

REPORT OF
THE OVERVIEW GROUP ON THE WEATHERTIGHTNESS OF
BUILDINGS
TO
THE BUILDING INDUSTRY AUTHORITY

31 August 2002

Introduction

On 18 February 2002, the Building Industry Authority (BIA) appointed a Weathertightness Overview Group to inquire into the weathertightness of buildings in New Zealand in general, and in particular into the current concerns regarding housing that is leaking and causing decay. The Overview group is:

- Don Hunn (Chair)
- Ian Bond
- David Kernohan.

Terms of Reference

The Overview Group's Terms of Reference are:

To identify:

1. The nature, extent and effect of the current failure of some buildings to deal with moisture in and through their exterior envelopes.
2. Potential contributing causes such as, but not limited to:
 - a) Inadequacy in the Building Code and Approved Documents
 - b) Inadequate documentation supplied for building consent
 - c) Insufficient checking at building consent, during construction, and at Code compliance stages
 - d) Inadequacy of building products, materials and components, including evaluation of their suitability or fitness for purpose
 - e) Insufficient technical information provided by manufacturer's literature and instructions
 - f) Inadequate contract documentation
 - g) Inadequate trade skills and supervision on site
 - h) Lack of co-operation and sharing of responsibility on site
3. Whether failures are attributable to deficiencies in the Building Act, the Building Regulations, or in the manner in which these are administered by the Authority or by Territorial Authorities (including the role of Building Certifiers), and whether the purposes and principles of the Act under Section 6 have been properly observed and followed by the Authority.
4. Any other matters that are considered relevant to the inquiry.

Nature and Methodology of Inquiry

The Overview Group meets formally on a regular basis. It has undertaken a literature search to learn more of the nature and extent of the problem both within New Zealand and beyond. It has met with experts on the matter both from within New Zealand and from Canada where there is experience with similar difficulties, especially in British Columbia. The Overview Group is aware of, and welcomes, the work of the Building Research Association of New Zealand (BRANZ)'s Weathertight Buildings Steering Group (WBSG) and has met with its Chair and members of the Group.

The Overview Group has conducted its meetings and visits in Wellington, Auckland and Christchurch. It has conducted all its meetings on the basis that any discussions with the many participants were held in confidence. This report, therefore, makes no direct reference to any specific statements, comments or assertions made during interview by any of the participants. The report reflects comment and opinion heard throughout the process.

The Overview Group has, in its deliberations, assigned various tasks to its members. Don Hunn, as Chair, has taken the lead role in structuring the investigation and co-ordinating the recommendations. He has given particular emphasis to considering the Building Act and the role of the Building Industry Authority. Ian Bond has taken responsibility for those investigations that relate to the application of the Act through the Building Code, its Approved Documents and their application and use in practice. David Kernohan has considered the information gathered about the research and education aspects of the inquiry. The Report and Recommendations are the agreed views of the Overview Group.

The Overview Group has visited a number of affected buildings and met with representatives from different sectors of the building industry including:

Architects

- Private practice consultants

Professional Organisations

- New Zealand Institute of Architects
- Institute of Professional Engineers of New Zealand
- Association of Consulting Engineers of New Zealand
- Construction Liaison Group
- Claddings Institute

Building Inspectors in Territorial Authorities

- Building Certifiers

- Private consultants specialising in leaking building problems

Dispute Resolution Consultants

Building contractors

- House builders - several small/medium size; three group housing contractors
- A major national commercial building company

House owners

- Individual private
- Body Corporate representatives
- Developers

Research

BRANZ - senior executives and researchers
Weathertight Buildings Steering Group (WBSG)
Forest Research
School of Architecture, UNITEC

Housing New Zealand

New Zealand Insurance Council

Banking

Bankers Association
Commercial Banks

Educational institutions and organisations

School of Architecture, Victoria University of Wellington
Building and Construction Industry Training Organisation
Design and Construction Consultants Industry Training Organisation

Manufacturers/Suppliers

Exterior Insulation and Finish Systems (EIFS)
Cement fibre board
Building Papers and Synthetic Wraps
Timber
Coating systems
Flashings

Trade and Industry associations

Master Builders' Federation
Certified Builders Association
Timber Federation
Timber Preservation Council
Windows Association of New Zealand
Cement and Concrete Association
Building Officials Institute of New Zealand

Specialist subcontractors

Coating applicator

Property developers

Government

Department of Internal Affairs
Building Industry Authority

Recommendations

It became clear early in the review that the issues raised by our Terms of Reference could be divided into two parts:

- Those concerned with weathertightness specifically
- Those that apply more generally to the building sector but which, in our view, would also have to be taken into account if the problems of weathertightness are to be addressed successfully.

The Report itself follows the Terms of Reference point by point. The Recommendations are numbered in the order in which they appear in the text. Below, the Recommendations are grouped according to whether they relate directly to weathertightness or whether they range more widely:

A. Weathertightness Recommendations

Recommendation 1

That the BIA:

- a) issue a public warning concerning the risks of collapse of cantilevered balconies and decks supported by untreated timber framing; and**
- b) resolve with Territorial Authorities how the public warning is to be followed up with appropriate procedures to ensure the risk is widely recognised and appropriate corrective action taken where necessary.**

Recommendation 2

That the BIA:

resolve with the Public Health Division of the Ministry of Health the best manner by which the potential health risks associated with fungal decay can be identified and the precautions that need to be taken, particularly when the removal of cladding exposes decayed timber framing. This information must then be disseminated to the public and the building industry.

Recommendation 5

That the BIA in revising its Approved Documents E2/AS1 External Moisture:

- a) continue with its intention to exclude for the time being from the Acceptable Solutions, face-sealed cladding systems in high risk areas**
- b) sponsor research into developing effective moisture management systems suitable for New Zealand conditions where there is a high risk of leakage**
- c) include in the Approved Documents the use of such moisture management systems when their efficacy is assured.**

Recommendation 6

That the BIA in conjunction with the Building Officials Institute of New Zealand (BOINZ):

- a) review and upgrade the criteria for what constitutes a reasonable level of detail to be provided with building consent applications with respect to weathertightness detailing including flashings.**
- b) review and develop guidelines for an inspection regime as part of the code compliance certification process, with specific reference to weathertightness aspects.**

Recommendation 11

That the BIA :

- a) develop more prescriptive Acceptable Solutions and Verification Methods for the Approved Documents B2 Durability and E2 External Moisture;
- b) develop recommended procedures and processes for the development and approval of Alternative Solutions; and
- c) promote with Standards NZ the development of a national performance-based Standard for domestic building weathertightness.

Recommendation 12

That the BIA:

review the current practice for product appraisal and develop formalised requirements. This should include establishing specific criteria for the process; accrediting and/or auditing appraising bodies; monitoring ongoing product performance; and establishing and maintaining a register of the 'approved' products. It would seem sensible to explore the possibility of better alignment of Australian and New Zealand practice.

Recommendation 13

That the BIA:

- a) take on a broader and more proactive responsibility to establish, fund, monitor and audit public-good research across the building sector; and
- b) establish an independent research programme to investigate the nature and extent of the weathertightness problem in New Zealand and gain better understanding of the causes of the current failure of some buildings to deal with moisture in and through their external envelopes.

B. Building Sector Recommendations

Recommendation 3

That the BIA discuss with the Minister of Internal Affairs the desirability of:

- a) convening a meeting of leaders of the building and associated sectors to discuss the issue of weathertightness, to explore the means by which the current disturbing trends can be halted and to agree on actions which might be taken to improve the performance of the sector in future, and
- b) a public enquiry into the building industry (similar to the one recently conducted in New South Wales) which would have the mandate to look beyond the issue of weathertightness alone and to examine the range of issues which have emerged from this and other reports.

Recommendation 4

That the BIA:

- a) discuss with the Department of Internal Affairs the philosophy of "minimise compliance cost" with a view to ensuring that the current or any future review of the Building Act promotes the concept of improving compliance process efficiency without compromise to building standards or quality;
- b) in any review of Approved Documents consider the concept of optimised 'whole-of-life' costs as opposed to minimised capital cost; and

- c) in reviewing the role and responsibilities of territorial authorities and building certifiers with regard to the building consent checking process and code compliance inspection regime, ensure that any guidelines or implied or expressed incentives do not inadvertently promote “down to cost” as opposed to “up to standard” behaviour.

Recommendation 7

That the BIA in conjunction with BOINZ:

develop guidelines on the interpretation of the Building Act and companion documents to provide an educational and reference document for building inspectors and certifiers. It should provide guidance on the interpretation of the Building Code provisions for Objective, Functional Requirement, and Performance, and such terms as “satisfied on reasonable grounds” and “adequate”.

Recommendation 8

That the BIA investigate with BOINZ:

- a) the issue of scope approval of building certifiers and its monitoring; and
- b) the split responsibility of building certifiers and territorial authorities with respect to building consents, inspection and code compliance certification; and attempt to improve and clarify both.

Recommendation 9

That the BIA investigates the public-good benefits of

- a) extending the information available with LIMs to include, for instance, the inspection and maintenance recommendations prescribed by the designer (similar to the requirements for lifts and fire protection in commercial buildings), and building product or system warranties such as cladding systems; and
- b) introducing a form of ‘occupation certificate’; and

Recommendation 10

That the BIA in conjunction with appropriate sector groups determine:

the need for developing tertiary qualifications, including programmes of continuing professional development, relevant and suitable to the knowledge, skills and experience expected of building inspectors and certifiers.

Recommendation 14

That the BIA:

initiate a formal analysis of the documentation trail to establish whether a holistic consideration of all contracts and quasi-contracts involved in the building process, set within a legislative and regulatory framework, could lead to improved definitions of the roles, functions, responsibilities and obligations of all the parties. In doing so, the BIA should examine the efficacy of adopting the concept of a home building contract.

Recommendation 15

That the BIA:

request the Building and Construction Industry Training Organisation (BCITO) to review in conjunction with appropriate sector groups the apprenticeship course in Carpentry and other key trades to ensure it delivers an appropriate balance of academic and practical knowledge and experience relevant to the needs of the individual, the industry and the consumer.

Recommendation 16

That the BIA in conjunction with the appropriate affected sector groups:

- a) explore the issues involved in advocating the national registration of builders and building related trades, given the contents of this report and concerns expressed about the standards of some trade practices on-site; and**
- b) support such advocacy if it is convinced of the benefits to the Industry.**

Recommendation 17

That the BIA:

promotes debate on the issues of trade regulation, professional education and builder registration at the proposed executive forum.

Recommendation 18

That the BIA in conjunction with the major territorial authorities:

identify instances where District Plan requirements are influencing the planning and site coverage of multi-unit housing projects and consider their appropriateness in the light of this Report.

Recommendation 19

That the BIA:

discuss this Report with the Bankers Association and the New Zealand Insurance Council to ensure that both the banking and insurance sectors are kept up to date with any further developments in dealing with the issue of weathertightness.

Recommendation 20

That the BIA having taken account of the range of matters covered in this report:

- a) give serious consideration to what further measures might be desirable to improve the accountability of all parties in the building sector (including owners) for the quality of construction (including weathertightness) within the framework of the current performance-based system.**
- b) develop and implement immediately a communications strategy to keep the public and the industry fully informed of the issues and action taken.**

Nature of the building industry

The building industry is multi-faceted. The design, construction and general procurement processes within the industry are constantly changing. However, it can be argued that change in the building industry has accelerated in the past decade. The housing market, and in particular the multi-unit or condominium sector, has become highly cost-competitive. The 1990's saw a phenomenal increase in demand for condominium style living. Buildings of this type are generally located either:

- in the inner city on confined and expensive sites requiring medium or high rise single buildings providing medium to high density accommodation; or
- out of the inner city involving low to medium rise construction and providing low to medium density accommodation. They are generally in a lower price bracket and often include shared recreational facilities, all of which appeals to the younger owner.

