving the country, there was many aspects of the project that needed to be planned and prepared. The Pre-Qualifying project was conducted during both of the 1997 spring semester terms. This Pre-Qualifying project was counted as half a typical course credit and was completed in addition to the average course load of a WPI student.

The purpose of a Pre-Qualifying project is to start the preparation necessary for the project. Once the project was agreed upon by Dr. Buchanan, the team started meeting with Dr. Barnett once a week.

During the first term, Dr. Jonathan Barnett started the team reading various books on New Zealand and doing research on the World Wide Web. This introduced customs and history of the country. The team copied, read, and summarized the Interactive Qualifying Project that was conducted in 1993 in New Zealand.

The project team also started searching for travel information and costs. During this time the team and Dr. Barnett decided that the project would deal with the education surrounding the NZBC<sup>186</sup>. It was decided that the project would be a partial follow-up to the Interactive Qualifying Project conducted in 1993.

During the second term, both project members enrolled in the introductory fire safety course. This enabled the team members to understand the terminology surrounding fire safety. When Dr. Barnett returned from New Zealand, he presented the team with a list of thirty names of people that had attended a seminar he presented while in Auckland. The team started contacting these people using facsimile and e-mail. The team received some responses, but many of the people contacted did not reply. As part of the Pre-Qualifying Project and the introductory class, the team wrote a paper covering the problems associated with implementation of a performance-based building code. The paper was a good form of background research for this Interactive Qualifying Project.

After roughly laying out a travel itinerary, the team bought airline tickets and discussed predicted deadlines with Dr. Barnett. It was agreed that the team would be in contact with Dr. Barnett twice a week via e-mail once they arrived in New Zealand.

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<sup>186</sup> New Zealand Building Code



The Pre-Qualifying project was a very good way of preparing the students for the work that was coming. The field of fire safety has many words and ideas specific to its discipline. If the team had not been prepared, the conversations during the interviews would have been very one sided.

## **F.4 Interactive Qualifying Project**

### **Background**

A large portion of the background for this Interactive Qualifying Project was taken from the Interactive Qualifying Project conducted in 1993 by WPI students. Other sources included interviewed people and reference books. All of these sources are noted in the text and listed in the bibliography.

### **Process**

In order to be sure that the work that was being completed was correct, the team kept in contact with Dr. Barnett. Once a section was finished, it was sent to Dr. Barnett for editing and comments. After each section was corrected, it was added to the body of the final paper.

The first part of the project was to gather information. This included conducting interviews, surveys, and collecting references from books. The majority of the interviews were conducted in Auckland. Other interviews were conducted in Wellington and Christchurch. There were many steps in the interviewing process. The following table (F-1) describes the process.

## **Table F-1**

### **The Interviewing Procedure**

1. Look up address in Yellow Pages
2. Lay out all points on a map
3. Group locations into daily separations
4. Assign tentative times to each interviewee
5. Set up interview
6. Plan means of transportation
7. Conduct interview
8. Team discussion of important points
9. Review notes and tapes
10. Type interview summaries
11. Proofread summaries
12. Send a facsimile out of interview summaries
13. Make any desired changes
14. Incorporate into final document

Some of the names of people to interview were given to the team by Dr. Barnett.

Others were given to the team by Dr. Buchanan, or by the interviewees themselves.

Without any form of transportation, it was very important that all of the interviews on one day were within walking distance of each other. If the group of interviews were far from the place the team was staying, they would use public transportation to get to them. Laying out all of the interview locations on a map before making phone calls was particularly useful. This way the proper amount of time was given to get from one location to another.

The interview was always held at the office of the interviewee. This caused the least amount of disruption in the interviewee's work. During the interview, the interviewee was given a summary of the project. They were then asked a series of questions. This series of questions would change depending on the interviewee. This enabled the team to ask only questions on subjects that the interviewee had knowledge

on. At the end of the interview, there was an opportunity for the interviewee to give any final recommendations. The interviews lasted from ten minutes to ninety minutes. In some cases the interviewees were extremely willing to give information and in others the answers were one word long. In both cases the information was useful.

The most important part of the interview process was the discussion between team members after the interview. This was when many of the recommendations were formulated. Notes were circled for future use. Many times the team would ask some of the following interviewees the plausibility of the proposed recommendations.

The team worked together on the summaries in Appendix D. This was done to be sure that the summaries were as accurate as possible. The summaries were proofread and sent back to the interviewees for editing. After the interviewee returned the summary, the necessary modifications were made and the text was incorporated into the paper. Any last minute changes were made in the final proofread of the appendix.

From the information obtained in the interviews, the recommendations in Appendix A, B and C were formulated. It was the team's intention to collect the opinions of many individuals and combine them into an organized single voice. The team would like to thank all the people that took the time to help in creating this group of recommendations. Table F-2 lists all the people interviewed.