With the collapse of the commercial building boom in the late 1980's, property developers turned their attention to this new demand for condominium living.

Overseas imagery and changes in lifestyle aspirations have led to consumer preferences for buildings that adopt a "Mediterranean" appearance of plaster and adobe finishes. Typically, the style can be identified by its flush plaster finishes, lack of eaves, use of parapets and with balconies both internal and external to the building's principal form. The increased availability of new and cheaper forms of building construction, notably monolithic panel systems, has had a clear association with these changes in preferences. There is consumer expectation that such buildings will be cost efficient and low-maintenance. Holding prices down (cost cutting) both in terms of the finished product and in its construction has become paramount and has led to some inadequate practices, largely driven by cost and economic pressures.

These pressures affect owner and developer choice of building form and the methods by which buildings are constructed. In addition, changes in the structure of the building industry and its on-site processes and practices have shifted responsibilities, which is contributing further to the problem. Quality assurance and accountability in the design and building process including the sale and purchase of homes has become more complicated and less clear. The industry faces a number of critical issues that impact on its current and ongoing credibility with the market generally and the consumer in particular. These can be categorised as being societal and technical issues.

Societal Issues

For more than a century, the process for building the conventional New Zealand detached house remained relatively unchanged. Having given consideration to budget, location and availability of building site, the would-be owner went to an architect or a draftsman or a builder, stated their requirements, a design was drawn up and agreed. A draftsman may or may not have been employed by the owner or be part of the builder's service. If an architect was employed the design went out to tender. A tender was accepted and a builder appointed. With a builder a price was agreed with the owner. In either case, the architect or builder ensured compliance with all consent processes. Work began.

Supervision of the work lay with the architect or the builder. In some cases a Clerk of Works was employed by the owner to monitor the day-to-day activities on-site. The builder was responsible generally for the employment, supervision and quality control of sub-contractors. Often, the sub-contractors were well known to the main contractor having regularly worked together before.

An intimate professional relationship prevailed between owner, designer and builder. There was a tacit sharing of responsibility between all three. The builder might provide warranties or guarantees. The architect took responsibility for design and supervision.

Regardless of which option was adopted, the builder would employ a relatively stable workforce comprising skilled carpenters and labourers many of whom would be highly trained and qualified. They would be responsible for all of the work other than for instance the plumbing and electrical and maybe the painting and decorating. They had an overall responsibility and in general took a pride in the completed product.

An alternative to this procurement process, and one that has gained popularity, is to purchase a home built speculatively by 'group' or 'volume' housing companies, most of whom build upwards of 100 individual houses per year. In this case, the housing company acts as a builder/developer. Typically, such 'group' housing companies offer a range of design and construction forms that might be termed 'traditional' or 'conservative'. Many consumers enjoy the opportunity of visiting show homes and seeing just what they will get.

The Overview Group noted that in general houses built by 'group' housing companies using tried and tested standard house designs and detailing did not manifest the leakage problems encountered in one-off speculative or owner-initiated developments or the developer-driven multi-unit developments that exhibit the design and construction characteristics outlined above.

Today, the housing industry and the housing market particularly in the cities has changed dramatically. Development of many large inner-city multi-unit condominium projects will be driven in the first instance by a property developer. That developer may employ an architect or draftsman to prepare the minimum drawings necessary to obtain first a resource consent and then a building consent. At that point, the developer will either tender for or engage a building contractor. A project manager is usually appointed to manage the co-ordination of the works on site. Even though a main contractor may be employed there is often a multitude of "labour-only" sub-contractors engaged which means that the sub-contractors and sub-trades, the actual workers, are often not well known to the main contractor and even less to the project manager and developer.

This has led to comments such as "no-one takes overall responsibility for the project anymore". The respective roles and responsibilities of architects, main contractors, sub-contractors, specialist sub-trades and project managers and developers become very complicated, hard to define and consequently unclear and hard to understand. There can be over 50 sub-contractors on a large site. The co-ordination and sequencing of cladders, flashers, plumbers for instance is often difficult and not given adequate priority due to time and cost constraints. Such an environment results in poor planning, co-ordination and a lack of individual responsibility and co-operation between the various sub-trades. It has been reported to the Overview Group that more and more often responsibilities and liabilities are being passed "down the line" to the sub-contractors and sub-trades. Whatever the reality of this, the circumstances result in a collective system failure – and buildings that leak.

Technical Issues

The use of monolithic cladding systems are promoted as being low maintenance, and providing a sealed and waterproof outer skin. The desire to seal buildings dates back to the energy crisis of the 1970s. Energy efficiency for new buildings is required in the Building Act.

Consumer and developer preferences for innovations in the design of multi-unit housing has led to the design of complex building forms with a multiplicity of junctions and penetrations. The implications of constructing such complexity are not well considered at the design stage. It must be said that in the Auckland climate, in particular but not exclusively, the behaviour of rain (horizontally and vertically), and the prevalence of condensation and humidity should elicit more appropriate design responses than have been evidenced to the Overview Group.

On-site, cutting, joining, fixing and coating panels effectively requires knowledge and skill. These are not always available or used properly or effectively. The performance of flashings, sill trays, sealants and jointing materials and compounds and their proper application is not well understood. Most surprisingly, there has been much evidence of a general lack of understanding of the importance of, and in some cases even the need for, flashings at junctions and penetrations (even at windows and doors). Their use can be often minimal and in the worst cases non-existent. Thus, there are systemic problems in the way in which component products are put together rather than necessarily any specifically identifiable problem with one product. In addition, there is a lack of understanding of the science relating to issues of differential thermal conductivity between materials; and the relationship between rigid panel and flexible framing and the need for special control (movement) joints, both of which lead to failure of the integrity of the joint and resultant leakage.

When water penetrates cladding systems, the water is held and cannot get out easily. Retained water or moisture affects all the materials involved. Primary of these is the now generally used untreated kiln dried timber used for framing although steel frame and strapped masonry can also be affected. While treated timber will also deteriorate in wet conditions, untreated timber seems particularly susceptible. There is some evidence that where untreated timber has become wet, the spread and rate of decay or fungal growths has been significantly faster and more widespread than might have been expected otherwise. Forest Research is currently investigating aspects of this issue.

At a detailed technical level, two fundamentals of good detailed construction design seem to be being by-passed in some instances. The first is the loss of the traditional “belt and braces” approach to construction practice. This accepts that water will penetrate the exterior of a building and that there should be a “second line of defence”, a means of getting the water away and a means of drying out any wet elements. The second is the lack of or misuse of flashings at junctions and penetrations. These are being dispensed with or are detailed or constructed inadequately. Although re-instating such fundamentals would have what some might see as adverse cost consequences, the consensus from builders is that the incremental cost of incorporating such features in the original construction is not significant to the bottom-line capital cost and would have significant whole-of-life cost benefits.

The Overview Group wants to emphasise that buildings can be and most are being built in a weathertight manner. However, to do so clearly requires greater care and attention to detail by both the designer and constructor than is being applied by some at present in some circumstances.

Overseas Experiences

In Canada, a moratorium on most Exterior Insulation and Finish Systems (EIFS) construction became effective in Vancouver in January 1996, three years after the city had tried unsuccessfully to abate the problem of weathertightness with revised building code guidelines. In March of that year, the National Research Council of Canada (NRCC), based in Ottawa, released their investigation of EIFS cladding. They found water intrusion occurs through a variety of means, namely windows, wall/roof intersections and wall penetrations. In 1999, the Canadian Wood Council launched their ‘Best Practice Guide for Wood-frame Envelopes in the Coastal Climate of British Columbia’. The primary focus of the Guide, funded by the Canada Mortgage and Housing Corporation, is on the management of moisture.

Some of the Guide’s key points are:

- Wetting exposure of these coastal climate buildings is high and drying potential is low
- The most important wetting mechanism to control is rain penetration
- There is little ability to dry materials by diffusion and venting, especially in winter, so that the ability to drain any water that gets past the cladding into the assembly is particularly important

- Condensation from interior sources of moisture is a less important factor than it is for colder inland climates but should not be ignored

The Guide's concerns include the behaviour of wood in construction; the control of moisture sources; heat flow, and the assembly of the system of roofs, walls, balconies and walkway assemblies and windows. The Guide includes recommended construction details and comments on components and materials including wood products, insulation, sheathing membranes, flashings, eaves' troughs and rainwater leaders, cladding, window and sliding doors, skylights, doors, sealants, painting and exterior coatings, water shedding roofing, waterproof roofing and balcony and walkway pedestrian traffic membranes. It recommends use of water-management systems that involve use of cavities and drainage planes.

In March 1996, the North Carolina Building Code Council adopted guidelines that effectively put an end to the use of foam-based barrier EIF systems. The regulations require manufacturers to provide a 20year warranty on barrier EIF systems and call for any EIFS in North Carolina to contain an internal water drainage system starting in 1997. The guidelines further call for the application of "drainable" EIFS for any repairs of existing EIFS-clad houses with moisture drainage problems. Around this time, the United States Gypsum Company (USG Corporation), a major manufacturer of EIFS, announced its plan to exit the "barrier" EIFS market and focus on "water-management" systems only. Regulations requiring all EIFS for Type VI construction in North Carolina to contain an internal water drainage system became effective in January 1997. Similar legislation was passed in Georgia in 1997.

In the US, the principal causes of building failure due to water penetration identified were:

- increasing size and complexity of houses
- floor levels too close to the ground
- loss of roof eaves
- inappropriate use of vapour barriers
- omission of flashings and abuse of sealants
- abuse of claddings by other trades and poor construction sequencing
- English as a second language for many workers
- Multitude of opinions. Science is still evolving and there is a lack of good research
- Condensation within concealed spaces of air conditioned buildings eg on the underside of floors in subfloor spaces.
- Stiffening of buildings from monolithic claddings can generate earthquake damage

It is noteworthy that the above criteria have been cited independently to the Overview Group as causes of damage in New Zealand in the course of the meetings and discussions the Overview Group have had with interested parties.

1. The nature, extent and effect of the current failure of some buildings to deal with moisture in and through their exterior envelopes.

In recent years, moisture problems have become the single most common reason for unsatisfactory building performance in New Zealand. Evidence for this has come from BRANZ's analysis of its own site visit records and from a BIA commissioned study of the pre-purchase inspections by PRENDOS Ltd of 287 houses spread over 50 sites, and including buildings from the pre-1920s through to the 1990s as analysed by UNITEC. PRENDOS Ltd is a private company based in Auckland that carries out building survey and remedial work. While this research is limited in scope and has been portrayed by some as providing an unrepresentative sample, its outcomes are one of the few pieces of research evidence available as to the extent and nature of the problem.

The PRENDOS Ltd records suggested about 60% of the dwellings inspected let in moisture to an unacceptably high degree through the cladding, the windows or doors, or through defects in deck and balcony construction. Over the whole sample, there were about as many fabric defects as junction ones. Since March 2002, the BIA has had 64 reports of leaking buildings. Of these, 9 are for multiple unit developments including those from a body corporate secretary covering 400 units and another with 195 units. Litigation is being pursued in a number of these cases. The Overview Group has visited a number of these buildings and been shown the extent of the damage.

Nature

As has been stated above, the nature of the weathertightness problem is the apparent inability of monolithic cladding panels to prevent external water entering the framework where it is unable to dry. There are issues of the performance of rigid cladding panel systems fixed in particular to flexible timber framing. The issues relate to the differential movements between materials from creeping (due to drying out) and thermal conductivity; loading conditions; and movement caused by wind and earthquake action. The integrity of the joints is reduced by these circumstances and is lost over time – sometimes surprisingly quickly. Areas where jointing is particularly vulnerable are inter-storey joints, joints at opening/cladding interfaces, vertical joints in panels, joints at penetrations through panels.

Water migrates through the framework, saturating the framework elements including the timber framing. This creates an environment for the development of fungal decay. The Overview Group has seen evidence of substantial portions of the timber framing being rotted out within two years of construction. The process appears to be accelerated where untreated timber is used in framing. In some cases the decay threatens the structural integrity of the building, creating the risk of failure and collapse.

Extent

There is evidence of a growing number of new housing constructions showing signs of water damage. The most significant incidences noted are in upmarket-style one-off, single dwellings and multi-unit condominium-type apartments both medium rise/medium density and low rise/low density. Characteristically, both building types use monolithic panel systems designed in styles that commonly include features that exacerbate the problem. These are complex major and minor roof forms, much reduced and in many cases no eaves, balconies external and internal to the outer wall plane, flush windows and doors with inadequate flashings and in some reported cases without flashings. The incidences sighted by the Overview Group were predominantly in Auckland where the preference for these forms of buildings appears strongest.

At present, for a number of reasons, it is difficult to know the extent of the problem in New Zealand. It is a “hidden” problem literally, hidden within the walls of buildings. It is

becoming less hidden as the growing incidence of water damage is recorded. However, there is anecdotal evidence that it is also hidden by other circumstances. These include, among others, the concerns of:

- building owners that their house values may be affected by adverse publicity
- builders that they may be liable for repair and reparation
- other parties who may be liable for the costs of repair and reparation

Although the full extent of the problem is not yet known, the Overview Group is convinced of the significance of the problem and that urgent action is required and must not be delayed while the extent is investigated further.

Effects - Health and Safety - Structural defects

The Overview Group is concerned that there are potential dangers for health and safety if the issue is not addressed systematically and quickly. Water damaged timber will become structurally unsound and fail if undetected. The extent of this risk is also not known but the analysis of the PRENDOS pre-purchase reports showed that of the 287 houses inspected, 39 of the 50 sites had units with balconies and on every site there was evidence of excessive water penetration. The balconies, clad in coated monolithic panels, were often uneven with no flashings or falls to shed water and poorly constructed waterproofing membranes. Handrail supports penetrating the top of the balcony were found to be a major contributor to the problem. Water had penetrated to the framing, decaying the timber – in some cases to dangerous levels.

Recommendation 1

That the BIA:

- a) issue a public warning concerning the risks of collapse of cantilevered balconies and decks supported by untreated timber framing; and**
- b) resolve with Territorial Authorities how the public warning is to be followed up with appropriate procedures to ensure the risk is widely recognised and appropriate corrective action taken where necessary.**

Effects - Health and Safety - Fungal growths

Water damaged timber is a breeding ground for fungal growths. There is some evidence of toxic fungal growth being evident during some repair work that has been carried out on leaking buildings. There is clearly a potential risk from toxic fungal growths for repair workers and house occupiers. The extent, nature and consequences of the issue is not known nor what might be appropriate mitigation and protection measures. Research is required to learn more of the phenomenon (also, see **Recommendation 13 below**).

Recommendation 2

That the BIA:

resolve with the Public Health Division of the Ministry of Health the best manner by which the potential health risks associated with fungal decay can be identified and the precautions that need to be taken, particularly when the removal of cladding exposes decayed timber framing. This information must then be disseminated to the public and the building industry.

Effects - Costs

Determining the overall costs associated with the weathertightness issue in New Zealand is not straightforward. Working from statistics provided by Statistics New Zealand for the period 1997 to 2001, the following can be surmised:

- Over the past five years, on average, the total value for building consents for all building types nationally is about \$6200 million per year.

- The total value for residential buildings is about \$3100 million per year (about 50% of the total dollar value of all building consents annually).
- The total number of building consents for dwelling units averages about 22500 per year which is an average of about \$138000 per unit.
- Building consents issued for new apartments (that is new residential buildings that include 10 or more dwelling units) average about 3000 units per year with an associated dollar value of about \$240 million per year (\$80000 per unit).
- Apartments constitute 7.5% of the dollar value of all residential buildings while consents for apartments are about 13% of all consents issued for residential buildings.
- Building consents issued per year in Auckland for residential buildings constitute on average about 36% of the national total.
- Monolithic claddings (Fibre Cement Sheet, EIFS, Stucco, Plywood) are used in 40.8% of all new dwellings. From the observations of the Overview Group, however, it is considered that monolithic cladding is used more extensively on modern style multi-unit dwellings and could be as high as 80% in that area. It is reasonable to assume, therefore, that between 1200 and 2400 new apartment dwellings are each year using this type of cladding.

If say 50 % of the monolithic-clad apartment dwellings require repair at an average cost of say \$20000, the annual repair bill would be in the range of \$12 million to \$24 million per year (or between \$120 million to \$240 million if that is the level of repair required for monolithic clad apartments backdated over the past decade. Media reports have suggested a repair bill in excess of \$1 billion and statements have been expressed to the Overview Group such as “there is not an apartment unaffected”. To the contrary, others have argued that it is a “beat-up”, that such figures are exaggerated and that even our \$120 to \$240 million estimate, may be excessive. The claim that the problem is a “beat-up” is based on the argument that the methods and costs of current repair work appear to be unnecessarily wholesale and extensive.

There is still a high degree of uncertainty in evaluating the potential cost of repair for the same reasons that the full extent of the problem of weathertightness itself is hard to determine. Even at the conservative end of the range, however, the scale of the problem is unacceptably high.

It has been reported that in the US “with 1.6 million new homes built each year, 90% are wood-framed. 29% of recent homes have problems with 6% considered serious. 90% of surveyed problems are due to rainwater leaks”. In Canada, “800 three to four storey condominium complexes were built in Vancouver between 1980 and 1995 with over half of these experiencing water leakage. It is estimated 50000 units are affected. Repair costs range from C\$35000 to C\$40000 per condominium unit that have a value of C\$150000”. In Vancouver, condominiums are “difficult to sell unless the cladding has been replaced, irrespective of damage”. The builders’ home warranty scheme has collapsed.

As we have noted, the extent of the problem in New Zealand remains to be quantified with that degree of certainty. There is no doubt, however, that the conditions that have produced the problems experienced in the past decade in British Columbia and North Carolina exist in this country. Putting aside the range of strong opinions, both for and against high levels of damage, the Overview Group is itself convinced of the opinion it expressed in its preliminary report – that it is wise at this time to accept that there is a problem and that something(s) should be done now. There is clear evidence of a growing number of new housing constructions showing signs of water damage. The numbers uncovered (literally) are likely to increase, probably significantly.

There is urgent need for proper research into the real extent of the problem and the financial consequences. However, the difficulties involved in determining the extent of the problem on a scientific basis is that it may involve a degree of destructive testing of some parts of existing houses. The intrusiveness of testing is one concern for building owners and occupiers.

However, another is the perceived implication that their property is “in trouble” with consequential impact on property values.

Initially, while accepting that water penetration problems may be more general, the Overview Group suggests that research into the extent of the problem should focus on multi-unit properties that feature monolithic cladding. One research proposal suggests that a study could be carried out to survey such dwellings built since 1990 in five main centres. The proposal suggests an intrusive rather than destructive methodology applying both observational and measurement techniques to the base sample (in this proposal, of 400 houses). The Overview Group believes such a research proposal has merit (**see Recommendation 13 below**).

2. **Potential contributing causes such as, but not limited to:**
- a) **Inadequacy in the Building Code and Approved Documents**
 - b) **Inadequate documentation supplied for building consent**
 - c) **Insufficient checking at building consent, during construction, and at Code compliance stages**
 - d) **Inadequacy of building products, materials and components, including evaluation of their suitability or fitness for purpose**
 - e) **Insufficient technical information provided by manufacturer's literature and instructions**
 - f) **Inadequate contract documentation**
 - g) **Inadequate trade skills and supervision on site**
 - h) **Lack of co-operation and sharing of responsibility on site**

The Overview Group believes there is potential for a major systemic breakdown across the industry. While buildings have always leaked, traditional building methods have had a greater degree of redundancy in their design - 'belt-and-braces' - and have coped by providing reasonable protection and by dealing with water penetration when it occurs – even if inadvertently. A confluence of factors has now made the systemic problem manifest. In summary, these include:

- Changes in responsibilities and relationships of designers and builders
- Town planning criteria relating to plot ratio and yard distances that inadvertently lead to particular building solutions or contribute to the choice of building style
- Lack of professional and trade skills and good judgements. There has been widespread comment about an identifiable decline in the levels of skills in most trades on site
- Changes in on-site structures and responsibilities (sub-trades)
- Imperatives of cost and speed (cutting corners)
- Emphasis among product manufacturers on product rather than building system
- Lack of effective supervision/inspection practices
- Lack of detail, prescription, performance criteria, and guidance in the Approved Documents (both the Acceptable Solution and the Verification Method) regarding weathertightness compared to other aspects such as structural integrity.
- Lack of designer and constructor attention to achieving weathertightness performance compared to other aspects such as structural integrity

Overarching all these factors is the fact that the public and in particular new house purchasers cannot be expected and more often than not do not understand the multiplicity of issues surrounding this complex subject. They expect the design professions and the building industry to protect them, and rightly so. **People don't expect buildings to leak.**

Although it is important to fully understand the nature, extent and effect of the problem it is the Overview Group's view that it is more important to accept that a significant problem exists and for the wider building industry to act now to address and remedy the problem and to avoid its occurrence in the future. This requires a collaborative approach by the leaders of the industry. Throughout the building sector there is now much greater recognition than there was even a year ago, of the seriousness of the problem of weathertightness and of its potential to damage public confidence in the industry, if something is not done about it. Up to the present, the reaction has been largely one of angry owners, faced with large and unexpected repair bills, seeking redress through the legal system. It would seem most of these cases are settled out of court, many of the settlements subject to confidentiality agreements, so that there is no public record of them and therefore a barrier to accruing the very information needed for preventative action.

Faced therefore with the need to take urgent action on the one hand and the paucity of information on the other, the Overview Group has concluded that while it is essential a more

comprehensive research programme should be instituted, seeking a solution to the problem cannot wait until all the evidence is in. In the Overview Group's view, it will be necessary to establish procedures which will enable all existing information and experience to be pooled, for steps to be taken to alert both the building sector and the public so that the issue is understood, and that action is initiated to improve both the performance of the building industry and the regulatory system which underpins it.

Given that the problem is multi-faceted, no single solution is possible and no single group is wholly at fault. Indeed, it would be counter-productive for the matter to be pursued in a recriminatory manner. That is not to say that individual owners or others should not exercise their legal rights to seek redress, but that any formal procedures to remedy the problem should seek to draw in the sector as a whole in an attempt to find solutions which will have wide support.

We would suggest a first step in this direction would be the convening of a meeting, at the highest possible level (Chairperson or Chief Executive) to which representatives of all the relevant organisations and interest groups are invited. The purpose of the meeting would be to establish formally that the building sector accepted that New Zealand, like parts of North America, faces a serious problem of weathertightness in significant parts of the home construction business. The building sector must assume responsibility for doing something about it.

Assuming the outcome of such a meeting were positive and could be publicised appropriately, it should help prevent any further erosion of public confidence and help promote improved building methods for the future.

It is unlikely, however, that a meeting of this kind would be sufficient of itself to allay the anger and frustration which marks the situation currently. It might even be seen to be an attempt to brush the problem under the rug. We have become conscious of the fact that while we have attempted to see a wide range of people and have considered the array of written material made available to us, there are many individuals and organisations who feel insufficient attention has been paid to their point of view. It would seem advisable to us, therefore, that consideration be given to holding some form of public inquiry which would give whomever wanted to, the opportunity to present their facts and opinions.