**Table F-2****Chronological List of Interviews**

| Names             | Location     | Interview date        | Time  |
|-------------------|--------------|-----------------------|-------|
| Dick Gillespie    | Auckland     | May 30 <sup>th</sup>  | 11:00 |
| Paul Clements     | Auckland     | May 30 <sup>th</sup>  | 11:00 |
| Ian Makgill       | Auckland     | June 3 <sup>rd</sup>  | 9:30  |
| Grant Coupland    | Auckland     | June 3 <sup>rd</sup>  | 3:30  |
| Richard Brand     | Auckland     | June 4 <sup>th</sup>  | 9:00  |
| Simon Davis       | Auckland     | June 4 <sup>th</sup>  | 10:30 |
| Neville Trevarton | Auckland     | June 4 <sup>th</sup>  | 12:00 |
| Gavin Parish      | Auckland     | June 4 <sup>th</sup>  | 12:00 |
| Ian Braggins      | Auckland     | June 4 <sup>th</sup>  | 12:00 |
| Jack C Maddox     | Auckland     | June 4 <sup>th</sup>  | 3:30  |
| Gary Chester      | Auckland     | June 5 <sup>th</sup>  | 9:00  |
| Doug Naylor       | Glenfield    | June 5 <sup>th</sup>  | 1:00  |
| J A (Tony) Gibson | Auckland     | June 5 <sup>th</sup>  | 3:30  |
| Les Mellars       | North Shore  | June 6 <sup>th</sup>  | 9:00  |
| Frank Micallef    | Auckland     | June 9 <sup>th</sup>  | 9:00  |
| Martin Feeney     | Auckland     | June 9 <sup>th</sup>  | 1:00  |
| Arthur Budvietas  | Auckland     | June 10 <sup>th</sup> | 9:00  |
| Ernest B. Lapish  | Auckland     | June 10 <sup>th</sup> | 9:00  |
| Ian Godfrey       | Manukau      | June 10 <sup>th</sup> | 2:30  |
| Jim Clarke        | Papatoetoe   | June 10 <sup>th</sup> | 2:30  |
| James Boyes       | Auckland     | June 11 <sup>th</sup> | 10:00 |
| Clifford Barnett  | Auckland     | June 11 <sup>th</sup> | 2:30  |
| Peter Byrne       | Wellington   | June 13 <sup>th</sup> | 9:00  |
| John MacGregor    | Wellington   | June 13 <sup>th</sup> | 10:30 |
| Rosemary Killip   | Wellington   | June 13 <sup>th</sup> | 10:30 |
| Christl McMillan  | Wellington   | June 13 <sup>th</sup> | 10:30 |
| Colleen Wade      | Wellington   | June 13 <sup>th</sup> | 2:30  |
| Carol Caldwell    | Christchurch | June 25 <sup>th</sup> | 10:00 |
| Tony Parkes       | Christchurch | June 25 <sup>th</sup> | 10:00 |
| Dave Eaton        | Christchurch | June 25 <sup>th</sup> | 11:00 |
| Hamish MacLennan  | Christchurch | June 25 <sup>th</sup> | 1:00  |
| Russell Gregory   | Christchurch | June 27 <sup>th</sup> | 11:00 |
| Steve Van der Pol | Christchurch | June 27 <sup>th</sup> | 1:30  |
| Brian Roff        | Christchurch | June 27 <sup>th</sup> | 2:30  |
| Wayne Roden       | Christchurch | June 27 <sup>th</sup> | 2:30  |

## **Background**

As part of the research for the final paper, the team researched the subject of education related to the New Zealand building code. Sources were found on the World Wide Web and at the engineering library of the University of Canterbury.

## **Major Points of Discussion**

During each post-interview discussion the team started to group the comments of the interviewees into major points. Before writing the paper, the team broke all the comments into four major themes. These themes became the chapters of the second part of the paper. Further branching developed the subsections of the chapters.

## **Suggestions and Recommendations**

After the second part of the paper was finished, and sent to Dr. Barnett for approval, the team had a brainstorming session. During this session all the recommendation packages were outlined. These packages were created by using the prevailing themes and weaknesses in the building industry. In many cases, the interviewee mentioned a solution to a problem they saw. These suggestions were researched further and if they were plausible, entered into the recommendation packages. These recommendation packages are meant to address the weaknesses and provide a means of solving them.

## **F.5 Closing**

This project was an excellent experience for the team. It provided us with an overseas experience, a new group of friends, plenty of exercise, a growing dislike of

English humor, and a chance to travel around a beautiful country. More importantly, however, the project was meant to create a useful set of recommendations to the parties involved. It is the hope of the team that this study will benefit the New Zealand building community. Each person has provided an incredible amount of information for the team to work with. We just hope that this project will help the industry as much as it helped us.

## GLOSSARY

ACCEPTABLE SOLUTIONS - a set of solutions that provides a prescriptive means of compliance and in most instances quotes familiar documents such as New Zealand Standards.<sup>187</sup>

ALTERNATIVE SOLUTION - design or construction other than an acceptable solution.<sup>188</sup>

APPROVED DOCUMENTS - see “Acceptable Solutions.”

AUTHORITY - see “Building Industry Authority.”

BIA - see “Building Industry Authority.”