Such a public inquiry would also provide a more neutral platform from which to launch policies, procedures and controls for the future - these would have more objective authority than the voluntary undertakings of the building sector alone. As a result of a public inquiry, for example, it may be found useful to revive a process similar to that used to develop the Building Act and its companion documents in the light of experience over the past 12 years.

Recommendation 3

That the BIA discuss with the Minister of Internal Affairs the desirability of:

- a) convening a meeting of leaders of the building and associated sectors to discuss the issue of weathertightness, to explore the means by which the current disturbing trends can be halted and to agree on actions which might be taken to improve the performance of the sector in future, and**
- b) a public enquiry into the building industry (similar to the one recently conducted in New South Wales) which would have the mandate to look beyond the issue of weathertightness alone and to examine the range of issues which have emerged from this and other reports.**

a) Inadequacy in the Building Code and Approved Documents

The role and responsibilities of Territorial Authorities and Building Certifiers

There was significant criticism from a number of those interviewed by the Overview Group that the territorial authorities and building certifiers are “not doing their job”. The Overview Group concludes that this is in general a reaction to the failure of the industry as a whole to perform – “shoot the gate-keeper”. Undoubtedly there are improvements that can be made in this area but it is not considered to be a fundamental cause of current weathertightness problems.

Issues of “how did this building ever get a building consent...” or “...how did this building ever receive a code compliance certificate?” were often raised. The discussion elsewhere in this report suggests some ways in which the Act, the Code and the compliance regime might be improved generally. As part of that reconsideration it would also be necessary to review both the qualifications of building inspectors and building certifiers and the career paths available. Such overarching questions have been raised with the Overview Group and are considered worthy of debate at the proposed executive forum.

Many design-practitioners expressed the concern that “it can be difficult to get an Alternative Solution through a territorial authority or building certifier” due to the lack of clear guidance on the process and performance criteria to be achieved. The multitude of authorities with varying views on interpretation was cited as exacerbating this problem. Consequently, the general view is that there is a tendency for more design by Acceptable Solution method than there should be with a resultant loss of opportunity to adopt more cost effective solutions (contrary, of course, to the objective of the Act). However, from the evidence presented to the Overview Group, it became clear that this issue does not relate to monolithic cladding systems and weathertightness. In fact, it appears to the Overview Group that it has in most cases become too easy to get an Alternative Solution cladding system through the building consent process.

It is generally accepted that territorial authorities and building certifiers cannot be expected to have the skill base necessary to review and approve all Alternative Solutions and neither would it be cost effective. Consequently, a dependency on producer statements and product appraisals has built up, which, in the view of the Overview Group is less than satisfactory. Territorial authorities and building certifiers have both expressed a strong desire for improved guidance on the general interpretation of the Building Act requirements and process. The Overview Group has made recommendations elsewhere in this report (**see Recommendation 7**)

A more general question was also raised as to why the administration of building control is the responsibility of territorial authorities. The Overview Group was given a number of indications that often senior management in territorial authorities and politicians have little or no knowledge or interest in their building inspectorate and their work, appear to be more focused on regional development and view the administration of building work as not part of their core business. There was some discussion as to the potential benefits of centralising the activities and putting them under the jurisdiction of the BIA.

Compliance Costs

At about the time of the introduction of the Building Act, Department of Internal Affairs senior staff members involved in the drafting of the Act, wrote the ‘Constructive Guide to the Building Act’. The forward by the Head of the Department at the time, states that an underlying philosophy of the Act is to “minimise compliance costs”. However, it is not clear to the Overview Group what this means as several interpretations can be made. It could relate specifically to the administrative cost of compliance or alternatively to the overall cost of the design and construction compliance with the code requirements.

Some territorial authorities and building certifiers hold the view that the certification process is constrained by a desire expressed by the BIA to building officials that any change to the process must avoid putting inflationary pressure on building costs.

There is also evidence of territorial authorities having staff performance measures relating to numbers of consents issued in minimum time, and the average time taken per inspection. These are counter-productive incentives and promote totally wrong behaviour and lead to adverse outcomes.

Although the above is all very much anecdotal evidence, it is consistent and portrays an attitude throughout the certification process of perverse incentives. The concern is that the attempt to hold down the cost of construction and/or code compliance costs of dwellings has focused on the initial capital cost of construction as opposed to the whole-of-life cost. This could compromise the long-term value of dwellings and result in a lower value housing asset base in New Zealand.

The Overview Group considers it essential that any objective to hold down the cost of construction must not be allowed to drive a 'down to cost' as opposed to 'up to standard' mentality. This can apply in both the construction and certification sectors of the industry. There is clear evidence that both territorial authorities and building certifiers feel constrained in terms of the level of service they can provide due to cost-cutting behaviour.

Recommendation 4

That the BIA :

- a) discuss with the Department of Internal Affairs the philosophy of “minimise compliance cost” with a view to ensuring that the current or any future review of the Building Act promotes the concept of improving compliance process efficiency without compromise to building standards or quality;**
- b) in any review of Approved Documents consider the concept of optimised ‘whole-of-life’ costs as opposed to minimised capital cost; and**
- c) in reviewing the role and responsibilities of territorial authorities and building certifiers with regard to the building consent checking process and code compliance inspection regime, ensure that any guidelines or implied or expressed incentives do not inadvertently promote “down to cost” as opposed to “up to standard” behaviour.**

Approved Documents

There has been a widely expressed view that the Approved Documents B2/AS1 Durability and E2/AS1 External Moisture are inadequate. The major concerns relate to walls and the lack of coverage of modern cladding products; the lack of comprehensive detail. The focus is on the performance of individual products rather than their role in the overall building system, or more particularly in the case of weathertightness, their role and function in the building envelope or building facade.

There has also been criticism of some of the detail in E2/AS1 such as in clause 3.1.1 regarding the acceptability of proprietary seals and sealants as a means of weatherproofing joints. This appears to have been widely adopted throughout the building industry as an acceptable minimum standard without proper regard to the other features and factors affecting the result. We have seen much evidence of leakage and damage clearly attributable to the reliance on, and in many cases poor application of, seals and sealants.

The Overview Group is aware that the BIA currently has working groups reviewing both of these documents and understands that these issues are being addressed and that the revisions will include more robust solutions. The Overview Group is generally supportive of the shift

to a 'system' as opposed to a 'product' approach as well as the risk and hazard based approach with its associated graduated solution that the working groups are adopting for the revision of E2/AS1.

The Overview Group is also aware of the research currently being proposed or undertaken in relation to face-sealed cladding systems with and without drained and ventilated cavities. It is fully supportive of the need to complete comprehensive investigation and testing of these systems in the New Zealand context to ensure their performance will meet the Objectives, Functional Requirements and Performance provisions of the Building Code before they are included in the Acceptable Solutions.

Recommendation 5

That the BIA in revising its Approved Documents E2/AS1 External Moisture:

- a) continue with its intention to exclude for the time being from the Acceptable Solutions, face-sealed cladding systems in high risk areas**
- b) sponsor research into developing effective moisture management systems suitable for New Zealand conditions where there is a high risk of leakage**
- c) include in the Approved Documents the use of such moisture management systems when their efficacy is assured.**

b) Inadequate documentation supplied for building consent

Evidence presented to the Overview Group indicates that a minimal level of detailing, particularly with regard to weathertightness, has in general been acceptable to territorial authorities and building certifiers in the building consent process. By default this has also become the level to which many designers are now expected to design a project. However, recently, a number of territorial authorities and building certifiers have begun to introduce requirements for the provision of flashing details in particular in building projects using monolithic cladding systems. Even so, the level of information generally being required is generic. It would take a skilled inspector and probably a skilled designer to foresee all the potential difficulties in constructing a complex building from drawings at a relatively early design stage.

In the context of problems attributable to leaks, the principal issue raised in relation to the documentation supplied for building consent was that insufficient and inadequate detail is being provided on drawings and in specifications that accompany building consent applications. Surprisingly, this lack of detail is being accepted by territorial authorities and building certifiers in many instances. A number of local territorial authorities have already put in train new systems of building consent application most notably for those buildings with plaster systems on fibre cement and polystyrene/EIFS, and for site inspection during construction. These systems are to be commended, but the Overview Group has noted that in some cases there appears to be an over-reliance on the ‘face-value’ of the appraisal when in actual fact the system warrants further or more rigorous review if the “satisfied on reasonable grounds” test is to be justified.

In addition, some territorial authorities and building certifiers are introducing inspection regimes that include inspection of the building as the exterior envelope is being sealed. Such practices are to be commended but the Overview Group is aware that there is no mandatory requirement of territorial authorities or building certifiers to carry out any such inspections. Indeed, some authorities have been advocating self-inspection regimes for use with some experienced and “trusted” contractors. It is the view of the Overview Group that there is a lack of consistency throughout the consent, inspection, and compliance process and that this requires urgent consideration and action.

Recommendation 6

That the BIA in conjunction with the Building Officials Institute of New Zealand (BOINZ):

- a) review and upgrade the criteria for what constitutes a reasonable level of detail to be provided with building consent applications with respect to weathertightness detailing including flashings.**
- b) review and develop guidelines for an inspection regime as part of the code compliance certification process, with specific reference to weathertightness aspects.**

c) **Insufficient checking at building consent, during construction, and at Code compliance stages**

Building consent and compliance processes & responsibilities

There has been the full spectrum of opinions on whether or not the processes are working adequately and the organisations effective. Opinions range from – “they have an impossible task”, or “they are a totally ineffective gatekeeper” through to “they offer good advice in resolving issues”, or “they serve as a good quality controller for the site workforce”.

Evidence demonstrates this and everything in between.

There was little if any criticism for the actual process. Having the choice between a territorial authority and a building certifier is perceived to be good. The main criticisms related to specific issues of performance of territorial authorities and building certifiers and there seems to be little distinction between them in this regard.

In the context of problems attributable to leaks, the principal issues raised were:

- Insufficient and inadequate detail is being provided in drawings and in specifications accompanying building consent application, and being accepted by territorial authorities and building certifiers in many instances. .
- Undue reliance on and unquestioned acceptance of appraisals for products such as cladding systems.
- An increasing trend for territorial authorities to require producer statements for reasons of limiting liability.
- Territorial authorities are little more than a depository of information.
- Responsibilities and pressures on compliance personnel within territorial authorities and building certifiers make it an unattractive working environment and recruitment difficult.
- Insufficient inspections. There is no mandatory requirement to undertake any inspection, just a requirement to “be satisfied on reasonable grounds”. For example, there is little evidence of a pre-clad inspection to check flashings, building wrap etc. although there appears to be an increasing awareness and trend to do so. The explanation given on several occasions – “the market level of inspection fees will not allow it”.
- A perception that in some territorial authorities there is a conflict between the ambition of politicians to encourage developers to invest in the region and the officers responsibility to maintain building standards. Political influence may be compromising standards.
- The vagueness of the Code provisions in B2 and E2 make them very difficult to administer. Comments were made like – “it is too difficult, therefore human nature being what it is, people shy away from it”. Conversely, B1 Structure, has Approved Documents that offer highly prescriptive Acceptable Solutions, and detailed criteria in relation to the Verification Methods for Alternative Solutions, and consequently the design check and construction inspection effort shifts towards this area and others like it.
- There is too much responsibility left to the territorial authority and building certifier – too much reliance on interpretation and judgement with regard to durability and exterior moisture due to the lack of definitive performance criteria.

There are two further issues that the Overview Group considers are contributing adversely to the performance of territorial authority inspectors and building certifiers that need to be addressed by the BIA:

- 1) Guidance on the interpretation of the Building Code provisions of Objective, Functional Requirement and Performance and terms such as “satisfied on reasonable grounds” and “adequate”.
- 2) Territorial authority inspectors and building certifiers need to be pro-actively supported and encouraged by the BIA to provide a higher and more consistent standard of service.

Recommendation 7

That the BIA in conjunction with BOINZ:

develop guidelines on the interpretation of the Building Act and companion documents to provide an educational and reference document for building inspectors and certifiers. It should provide guidance on the interpretation of the Building Code provisions for Objective, Functional Requirement, and Performance, and such terms as “satisfied on reasonable grounds” and “adequate”.

Relationship between territorial authorities and building certifiers

The current system provides for building certifiers to check building consent applications within their BIA approved scope and issue a building certificate covering that scope. In many cases there is work outside the approved scope of the certifier and this is excluded from the certifiers building certificate and is passed back to the territorial authority to check and approve prior to issuing the building consent. In such cases, the general practice seems to be that the building certifier takes on the responsibility for the inspection of the construction and issuance of the code compliance certificate.

There are two issues of concern to the Overview Group:

- The lack of clear understanding of the approved scope of the building certifier in particular in relation to Alternative Solutions for the likes of E2, - are they able to certify a cladding system for E2/VM1? There is a lot of confusion.
- The split responsibility between the two processes has the potential to contribute to a process failure.

Recommendation 8

That the BIA investigate with BOINZ:

- a) the issue of scope approval of building certifiers and its monitoring; and**
 - b) the split responsibility of building certifiers and territorial authorities with respect to building consents, inspection and code compliance certification;**
- and attempt to improve and clarify both.**

Ongoing Building Performance

Ongoing maintenance is clearly necessary to achieve ongoing performance of a building. Most if not all cladding system technical literature and warranties state in the fine print that at least annual inspection and cleaning of the coating and seals and sealants is necessary. There is conclusive evidence that the majority of home-owners are not aware of this and do not do it. The practicality of doing so in many situations is questionable, especially on multi-level and inner-city dwellings. It is suggested that the building designer has a responsibility for prescribing the inspection and maintenance requirements associated with the design and choice of products. These could be set out and appended to the building consent application, the code compliance certificate and ultimately become part of the data supplied with a LIM. It may go some way towards educating the typical New Zealand home-owner who quite evidently has a low understanding of home maintenance requirements.

There is evidence that a large number of houses are not being sufficiently completed to be able to obtain a code compliance certificate. This can occur for a number of reasons, common ones being that the owner has run out of funds and suspends or terminates the building contract. Exceeding the budget is also a common situation with a builder/owner. In either situation it also appears to be common practice for the owner to occupy the house well in advance of obtaining a code compliance certificate. There are several concerns. Occupation can occur prior to a building being adequately completed to ensure it is safe and

sanitary. Building certifiers have no power to control this situation other than refer it back to the territorial authority. The territorial authority cannot readily address the situation and as a consequence there has built up a large number (suspected to be many thousand throughout New Zealand) of long-term occupied homes without a code compliance certificate. There is also evidence that some homes are being on-sold without a code compliance certificate. This situation is considered to be generally undesirable and should be rectified. The Overview Group is aware that the original Building Act review considered incorporating an ‘Occupation Certificate’ although the intent and scope of it is unknown. New South Wales does have such a certificate. It is recommended that adopting some form of occupation certificate and increasing the powers of the territorial authorities to address this problem is included in the review.

Recommendation 9

That the BIA investigates the public-good benefits of :

- a) extending the information available with LIMs to include, for instance, the inspection and maintenance recommendations prescribed by the designer (similar to the requirements for lifts and fire protection in commercial buildings), and building product or system warranties such as cladding systems; and**
- b) introducing a form of ‘occupation certificate’; and**

Building Inspector and Certifier Education

At present, the majority of building officials employed by territorial authorities and building certifiers have trade backgrounds with usually a significant number of years practical experience on site as a builder or in a related trade. Some have tertiary qualifications even to University level but there are no degree level courses available in New Zealand directly applicable to this field of work. The salaries offered are at the lower end of the scale for graduates of degree courses beginning a career in the building industry.

The level of knowledge of science and technology, over and above the practical experience of building, required by the Building Act and the Building Code and especially in dealing with alternative solutions, suggests that “experience” and “on the job” (continuing professional development) training may not be adequate. In addition, concern has been expressed as to “where are the next generation of building inspectors coming from?” Private building certifiers generally have similar backgrounds to territorial authority building inspectors. Many building certifiers have previous experience as building inspectors, but have seen new and different opportunities not only to work in the building consents/code compliance certification area, but also to offer additional services such as pre-purchase inspections, building evaluations and the identification and investigation of building failures.

An argument has been presented to the Overview Group that the education and training of building inspectors and building certifiers requires to be formalised. In this view, the levels of understanding of science and technology required of inspectors and certifiers under the Building Act lead to the conclusion that an appropriate tertiary level qualification should be a pre-requisite. A postgraduate Diploma or Degree might be one form of appropriate qualification. Such a course could have significant on-site content. Recognition of Prior Learning (RPL) would need to be considered in any qualification structure. A suitable first-degree course might be similar to, and include, the three-year Bachelor of Building Science offered at Victoria University of Wellington.

Generally, New Zealand lacks science and technology based courses at tertiary level. There are few if any recognised Bachelor of Building, Construction Studies or Building Surveying courses available. The Building Science course at VUW has long been regarded as the “poor cousin” of the architecture course. Indeed its relationship with the architecture course has changed over the years as has the content of building science and technology in the

architecture course. It may be that the whole education of our building professionals requires review and rationalisation with a view to addressing the practice of good building. There is opportunity for a number of education providers to prepare and make available fulltime, part-time, in-service and continuing professional development courses not just to the building inspectorate but more widely throughout the industry.

Recommendation 10

**That the BIA in conjunction with appropriate sector groups determine:
the need for developing tertiary qualifications, including programmes of
continuing professional development, relevant and suitable to the knowledge,
skills and experience expected of building inspectors and certifiers.**

d) Inadequacy of building products, materials and components, including evaluation of their suitability or fitness for purpose

Alternative Solutions and Verification Methods

There is a general concern, especially amongst designers that too much in the way of prescriptive method-based design is being put into the Acceptable Solutions documents and too little assistance provided to promote and clarify the Verification Method approach for Alternative Solutions. Designers generally, i.e., professional architectural and engineering consultants and product manufacturers, are concerned that the current revision to E2/AS1 could be in the first category. They suggest that much more emphasis should be given to further specifications with better guidance and criteria for the processes and procedures associated with submitting and approving designs based on an alternative solution. They want to see the performance-based philosophy, the foundation of the Building Act, encouraged.

The Verification Method E2/VM1 External Moisture, contains just nine lines of text in relation to domestic building windows, doors, and cladding systems, the majority of which refers to the use of AS/NZS4284 as being an acceptable Verification Method for determining compliance with the weathertightness requirements of the Code. In effect, the Verification Method for external moisture for domestic building relies solely on the qualitative Performance provision E2.3.1 in the Code – *“Roofs and exterior walls shall prevent the penetration of water that could cause undue dampness, or damage to building elements”*. Improved performance based standards will be particularly helpful in improving the appraisal process for cladding products.

The Approved Documents provide minimum standards to be achieved to meet the performance requirements of the Building Code. In situations where multiple minimum standards are adopted, there is a lack of design redundancy. There is evidence that some of the leak problems are attributable to this issue. Although it is acknowledged that it can be difficult to formulate a definitive solution to the issue of ‘multiple minimum standards’, it can be addressed in principle with at least guidance and recommendations given to both designers and compliance officers.

Recommendation 11

That the BIA :

- a) develop more prescriptive Acceptable Solutions and Verification Methods for the Approved Documents B2 Durability and E2 External Moisture;**
- b) develop recommended procedures and processes for the development and approval of Alternative Solutions; and**
- c) promote with Standards NZ the development of a national performance-based Standard for domestic building weathertightness.**

Appraisal and Accreditation systems

The Building Act Part VIII provides for the Building Industry Authority to operate a procedure for accrediting proprietary products and processes that are to be accepted as complying with specified provisions of the Building Code. Such products would be those not covered by one of the Acceptable Solutions in the Approved Documents authorised under the Act. The Overview Group understands that this procedure was set up to be similar and consistent with its Australian counterpart to provide for the trade of building products between the two countries. Under this procedure a product supplier can apply to the BIA for an accreditation, which, once granted, territorial authorities and building certifiers must accept as establishing compliance with specified provisions of the Building Code. In doing so, they will be protected from legal liability.

For a product to be accredited the supplier must first obtain an appraisal. An appraisal is a detailed and reasoned technical opinion issued by an appropriately qualified organisation having no proprietary interest in the appraised item. Appropriately qualified organisations include the likes of BRANZ; a university; or a firm of consultants. Clearly, a product manufacturer's technical literature does not constitute an appraisal in terms of Section 58(4) of the Act. The Act states –“ An appraisal shall include –

- (3) An opinion that the product is suitable for its purpose, if it is manufactured and installed under specified condition; and
- (4) A specification of the product and, if necessary, of the manner of installation; and
- (5) The specific conditions to which the opinion is subject; and
- (6) The basis of the appraisal; and
- (7) A list of other documents (if any) that need to be referred to in order to check that an individual application of the appraised item conforms to the conditions”.

It appears that the authors of the original Building Act intended that consideration be given to the installer or applicator of the product. The Department of Internal Affairs in their publication 'Constructive Guide to the Building Act' said -“When identifying the installer of a product it will be necessary to identify the installer either by name, or in terms of the training, inspection and quality assurance programmes required”. This would suggest that they intended that appraisals look closely at the qualifications, training and quality inspection regimes that are needed to ensure that the product achieves its claimed performance. The Overview Group does not consider this is being done adequately.

There is some question in our mind as to the purpose of the accreditation system incorporated in the Building Act. While the current procedure is adequate in itself, if it was intended by Parliament that it become part of standard practice in approving new building products and systems, it has not had this effect. We understand that the BIA has to date granted only 11 accreditations of which none relate specifically to building envelope components including cladding products. A number of applications for accreditation relating to cladding products have been received but none granted due to insufficient or inadequate supporting information. In all cases the applicants did not progress their application, and we have heard from product manufacturers that the BIA requirements are too onerous (costly and time consuming) and provide no identifiable commercial benefit. However, appraisals, similar in form to that prescribed in the Act, have become well established within the building industry and by default are relied on heavily and are generally accepted by territorial authorities and building certifiers as a basis for acceptance of product compliance with the building code. BRANZ has established itself as the pre-eminent organisation for undertaking such appraisals and its 'BRANZ Appraisal Certificate' system is widely promoted.

The manner in which appraisals are being undertaken, presented and promoted, and relied on by territorial authorities and building certifiers as the basis for being “satisfied on reasonable grounds” with little and often no challenge, has been the subject of much concern expressed by those interviewed by the Overview Group. Typical of the criticisms raised were:

- appraisals rely heavily on supplier's trade literature, which is not comprehensive and is largely marketing driven
- appraisals often relate to a specific product or element rather than a system; little if any testing is done to determine compliance with the weathertightness requirements of E2 of the Code
- appraisals are accepted without question by territorial authorities and building certifiers because they don't have the resources to investigate further, it would cost too much and take too long; their legal advice is that an appraisal should be sufficient grounds for being “satisfied on reasonable grounds”
- appraisals too often do not adequately set out the scope and limitations that apply to the product; and the appraisal process lacks robustness and rigour.

Over the past decade, an extensive range of cladding products has come onto the New Zealand market and this appears to be continuing. Much of it is imported product from not traditional sources. Some products are being launched and heavily promoted without any independent appraisal or certification. In some cases the technical literature produced by the product manufacturer is being presented in a similar form to the appraisal format set out in the Act and makes statements that the product, if installed in accordance with the literature, will meet the requirements of E2. There is a concern that such a statement, and the form of its presentation, coming from a major and recognised product manufacturer creates a perception of official compliance.