BUILDING ACT 1991 - legislation intended to safeguard the health and safety of the public, protect other property affected by construction, alteration and demolition of buildings, and to establish a national and uniform building code.<sup>189</sup>

BUILDING INDUSTRY AUTHORITY - the Building Industry Authority is:

- The agency established by Government to manage the building controls system.
- Responsible for monitoring the performance of Councils in the administration of the Act within their districts.
- Able to determine building control doubts or disputes
- Responsible for issuing Approved Documents which are guidance documents providing methods of compliance with the New Zealand Building Code.<sup>190</sup>

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<sup>187</sup> Building Industry Authority. “Acceptable Solutions No. 4”, 1994 (?) TMs [original]

<sup>188</sup> Ibid.

<sup>189</sup> Environmental Administration Unit and Public Health and Safety Unit of Christchurch City Council. “Project Information Memorandum, 1993” TMs [original]

<sup>190</sup> Building Industry Authority. “How it Works No. 1”, 1994 (?) TMs [original]

COMPLIANCE SCHEDULE - a document listing the inspection, maintenance, and reporting procedures for specific systems to ensure their continued safety of operation.<sup>191</sup> A compliance schedule and is needed if a building has any of the features listed below.

- Automatic sprinkler systems or other systems of automatic fire protection
- Automatic doors, which form part of any fire wall and which are designed to close shut and remain shut on an alarm of fire
- Emergency warning systems for fire or other dangers
- Emergency lighting systems
- Escape route pressurization systems
- Riser mains for fire service use
- Any automatic backflow preventer connected to a potable water supply
- Lifts, escalators, or travelers or other similar systems
- Mechanical ventilation or air conditioning systems serving all or a major part of the building
- Any other mechanical, electrical, hydraulic, or electronic system whose proper operation is necessary for compliance with the New Zealand Building Code
- Building maintenance units for providing access to the exterior and interior walls of buildings
- Such signs as are required by the building code in respect to any of the above mentioned systems

COUNCIL - see “Territorial Authority.”

DETERMINATION - a decision by the Building Industry Authority with respect to a doubt or dispute over whether a proposal complies with either the Act or New Zealand Building Code.<sup>192</sup>

FUNCTIONAL REQUIREMENTS - a criteria which describes what the building must do to satisfy the social objectives.<sup>193</sup>

INDEPENDENT QUALIFIED PERSON - a specialist approved by the Council and having the appropriate skills to carry out specific procedures required by the compliance schedule.

INDUSTRY TRAINING ORGANIZATIONS - A group of organizations dedicated to educating technicians.

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<sup>191</sup> Building Industry Authority. “New Terms and Procedures No. 2”, 1994 (?) TMs [original]

<sup>192</sup> Ibid.

<sup>193</sup> Building Industry Authority. “Acceptable Solutions No. 4”



INNOVATIVE DESIGN - see “Alternative Solution.”

IQP - see “Independent Qualified Person.”

ITOs - see “Industry Training Organizations”

NEW ZEALAND BUILDING CODE - a performance-based building code that was implemented by the Building Act 1991.

NZBC - see “New Zealand Building Code.”

NZS 1900 - a set of model bylaws for acceptance by individual cities. These standards were primarily prescriptive.

OBJECTIVE - a criteria which explains social objectives to be achieved.<sup>194</sup>

PERFORMANCE - a criteria which gives specific details against which any proposal may be checked for compliance.<sup>195</sup>

PERFORMANCE BUILDING CODE - a set of regulations specifying what performance criteria need to be achieved. Any means can be used as long as performance criteria is achieved.<sup>196</sup>

PRESCRIPTIVE BUILDING CODE - a building code which specifies exactly how a building should be built and what to build it with.

PRODUCER STATEMENT - a statement confirming that plans or specifications or completed works for all or a specific part of a building, comply with the New Zealand Building Code. A producer statement will usually be issued by a recognized specialist. This may be an architect, engineer, clerk of works, an appraisal organization, or a contractor. It is up to the Council to decide whether to accept such a statement.

TA - see “Territorial Authority.”

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<sup>194</sup> Building Industry Authority. “Acceptable Solutions No. 4”

<sup>195</sup> Ibid.

<sup>196</sup> Anderson, Cox, Irelan, Woehnker. p. 45

TERRITORIAL AUTHORITY - councils which are required to:

- Administer the Act and Regulations within their districts.
- Deal with building consent applications within the prescribed time limits.
- Determine whether waivers or modifications to code requirements should be permitted, and whether building code proposals comply with the New Zealand Building Code.
- Enforce the provisions of the Regulations.
- Issue project information memoranda, code compliance certificates, and compliance schedules.
- Maintain good records of building information and make them available to the public.<sup>197</sup>

WARRANT OF FITNESS - a certificate provided annually and signed by the building owner, confirming that compliance schedule requirements have been satisfied.<sup>198</sup>

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<sup>197</sup> Building Industry Association. "How It Works No. 1"

<sup>198</sup> Building Industry Authority. "New Terms and Procedures No. 2"

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