The qualifications that accompany some appraisals are such that their acceptance by territorial authorities and building certifiers without some further investigation is considered by the Overview Group not to meet the “satisfied on reasonable grounds” test. For example, BRANZ recent Appraisal Certificates contain a statement that the product – “if used, designed, installed and maintained in accordance with this Certificate, will meet, or contribute to meeting the following provisions of the NZBC:” including B1, B2, and E2. In the opinion of the Overview Group this statement negates any assurance that there may have been that the product will meet the objectives of the Act. Therefore, in itself, it provides very little in the way of reasonable grounds for acceptance without further and often considerable investigation by the certifying officer. It is also the opinion of the Overview Group that these appraisals have achieved a status well beyond that intended by the Act.

It is noteworthy that BRANZ has undertaken approximately 26 appraisals of cladding systems, but the Overview Group is not aware of specific testing having been undertaken relating to weather penetration of the building envelope. Section E2/VM1 of the Code clause 1.1.1, states – “The weathertightness test of AS/NZS 4284 is a verification method for determining compliance with E2.3.2 of windows, doors and cladding systems for domestic buildings”. This Standard, AS/NZS 4284, is not referred to in the BRANZ Appraisals reviewed by the Overview Group even in the Appraisal’s Bibliography. Product appraisals are now so widely and readily accepted by both territorial authorities and building certifiers that there is no incentive for a product supplier to pursue BIA Accreditation. The appraisal system has become so well established that it appears to have usurped the accreditation system contemplated in the Act. If so, is this acceptable? The Overview Group thinks not.

In summary the Overview Group concludes that:

- There is no official building product approval system operating in New Zealand.
- It is understood that there is such a system operating in Australia and that they have concerns about New Zealand’s lack of parity.
- The current weathertightness problems relate to a large extent to cladding products that have been the subject of ‘appraisal’, which has been the basis of their acceptance by a territorial authority or building certifier as complying with the Building Code. The products’ function and purpose as part of a building envelope or building system is not being adequately appraised.
- The current practice for appraisals is inadequate and in many cases they do not provide a means for a territorial authority or building certifier to be “satisfied on reasonable grounds” that the product complies with the Code without additional verification.

Recommendation 12

That the BIA:

review the current practice for product appraisal and develop formalised requirements. This should include establishing specific criteria for the process; accrediting and/or auditing appraising bodies; monitoring ongoing product performance; and establishing and maintaining a register of the ‘approved’ products. It would seem sensible to explore the possibility of better alignment of Australian and New Zealand practice.

e) **Insufficient technical information provided by manufacturer's literature and instructions**

The Overview Group has formed the view that symptoms of a lack of scientific knowledge and understanding in the building industry include:

- shortcomings with respect to the evaluation of building products, materials and components for their suitability or fitness for purpose: and
- the provision of insufficient technical information by manufacturer's literature and instructions.

Lack of Science

Research in the building industry in New Zealand is largely carried out by the Building Research Association of New Zealand (BRANZ) at its laboratories at Judgeford near Wellington. The Universities through their Schools of Architecture and Engineering also carry out some research into building performance. For instance, the School of Engineering at Canterbury University is well known for its Fire Research while the Centre for Building Performance Research at Victoria University has produced significant work on the use of energy in buildings. In addition, other organisations, including a number of product manufacturers, conduct research. In the case of product manufacturers research is usually conducted into their own products. For instance *James Hardies* have their own research facility in Australia; and *Rockcote* have sponsored research and testing of their own products at Canterbury University. Research into the use of timber in the building industry is carried out by Forest Research in Rotorua. Both Forest Research and BRANZ conduct research for private clients as well as from public funding.

The testing of materials and products is not research *per se*. Nevertheless it is an activity of a number of research organisations and should be an essential part of the proper use and application of materials and products in the building industry. It remains possible, however, for wholly untested materials, products, components and systems to be used for the construction of buildings in New Zealand.

Generally, basic research into issues of weathertightness in New Zealand building is sparse. BRANZ records a low level of weathertightness building science in the last 20 years. It has been suggested that this low level has been largely a result of a lack of interest and funding. Certainly, the financial support from private and public sources such as the Foundation for Research Science and Technology, to research organisations for independent building research, is generally very low given the importance of the sector to the economy.

Weathertightness research is well developed in the US and Canada as a result of the "leaky condo" problem on which action began to be taken in 1993. The Canadian National Research Council's Institute for Research in Construction (NRC) and the Canada Mortgage and Housing Corporation particularly in British Columbia, are acknowledged leaders in the field. The problem is now taken so seriously in North America that Canada and the U.S. have agreed on a combined research programme targeted at regions where weathertightness has become an issue.

Research in New Zealand has been slow to gain momentum. There has been a reluctance to believe that our building products or building practices could be seriously inadequate in particular circumstances or that they might create extensive problems. Nevertheless, in the last two years the realisation that the problem could reach significant proportions has promoted some action.

The Weathertight Buildings Steering Group (WBSG) was formed by BRANZ in April 2001. Industry representatives on the group include the Master Builders Federation (MBF), Certified Builders Association (CBA), a Manufacturer representative, Building Officials

Institute (BOINZ), Claddings Institute (CINZ), Windows Association (WANZ), UNITEC, and the Building Industry Authority (BIA). The WBSG meets approximately bi-monthly and acts as a consensus group. While the Group is not well resourced financially, it has begun to develop a proposal to research the extent of the weathertightness problem. It is also supporting research being carried out by Forest Research to measure the sensitivity of common timber framing materials to different levels of moisture over time. Preliminary results of the FRI study should be available by the end of September 2002.

While BRANZ is the principal agency for building research in New Zealand, it does not have the facility or resources to carry out all the research activity that arguably might be required. In addition, while it co-operates with a number of other researchers, it is not seen as independent of industry and commercial interests. It has a range of concerns other than weathertightness. It has had to determine priorities given its own funding and resources. BRANZ operates as two entities – BRANZ Ltd and BRANZ Inc. BRANZ Ltd derives around 40% of its income from BRANZ Inc. for which the principal income source is the Building Research Levy. BRANZ is a major contributor to the Weathertightness Buildings Steering Group and has provided seminars on weathertight buildings, and information bulletins on related topics.

BRANZ Ltd currently has programmes that within a loose definition of the weathertightness field total over \$1 million in 2002-3. These include modelling of the moisture movement in cavities, understanding of durability of materials in cavities and the preparation of design guides for weathertight claddings. Currently BRANZ is focusing on research into wind and rain co- incidence; rain entry testing of walls and windows including the performance of joints, flashings and drainage planes; air pressure distributions; cavity moisture behaviour and disposal; and recording field experience. The status and progress of these projects is varied. They address important technical issues that require investigation.

The Overview Group suggests there is an urgent need to develop a comprehensive overview of the research required both as to the extent of the weathertightness problem and to its causes. As indicated above, some projects are already being undertaken by different organisations. Some could be part of overlapping research projects. There is a need to establish precisely what is being done throughout the country and what gaps need to be filled. On this basis the Overview Group suggests an independent research programme for the public good should be developed to co-ordinate research activity and to monitor and audit its outcomes.

Areas for Research

Possible areas for research generated from the basic requirements of the Building Act for health, safety and durability with respect to weathertightness might include:

The Nature, Extent and Effect of the current weathertightness problem

- How best can a non-destructive sampling of multi-unit properties that feature monolithic cladding be undertaken to gain meaningful and statistically valid information on the extent and effect of the problem?
- Are there practical observational methods of researching the extent of the problem?
- To what extent is destructive testing an inevitable requirement of determining the nature of the problem?
- Can the extent of the problem be identified reasonably?

The Building System - water management at the building envelope.

- Under what climatic conditions are monolithic panel systems prone to weathertightness failure?
- What weathertightness issues require consideration when designing buildings using monolithic cladding panels?

- How best can individual building products and components be tested for weathertightness within a building system or building façade context?
- If there is no condition under which water can be prevented from penetrating the outer skin of the envelope, what measures are necessary to manage the water and ensure no damage to the structural frame or construction elements?
- Are cavities, flashings, drainage planes, waterproof building wraps essential? If so, why?
- What sort of inspection regime during construction would be effective to ensure proper construction of approved building systems?

Monolithic Claddings

- Are all claddings available genuinely durable?
- Is the chemistry and application of fixings, jointing and sealing compounds and external coating finishes and their performance over time understood?
- Can all penetrations be sealed or flashed effectively?
- How much robustness, flexibility is factored into any cladding or monolithic cladding system?
- Are cavities essential – in what circumstances?
- What issues are raised through pressure differentials external to the building, within the wall, and inside the building?
- What issues are raised through the different thermal conductivities of the different materials used in external envelopes?

Chemistry of jointing compounds/finishes/sealants

- What are the general performance characteristics expected of sealants?
- What is the durability of sealants especially with respect to temperature change, sun and rain exposure?
- How do jointing compounds, finishes and sealants respond to the movement of building frames, cladding panels and other building elements and components?
- Is the design requirement (consumer expectation) of a lasting flush finish of joints and cladding panels too demanding a requirement?

Flashings

- What are the generic requirements for flashings at doors, windows and other junctions and wall penetrations?
- What are appropriate materials, geometries, principles?

Building Wraps

- What are the essential purposes of building wraps?
- What are the generic requirements/roles of building wraps, building papers? Need they be waterproof or able to ‘breathe’?
- How should/do building wraps relate with insulation systems?

Timber treatment

- What are the characteristics of treated and untreated kiln-dried timber, in all the forms used for building construction?
- What do the various grades of timber signify for the weathertightness of buildings?
- What forms of timber treatment resist water penetration?
- What is the effect of water penetration?
- Does treated or untreated timber deteriorate differently due to the presence of water? To what extent?
- Is there a difference between treated and untreated timber in respect of the incidence of decay and fungi due to the presence of water?
- What is the cause and incidence of toxic fungi and in what circumstances?

- What is the safe treatment of toxic fungi?
- Are there issues regarding structural strength and durability with respect to the maturity of timber?
- How accurate is stress grading? What might stress grading signify with respect to weathertightness, if anything?
- How clearly and extensively is timber properly identified and labelled, in the yard and on-site (both in storage and in use)?
- What practices affect the condition of timber off-site and on-site prior to a building being “closed in”?

Internal linings

- Is there any role internal linings could play in addressing issues of weathertightness?

How should the research be managed?

The issue of public good and private interest manifests itself when determining what research should be done and by whom. Private companies have vested interests in what they may or may not research. That does not necessarily rule out the usefulness of the research for the public good. The Overview Group is aware there is a perception that, notwithstanding the position of BRANZ or the existence of the WBSG, that there is little research or testing in the building industry that can be deemed to be wholly independent.

There is a need for an independent determination of the priorities for research and the oversight, monitoring and auditing of research in this area for the public good. Priorities might be directed usefully to applied research that addresses the immediate problems of the nature, extent and effect of the current failure of some buildings to deal with moisture in and through their exterior envelopes and the contributing causes. Creation of a means for co-ordinating the appropriate public and private funding of research, while maintaining the independence of research for the public good, also requires immediate action. In terms of public funding, it is the Overview Group’s understanding that the Government has accumulated a significant surplus from the Building Levy. In our view some of this funding should be made available for research.

Recommendation 13

That the BIA:

- a) **take on a broader and more proactive responsibility to establish, fund, monitor and audit public-good research across the building sector; and**
- b) **establish an independent research programme to investigate the nature and extent of the weathertightness problem in New Zealand and gain better understanding of the causes of the current failure of some buildings to deal with moisture in and through their external envelopes.**

f) Inadequate contract documentation

As the Overview Group has worked its way through the processes involved in creating the concept of the building on a particular site, designing and planning it, realising its construction and then occupying and maintaining it, we have been struck by the paradox of what seems to be a formidable paper trail accompanying this progression on the one hand, and the apparent lack of accountability on the other – either for the process as a whole or for its constituent parts. This Report deals with the question of accountability below under 4. Any Other Matters. In this section we merely wish to make a few preliminary comments about the contracts themselves.

At the time of writing this Report, the Overview Group has not completed its investigation into the legal aspects of these issues. So, we would prefer to withhold final comment on contracts until that has been done. We have not had the time to do it ourselves but it seems to us that in the light of the prevalence of litigation, its cost and intensity, it would be a worthwhile exercise to examine from the perspective of building quality and permanence and specifically of weathertightness, the trail of documents from the first steps of issuing instructions to a designer, through the issue of the consents and the letting of contracts to the code compliance certificate and the transfer of warranties – and, of course, the influence of the legislative and regulatory frameworks on this sequence of contracts or quasi-contracts.

Hopefully from such an analysis, the roles and functions of each of the parties at each stage would be clarified and would make much clearer the responsibilities that each should be exercising in making the essential trade-offs between building style, suitability, cost, quality and permanence. In the Overview Group's view transparent choices have to be made to specify these trade-offs which can only be achieved when all the parties, including the owner or prospective owner (in the case of units constructed by developers), are well informed and understand their obligations.

It was of considerable interest to the Overview Group to discover that almost simultaneously with ourselves, the State legislature in New South Wales has produced a report on the quality of buildings. Much of what the Joint Select Committee found there has direct relevance to New Zealand so that those who are given the task of following up this Report should read it carefully, and some collaboration or at least sharing of experiences and proposed solutions with the NSW counterparts would be worthwhile.

On the particular matter of contracts, the Parliament of New South Wales Joint Select Committee Report on the Quality of Buildings (July, 2002) suggests that

“the most important document for consumers in the home building process is the home building contract. The Committee recommends that the Home Building Compliance Commission design and establish by regulation:

- A number of standard conditions of home building contract, which cannot be excluded or modified, covering matters common to most residential building contracts and stipulating that:
 1. The construction quality of the building works are to conform with the Building Code of Australia, specifications, or relevant Australian Standards
 2. The design plans must be attached to the contract
 3. Variations to the design plans must still conform with Building Code requirements or satisfy the development consent conditions
 4. Variations to the design plans must be agreed to in writing by all parties to the contract
 5. The Conveyancing Act be amended to require that the Home Warranty Insurance Policy must be attached to the Contract

6. The final payment (of 5% of contract price) be withheld until the issuing of the Occupation Certificate at settlement
- That these conditions be included in a model contract created by the Commission
 - That the Commission be given powers to accredit contracts used by other agencies or industry bodies which include these standard conditions
 - Penalties be imposed on authors who make false claims that their contract has been accredited by the Commission”.

Recommendation 14

That the BIA:

initiate a formal analysis of the documentation trail to establish whether a holistic consideration of all contracts and quasi-contracts involved in the building process, set within a legislative and regulatory framework, could lead to improved definitions of the roles, functions, responsibilities and obligations of all the parties. In doing so, the BIA should examine the efficacy of adopting the concept of a home building contract.

g) Inadequate trade skills and supervision on site

Education

Education levels in the building industry range from no qualification to doctorates. At the trade level, qualifications tend to be attained through the auspices of Industry Training Organisations (ITOs) or from specific product manufacturers for those wishing to install or apply a manufacturer's product under license. At the professional level, qualifications are attained through the University and Polytechnic sector. The Overview Group has noted that there is no specific qualification required of building inspectors or building certifiers (**see Recommendation 10 above**).

At the trade level, the Overview Group became aware that there is a perception throughout the industry that skill levels on site are declining. The evidence for this is related not only to the weathertightness problem itself but more generally to workmanship practices and the on-site working environment. Reasons ascribed to this perceived decline include problems with the apprenticeship system, a lack of skilled workers, the predominance of labour-only contracts, the lack of regulation of standards, and of quality assurance and accountability across the industry.

Trade Training

The Building and Construction Industry Training Organisation (BCITO) is the principal organisation responsible for the training of on-site personnel, predominantly through its Certificate course in Carpentry. When it was first set up, the BCITO was aligned closely with the Master Builders Federation (MBF). The Carpentry Apprenticeship changed from "time served" to "competency based" under the NZQA National Certificate in Carpentry. The NZQA Unit standards for carpentry are divided into a theory and practical component.

There are three main Apprenticeship Training Options available to Apprentices within the building and construction industry. However, all three options might not be available for each apprentice.

- Pre-Employment or Pre-trade courses followed by on-site practical learning. This allowed Polytechnics to be eligible for full EFTS funding from Government. It has been argued that theory was often taught with little if any experience of relevant practice.
- On-site training for both theory and practical. In 1999 for various reasons the BCITO determined to move to 'self paced learning' by developing modules (exercises and worksheets) to cover the theory component of the relevant Unit Standards in the New Zealand Qualifications Authority (NZQA) Framework. Modules are backed up by reference books. The theory component is read by the apprentice and signed off by the employer. This means the Apprentice relies on a good reading comprehension level and an employer who is able to adequately explain anything the apprentice does not understand. The BCITO monitors the process twice a year. This seems minimal in the opinion of some.
- On-site practical training combined with block courses for theory training. Some major building companies advocated the return to block courses as a means of delivering training. Some providers chose to supplement the theory with practical work. The sporadic nature of the block courses affected the funding stream for the Polytechnics and became a contributing factor in the demise of many Carpentry courses. Because they are only contracted to supply the theory component of the Unit Standards this also resulted in the demise of workshops and other training facilities at these institutions. There has also been criticism that where private institutions have offered courses to assist with the completion of the theory component of the Unit Standards many provide little if any tutorial assistance. They provide merely an environment for completing the theory unit provided in option 2.

The practical part of each Unit Standard is documented by the apprentice in a record of work book. This is signed off by the employer and the BCITO offers a moderation

service. The work book system has been criticised by some for not sequencing the units to reflect acquired knowledge and experience and for not testing the retention of knowledge.

The Certified Builders Association is presently developing joint Certificate and Diploma Courses in Applied Technology conjointly with its members and a number of participating education institutions. The Certificate is a basic pre-trade, one year, fulltime course. The Diploma Course that follows is a three year course with a mix of on-site and classroom teaching. The Course takes apprentices through the Unit Standards in a pre-determined sequence and offers supervised site experience. There is opportunity to offer additional units, for instance on business management, beyond the requirements of the Unit Standards. Recognition of Prior Learning is used throughout these learning processes to ensure experience and practice is related with the level at which any student is placed.

Recommendation 15

That the BIA:

request the Building and Construction Industry Training Organisation (BCITO) to review in conjunction with appropriate sector groups the apprenticeship course in Carpentry and other key trades, to ensure it delivers an appropriate balance of academic and practical knowledge and experience relevant to the needs of the individual, the industry and the consumer.

Trade Regulation

The Master Builders Federation (MBF) and the Certified Builders Association (CBA) have involved themselves in developing appropriate education programmes for the sector. While the MBF do not require their members *per se* to have trade qualifications as a prerequisite of membership, they do assess formally the acceptability of qualifications and experience for membership. The CBA requires both appropriate formal trade qualifications and relevant experience for membership of their organisation. However, it is to be noted that MBF has just over 2000 member companies and CBA 1700. It is estimated that there are at least 16000 other companies and individuals involved in the building industry as builders. In addition, there is a limitless number of 'do-it yourself' builders not least home owners themselves. It is unclear what if any qualifications and training this large number of builders has.

Both MBF and CBA are concerned that in general the industry does not become over-regulated. However, they are also concerned that there is growing evidence of a largely unskilled and unregulated workforce operating in the building industry to its detriment. Regulating the industry at the trade level could range from the 'Green Card' system that operates in Queensland to compulsory membership of MBF and/or CBA to a regulation regime for Carpenters similar to those for Electricians, Drainlayers and Plumbers. The Green Card operates in Queensland where the responsible builder must present the Green Card (evidence of State recognition as an appropriately qualified builder) on uplifting any building consent. One similar form of approach might consider membership of MBF or CBA as a prerequisite to obtaining a building consent, though such a function might conflict with these organisations' wider industry role. Nevertheless, serious consideration needs to be given to the potential benefits of registering Carpenters, and how best that might be organised, as such registration might make a significant contribution to raising practice standards on building sites throughout New Zealand.

Recommendation 16

That the BIA in conjunction with the appropriate affected sector groups:

- a) **explore the issues involved in advocating the national registration of builders and building related trades, given the contents of this report and concerns expressed about the standards of some trade practices on-site; and**
- b) **support such advocacy if it is convinced of the benefits to the Industry.**

h) Lack of co-operation and sharing of responsibility on site

As reported on the Web Page of ‘U.S. Inspect – Professional Home Inspections’ in an interview with *Walls and Ceilings* in November 1998 David Fyfe, President and CEO of Harris Specialty Chemicals, the parent company of Senergy Inc., offered the following response to the question – at what point did it become clear to Senergy that the future of residential EIFS lay in drainage systems? He answered: “The big change was that until 1996, we had regarded ourselves as just a component of the total building envelope. It was the builder’s responsibility to co-ordinate the components and it was the builder’s responsibility to make sure that the weaknesses of one part were compensated by the strengths of another. That was our naivete, to believe that we could just be regarded as a component of the envelope, just like windows.”

The quotation above illustrates well the experience of others in dealing with this issue. In the comments made to us not only was concern expressed about an identifiable decline in the levels of skills in various trades on site and the variable application of trade skills and good judgements, but there were also some observations about changes in:

- on-site structures and responsibilities (sub-trades)
- responsibilities and relationships of designers and builders
- the application of professional skills and good judgements

The advent of labour-only contracts has changed the responsibilities of the main contractor and sub-trades. There is now a proliferation of sub-trades on-site from traditional carpenters and plumbers to specialist cladders and coating applicators, to labourers. Some product manufacturers are becoming more careful about who they employ or allow to be employed to install their product. Some companies offer relatively extensive education programmes before licensing approved installers or applicators. Some insist that only applicators who have completed their specific courses successfully may install or apply their product, otherwise their product guarantees are invalid. However, on-site supervision of how one element of the building relates with another sequentially or otherwise is apparently no longer seen as a paramount responsibility of the main contractor, project manager or architect. One specialist sub-trade may work alongside another with little or no knowledge of how their product operates (or does not operate) in relation to another.

Professional Education

Today, project management appears to be a matter of programming and co-ordinating the arrival of materials and sub-trades on-site. Quality assurance on-site appears to “get lost”. The advent of the labour-only environment has contributed to the demise of the main contractor who formerly had an ongoing relationship with, and responsibility for, standards of workmanship. In addition, the absence of the architect or Clerk of Works as an agent of the owner supervising the quality of the works has had an adverse effect on the quality of the overall building product. In many instances, building project managers may have little contact with, or knowledge or understanding of, the situation on-site itself. Their primary concern is with speed and minimising cost. Many are reported to have an educational background from outside the building industry.

Similarly, property developers often have no direct background in or even particular knowledge of the building industry - “everybody is a property developer”. Often, their investment in building is purely financial. The impression gained is that the return on investment is based on the old premise of maximum return for minimum outlay. The architect or the architectural draftsman is employed by the property developer to design the project to the point where a building consent is issued. The property developer then employs a project manager to manage a “cost efficient” process of construction where the “time is money” attitude is paramount.

Architects have either abrogated their traditional responsibilities for supervising construction or have been pushed out by those with a different concept of value for money. The architectural draftsman has traditionally offered only a drafting service, with little or no responsibility for the works or their supervision.

However, architects have also promoted themselves at the 'high design' end of the housing market. Their designs are one-off and often feature complex major and minor roof forms; much reduced and in many cases no eaves; balconies both external and internal to the outer wall plane; and, often, flush windows and doors. The detailing of such is not always well documented. In the view of some, there has been a trend in architectural education to the 'Art' end of the educational spectrum to the detriment of the Science and technical aspects of the construction of buildings. Design studio projects in Schools of Architecture rarely require the presentation of design details that even indicate the buildability of a project far less its weathertightness. Assessment criteria in design projects rarely place emphasis on buildability and weathertightness.

The Design and Construction Consultants Industry Training Organisation (DCCITO) is responsible for training in the drafting area. The draftsman, notwithstanding his or her ability to practise on their own account is educated to a lower level than the architect. The technical and scientific training of draftsmen is to a different level of understanding and application than that of the architect. However, the curricula of the drafting courses developed under the auspices of the DCCITO are currently under review and there will be opportunity for the recommendations of this Report to be considered by that review process. Engineers, in their education at both professional and technical levels, have tended to deal with the structural and servicing aspects of building and not with issues of weathertightness.

Building provider registration

Changes in the industry have resulted in changes of responsibilities. To ensure Quality Assurance from those responsible for procuring, designing and constructing buildings there is a need to clarify roles and responsibilities especially with respect to who is providing such assurance to the public. In the past, there seems to have been a better recognised sphere of responsibilities for the owner, the architect and the main contractor. Circumstances have changed with the clarity of lines of responsibility now blurred. One solution may be to adopt legislation similar to that presently being promulgated in Tasmania. There, the concept of the Accredited Building Practitioner (ABP) with various levels of responsibility is being advocated to "protect consumers who use building practitioners".

The concept is to have four levels of ABP. An Accredited Building Practitioner at Level 4 would accept responsibility for an unrestricted range of building work and might include appropriately registered architects, builders, engineers, project managers etc.. An ABP with Level 3 accreditation would accept responsibility for up to 3 storey buildings; Level 2 – commercial buildings up to 2 storeys; and Level 1 – single residential up to 2 storeys. Appropriate academic qualifications and levels of practical experience are expected of practitioners at each level. Levels of personal indemnity insurance required at each level are also stipulated. There is some argument that a similar provision should be considered in New Zealand and could be legislated as part of the Building Act or under consumer guarantee or protection legislation. Such legislation might also provide umbrella legislation for the building professions obviating the need for such as the Architects Act 1963 that currently protects the title 'architect' but not the practice of architecture. The Overview Group has not formed an opinion on this matter but would encourage the appropriate sector groups to give consideration to the opportunities and threats such legislation might provide.

Recommendation 17

That the BIA promotes debate on the issues of trade regulation, professional education and builder registration at the proposed executive forum (see Recommendation 3(a))

3 Whether failures are attributable to deficiencies in the Building Act, the building regulations, or in the manner in which these are administered by the Authority or by Territorial Authorities (including the role of Building Certifiers), and whether the purposes and principles of the Act under Section 6 have been properly observed and followed by the Authority.

This Section of the Report is not yet complete. The Overview Group does not yet have to hand all the information it requires to make recommendation. It is intended this Section of the Report will be submitted to the Authority by mid- October 2002

4. Any other matters that are considered relevant to the inquiry

District Plans

It has been commented that Territorial Authorities prescribe criteria in relation to plot ratios and side yard provisions in their District Plans. There is evidence that the removal of eaves is driven by developer/designer desires to maximise accommodation in relatively small urban and suburban sites to meet District Plan requirements. This suggests the adoption of the “Mediterranean” style as a preferred building design style is not wholly for aesthetic or social reasons.

Recommendation 18

**That the BIA in conjunction with the major territorial authorities:
identify instances where District Plan requirements are influencing the planning
and site coverage of multi-unit housing projects and consider their
appropriateness in the light of this Report.**

Banking and Insurance

In October 1996, the Maryland-based Chevy Chase Bank issued a bulletin that the bank would not accept any loans in any region where homes were constructed “using any synthetic stucco”. To date, the effects of the problem in New Zealand with respect to the cost of repairs have been largely dealt with by building owners and their builders though not without incidences of frustration and/or litigation. Issues of reparation involving insurance companies are being largely settled out of Court. So far as the Overview Group has been able to ascertain from brief discussions neither the banking nor insurance industries consider that problems of weathertightness have developed to a point where their business policies need to be revised.

The banks lend money to developers that they recoup when units are sold (with generally a high proportion being pre-sold off the drawings) to individual consumers. This provides a high level of security to the banks. The consumers are supported by mortgages provided by the same banks. At present, the banks are only concerned with the ability of the borrower to pay whether it is the developer or home buyer. No advice about building quality is proffered, unlike the practice into the 1980s when financial institutions were reluctant to lend on stucco houses. Nevertheless, there does not yet seem to be a problem of mortgagees failing to meet loan payments. Until this happens, it is unlikely that any bank will risk losing competitive advantage by adopting more restrictive loan conditions than other banks.

The question of insurance is more immediate. The business concept on which insurance companies operate is that generally they insure against incidents that are definable and time-bound. They do not insure against progressive conditions leading to deterioration over a period i.e. they do not insure against gradual rot in houses. In some circumstances, for example a burst pipe, insurance companies will pay for water damage but these are not the circumstances covered by this review. Some property owners are already encountering difficulties with insurance and it is possible that premiums in certain types of building could increase.

A group of Auckland property developers has advocated development of a defect liabilities insurance which might give up to ten years cover for building problems including leaks and rotting. Such cover is not available as yet in New Zealand but is available in Australia - though doubts have been cast on its continuance due to the tightness of the re-insurance market. In apartment situations, insurance of this type could be made available to owners through body corporates. The benefits may be more rigorously monitored quality building

practices. However, the counter argument is advanced that standards should be assured without recourse to the extra and unnecessary costs of such insurance.

The banking and insurance aspects of the weathertightness problem add appreciably to its complexity and sensitivity. They are not areas that lend themselves easily to a review of this kind and for that reason we have not carried our enquiries very far. At the same time, the contacts we made in both the banking and insurance companies were keen to learn more about the issues and to ensure they are kept up to date with any further developments.

Recommendation 19

That the BIA:

discuss this Report with the Bankers Association and the New Zealand Insurance Council to ensure that both the banking and insurance sectors are kept up to date with any further developments in dealing with the issue of weathertightness.

Accountability

We have referred earlier to a recent report by the New South Wales State Legislature on the quality of building. Similar problems to ours have arisen there and it was interesting that the starting point for their consideration of the issue was the following:

“Homes are the basis upon which most people establish their lives. They provide the environment for financial, physical and psychological security and development. They are one of the anchors of our contemporary way of life. For the majority of individuals and families, the purchase of a home is the most significant financial decision they will undertake. The complexity of constructing homes means that consumers are unable to determine the safety and quality of their purchase without some guidance. For these reasons, the purchase and building of a home must be treated differently from any other product.”

In his Foreword to the report the Chairman stated that “the building regulation system should rely on three core pillars. These are **responsibility, accountability and liability**. Adherence to these pillars should be a major priority to regulating one of the most costly and significant financial products in the market, namely a house. Yet, there is more consumer protection afforded in the purchase of other consumer items, such as a defective motor vehicle, where greater standards of responsibility, accountability and public liability apply to rectification and redress”.

Having completed the investigations recorded in the previous sections of this report, we have come to similar conclusions as our Australian colleagues. The single thread that runs through the multi-faceted building sector we have portrayed, is the seeming lack of accountability. The practical effect of the current system when it comes to the crunch of litigation (and as we have said that is where the battle over weathertightness tends to be fought) is to dump most of the responsibility on the building inspector. It should be apparent from what we have said that this is not a true reflection of the building process. While we have found that this part of the process requires significant improvement, the number of parties required to arrive at the end product should be mirrored in the system of “responsibility, accountability and public liability.”

In an attempt to pin down these multifarious accountabilities we have produced the diagram below which is intended to depict the various stages through which the building of a home must proceed, and the person or persons who should accept responsibility at each of these stages. It will be clear from the diagram that accountability at the various stages is well spread across the sector. However, it is the Overview Group’s conclusion that currently the levels of accountability in the building sector are unacceptably low.

	Idea/ Location	Design Concept	Funding	Designing	Building Consent	Pricing-Builder Labour only Sub-trade	Building Inspection	Code Compliance	Occupation / Purchase / Litigation	Fault Identification /
BIA		X		X	X		X	X		X
Designer		X		X	X					
Project Manager					X	X	X			
Contractor					X	X	X	X		
Developer	X	X	X	X		X	X	X		
Occupier									X	X
T.A./B.Certifier					X		X	X	X	
Insurer/Banker			X						X	
DIA					X			X		
BRANZ				X	X		X	X	X	X

Figure 1 Accountabilities in the Building Industry

We emphasise that these are our judgements. Someone else might come to a different set of judgments in particular cases. However, we believe it would be difficult to escape the overall impression that barring one or two areas, lack of accountability which leads to acceptance of responsibility, and liability, and the provision of satisfactory redress, is a serious problem in the New Zealand building sector.

It is tempting to equate this situation with the introduction of the performance-based Building Code since that period virtually equates with the rapid growth in the number of units of the style which is more prone to problems of weathertightness. We would have to say, however, that while the new, less prescriptive, approach made possible the rapid growth we have witnessed there is not sufficient evidence to state that the performance-based philosophy is the culprit. On the contrary, there is almost universal support in the sector, and perhaps even among the public, for the greater choice and flexibility allowed by the new system. There is no desire to return to the detailed prescriptions of the past.

At the same time, there is also a wider belief than say 5 years ago that the idea of “market self-regulation” is inadequate in its present form and that the desire for “minimum compliance cost” has in some quarters encouraged cost cutting which has exacerbated other factors impinging on quality construction.

Costs, Liabilities, Reparation and Remedies

The Overview group has been concerned by the trauma experienced by many individuals when faced with the reality of a leaking home. We have met a number of people who face major financial difficulty as a result of the inadequacies of the building process. “Let the buyer beware” is one approach – but it is the view of the Overview Group that the buyer in this case has good reason to expect a home that does not leak, notwithstanding apparent consumer preferences for a building type that is prone to this kind of failure.

As we have noted above, insurance companies offer no protection for what is viewed as a ‘deterioration’ rather than an ‘event’. Legislation offers little course for redress. Dispute resolution and litigation has to be based around the contracts undertaken. It is the view of the

Overview Group that it is the area of contracts throughout the building process where responsibilities and accountabilities might be addressed.

In the course of this report we have suggested a number of measures which we hope should clarify roles, responsibilities and obligations. We consider the objective should be to reduce the current alarming trend towards increased litigation and place much more emphasis on prevention and more pro-active risk management. We have tried to avoid suggesting the re-imposition of detailed controls, although we do think serious consideration should be given to the more detailed prescription of the documents that underpin the performance-based Code.

Equally important will be the availability of much more information in the public domain in order to even up the quality of the transactions between the various participants in the market place, above all the consumer. Education processes will be needed to ensure the issues are understood and acted on by all parties in the building sector and the Overview Group has noted discussions within the building professions into the potential of building provider registration.

Recommendation 20

That the BIA having taken account of the range of matters covered in this report:

- a) give serious consideration to what further measures might be desirable to improve the accountability of all parties in the building sector (including owners) for the quality of construction (including weathertightness) within the framework of the current performance-based system.**
- b) develop and implement immediately a communications strategy to keep the public and the industry fully informed of the issues and action taken.**